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***Correspondence:**

Dr. Krishna Subedi
Department of Community Dentistry
Gandaki Medical College Teaching
Hospital, Pokhara, Nepal
Email: drkrishnasubedimdspd@gmail.com
ORCID iD: <https://orcid.org/0000-0001-5409-1751>

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Synchronous use of two markers of research: p-value and confidence interval

Krishna Subedi*¹, Nuwadatta Subedi²

¹Department of Community Dentistry, ²Department of Forensic Medicine, Gandaki Medical College Teaching Hospital, Kaski, Pokhara, Nepal

In medical research, p-values are widely used as markers of statistical significance.¹ Researcher frequently compete with the p-value. There is plenty of argument regarding the misuse and misinterpretation of a p-value from the past to the present. However, it is still the most common value that is handled by researchers.

The p-value was first introduced by Fisher in 1922 where it is defined as the probability p under that hypothesis of as great or greater departure than that observed. It was later modified by Neyman et al. in 1933 to a procedure whereby an observed departure with $p < 5\%$ (or other small value) would lead to rejection of the null hypothesis.²

The p-values are used in significance testing for the null hypothesis, which can be accepted or rejected. The null hypothesis states no significant relationship exists between the two variables. Rejecting the null hypothesis means accepting the alternative hypothesis (a significant relationship exists between two variables). The p-value estimates the probability that findings will be at least as extreme as the ones observed when the null hypothesis holds true. Then, it is measured against a predetermined significance level (α). The result is regarded as statistically significant if the stated p-value is less than α . Typically, in biomedical research α is set at 0.05. Sometimes significance levels 0.01 and 0.001 are also used.³

There are various misconceptions regarding the interpretation of the p-value, some of which are listed here.

1. Clinical versus the statistical significance of the effect size

The differences between the groups are relevant when the p-value is very low. However, the actual difference may be too small to be clinically important as the p-value carries no information about the magnitude of an effect, which is captured by the effect estimate and confidence interval.

2. Non-significant significance (p >0.05) values

The new therapy has no impact if the p-value is higher than 5%. No matter how significant an impact may be, it is always the observed effect that is best supported by the data from a given experiment.

3. Overinterpreting a non-significant p-value that is close to 5%:

A p-value of 0.06, for example, should not be interpreted as a trend toward a difference. A p-value of 0.06 indicates that there is a 6% probability of getting the result by chance when the treatment has no discernable effect. The null hypothesis shouldn't be rejected because we put the significance level at 5%.

4. Effect sizes versus p-values

The p-value, according to many researchers, is the most crucial figure to report.

However, we should emphasize the effect size. The mean values for each group, the difference, and the 95% confidence interval should be reported instead of just the p-value.^{4,5}

5. Highly significant when the p-value is <0.001

When the p-value is very small many researchers believe that the effect is highly significant but it does not hold always. The p-value does not describe the effect size. So it is better to avoid terms like highly or moderately significant based on the p-value.⁶ The isolated use of p-value is a matter of debate and raised issues like replicability, veracity, and reliability of the generated conclusions.⁷ Therefore, there are some alternatives/complementary to the use of p-value. Complementing p-value with other statistics such as confidence interval, effect sizes, and Bayes factors is recommended.⁸

Confidence interval (CI)

The confidence interval was first introduced by Neyman in 1930.⁹ The use of CI in the scientific journal started in the 1980s.¹⁰ However, still many journals are not using CI but only reporting p-value. The relative use of CI is low in clinical and biomedical research.⁷

A CI is a degree of uncertainty around the effect estimate. It consists of an upper and lower limit, which shows that the true (unknown) effect may fall within this interval. The effect stated in the research paper must always lie within the CI reported, and the width of the interval portrays the precision of the effect estimate. For precise effect estimates, CI needs to be narrower. Sample size (n) and heterogeneity (standard deviation [SD] or standard error [SE]) both affect the CI width. There is an inverse relationship between the degree of uncertainty and the sample size, the bigger the sample size, the smaller the width of CI indicating a lower degree of uncertainty. However, the degree of uncertainty is directly proportional to heterogeneity. Studies with lower SDs or SE have narrower CI.¹¹

There is a rule for same-sized samples: the smaller the confidence level is, the higher the estimate accuracy.¹² Only the studies with a large sample will give a very narrow confidence interval, which points to high estimate accuracy with a high confidence level.¹²

Finally, the size of the confidence interval is influenced by the selected level of confidence (probability). A 99% CI is wider than a 95% CI. The confidence (probability) level (i.e., 95%) of the CI represents the accuracy of the effect estimate. For example, the 99% CI is more accurate than the 95% CI, because it captures a broader spectrum of the data distribution. In general, with a higher probability to cover

the true value the confidence interval becomes wider.^{11,13,14} However, the trade-off is that the 99% CI is less precise than the 95% CI. The decision of using a certain confidence level should consider a balance between accuracy and precision. In health sciences, the 95% confidence level is most often used which relates to the level of statistical significance $p < 0.05$. Very less often 90% and 99.9% are also used.¹¹

The confidence interval provides a reasonable approximation of the (in) precision and sample size of a given study. As a result, CI can be used to assess the quality of research. Nowadays many journals are recommending the reporting of CI.¹² For continuous data, a CI is the range of values statistically consistent with the value observed in the study. For binary data (presence or absence of disease, prevalence), the CI is determined for the rate of the event. It shows the range of values for the rate of the events that are statistically consistent with the observed rate.¹⁵

Limitations of CI

Although CIs can be used to enhance the interpretation of a study, they have several limitations. For example, a 95% CI does not have a 95% probability of containing the true value of interest (eg, the true treatment effect), even though it is commonly described that way. Creating an interval that does have a specified probability of containing the true value is termed a probability interval, which further requires a bayesian analysis. In addition, the values within a 95% CI are not the only values that could lead to the current data and model results; they are simply the most compatible values.¹⁶

The p-value and the confidence interval are two complementary statistical measures. Therefore, it is better to use both p-value and confidence intervals in research. While reporting p-value, do not report a “ $p < 0.05$ ” or “ $p \geq 0.05$ ”. It should be reported the actual values. We also encourage the researchers to keep in this mind while submitting their research papers to journals.

REFERENCES

1. Cristea IA, Ioannidis JPA. P values in display items are ubiquitous and almost invariably significant: A survey of top science journals. *PLOS ONE*. 2018;13(5):e0197440. DOI: 10.1371/journal.pone.0197440 PMID: 29763472.
2. Fraser DA. The p-value function and statistical inference. *Am Stat*. 2019;73(sup1):135-47. DOI: 10.1080/00031305.2018.1556735
3. Vidgen B, Yasserli T. P-Values: Misunderstood and Misused. *Front Phys*. 4:6. DOI: 10.3389/fphy.2016.00006

4. Ferreira JC, Patino CM. What does the p-value really mean. *Jornal Brasileiro de Pneumologia*. 2015;41(5):485. DOI: 10.1590/S1806-37132015000000215 PMID: 26578145.
5. Goodman S. A dirty dozen: Twelve p-value misconceptions. *Semin Hematol*. 2008;45(3):135-40. DOI:10.1053/j.seminhematol.2008.04.003 PMID: 18582619.
6. Madjarova SJ, Williams RJ, Nwachukwu BU, Martin RK, Karlsson J, Ollivier M, et al. Picking apart p values: common problems and points of confusion. *Knee Surg Sports Traumatol Arthrosc*. 2022;30(10):3245-48. DOI: 10.1007/s00167-022-07083-3 PMID: 35920843.
7. Amaral E de OS, Line SRP. Current use of effect size or confidence interval analyses in clinical and biomedical research. *Scientometrics*. 2021;126(11):9133-45. DOI: 10.1007/s11192-021-04150-3 PMID: 34565930.
8. Lakens D. The Practical Alternative to the p Value Is the Correctly Used p Value. *Perspect Psychol Sci J Assoc Psychol Sci*. 2021;16(3):639-48. DOI: 10.1177/1745691620958012 PMID: 33560174.
9. Neyman J. Fiducial argument and the theory of confidence intervals. *Biometrika*. 1941;32(2):128-50. DOI: 10.1093/biomet/32.2.128
10. Gardner MJ, Altman DG. Estimating with confidence. *British Med J*. 1988;296(6631):1210. DOI: 10.1136/bmj.296.6631.1210 PMID: 3133015.
11. Hespanhol L, Vallio CS, Costa LM, Saragiotto BT. Understanding and interpreting confidence and credible intervals around effect estimates. *Braz J Phys Ther*. 2019;23(4):290-301. DOI: 10.1016/j.bjpt.2018.12.006 PMID: 30638956.
12. Simundic AM. Confidence interval. *Biochem Medica*. 2008;18(2):154-61. DOI: 10.11613/BM.2008.015
13. Du Prel JB, Hommel G, Röhrig B, Blettner M. Confidence interval or p-value?: part 4 of a series on evaluation of scientific publications. *Deutsches Ärzteblatt International*. 2009;106(19):335. DOI: 10.3238/arztebl.2009.0335 PMID: 19547734.
14. Doll H, Carney S. Statistical approaches to uncertainty: p values and confidence intervals unpacked. *BMJ Evid-Based Med*. 2005;10(5):133-4. DOI: 10.1136/ebm.10.5.133
15. Young KD, Lewis RJ. What Is Confidence? Part 2: Detailed Definition and Determination of Confidence Intervals. *Ann Emerg Med*. 1997;30(3):311-8. DOI: 10.1016/S0196-0644(97)70167-7 PMID: 9287893.
16. Hawkins AT, Samuels LR. Use of Confidence Intervals in Interpreting Nonstatistically Significant Results. *JAMA*. 2021;326(20):2068. DOI: 10.1001/jama.2021.16172 PMID: 34812882.

Feedback of the faculty participants on training workshop on developing multiple choice questions

Rano Mal Piryani*¹, Suneel Piryani², Nudrat Zeba³

¹Department of Pulmonology and Medical Education, Director Medical Education, Bilawal Medical College, Liaquat University of Medical and Health Sciences, Jamshoro, Sindh, Pakistan, ²Public Health Professional, Karachi, Sindh, Pakistan, ³Department of Community Medicine, Coordinator for Integrated Module-Based Curriculum, Bilawal Medical College, Liaquat University of Medical and Health Sciences, Jamshoro, Sindh, Pakistan

ABSTRACT

Introduction: Multiple choice questions are commonly used tools for the written assessment of undergraduate health professions students. Faculty members need training for the development of valid and reliable multiple choice questions. For this purpose, Bilawal medical college organized one-day training workshop on developing multiple choice questions for newly recruited faculty members in March 2021. The main objective of the study was to assess the feedback of the participants on training workshop. **Methods:** This descriptive cross-sectional study assessed the feedback of the participants of training workshop on developing multiple choice questions. The feedback questionnaire had four questions. First was on "rating training workshop on scale 1 to 10 (1=poor, 10=excellent) for usefulness, content, relevance, facilitation and overall". Second was on confidence of the participants in developing MCQs after participation based on Likert scale 1 to 4 (1=not confident to 4=extremely confident). Third was on perceptions of the participants on strengths of training workshop. Lastly, fourth was on areas for improvement. The data was analyzed for central tendency using microsoft excel. **Results:** Participants' feedback rating about usefulness (8.82±1.51), content (8.12±1.69), relevance (8.35±1.46), facilitation (8.41±1.46) and overall (global) rating (8.35±1.41) was remarkable. Their confidence level after participation (3.41±0.51) was noticeable. **Conclusions:** The perceptions of the participants immediate after the training workshop i.e, their reaction was positive.

Keywords: Assessment, feedback, MCQs, training.

*Correspondence:

Dr. Rano Mal Piryani
Pulmonology and Medical Education, Director
Medical Education
Bilawal Medical College, Liaquat University of
Medical and Health Sciences
Jamshoro, Sindh, Pakistan.
Email: rano.piryani@gmail.com

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INTRODUCTION

Multiple Choice Questions (MCQs) are one of the commonest written methods of assessment for cognitive domain. Well-constructed MCQs without flaws can assess the learning of cognition even at higher order of thinking skills such as application and analysis according to Bloom's modified taxonomy and at 'know how' level of the Miller's Pyramid for assessing the competence maintaining optimal level of validity and reliability.¹⁻⁵ This tool of assessment, first time was used in 1914 by Kelly. Since then various types or styles of MCQs have been developed such as Classical or Modified single best option (SBO) or single best answer (SBA) type, true/false statements type, extended matching type, situational judgement, script concordance questions but most commonly used type is modified MCQs i.e., SBO or SBA.^{1,4}

The standard guidelines for the development of MCQs are available but their availability and reading is not enough to facilitate the process of construction of flawless quality MCQs especially those MCQs which test the higher cognitive thinking skills.^{2,6} In many medical schools of south asian countries, faculty members may be asked to do the tasks (for example, develop MCQs) for which they have no experience and or received no prescribed training.² Even experienced faculty

members make flaws in constructing MCQs but faculty members having formal training in constructing effective MCQs may make comparably less errors and over the time continued practice make them perfect in developing flawless MCQs.⁶

It has been found that proper formal training of faculty members in developing MCQs improves MCQs constructing skills of the faculty members and the quality of MCQs.^{2,7,8} While, the satisfactions of the faculty members with the training is found to be another important feature for short to long term impact of the training; the feature that improves the quality of MCQs.^{2,9}

Keeping this in mind, Bilwal Medical College (BMC) for Boys established in 2018, a constituent of Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro organized one-day training workshop on developing multiple choice questions for newly recruited faculty members in March 2021. The key objective of the training workshop was to enable participants and faculty members of basic sciences to develop MCQs following the scientific standard and guidelines. The main objective of the study was to assess the feedback of the participants on training workshop.

METHODS

This descriptive cross-sectional study was done at BMC for Boys, LUMHS in March, 2021. The main objective of the study was to assess the feedback of the participants on training workshop developing MCQs. First one-day "Training Workshop on developing MCQs" was organized by BMC for Boys, LUMHS on March 24, 2021 and the group practice session was conducted on March 30, 2021. The objective of the training workshop was to enable participant faculty members (lecturers) of basic sciences to develop MCQs following scientific standard and guidelines while the objective of the group practice session was to discuss and critically analyze the MCQs developed by the participant faculty members.

The workshop was conducted by principal author as a resource person. The 17 faculty members (lecturer and assistant professor level) from different departments of basic sciences participated in the training workshop. The methods used for conducting training workshop were Interactive tutorial, experience sharing exercise, brainstorming, individual work exercise and presentation and group work exercise and presentation in plenary. The contents discussed in the training workshop were: 1) brief overview of assessment and types of MCQs, 2) anatomy of MCQs, 3) constructing MCQs; problems, pitfalls, flaws & tips

and 4) guidelines for developing MCQs including Guidelines of College of Physicians & Surgeons Pakistan. 5) format for writing MCQS. (As shown in MCQ submission form) Informed consent was taken from the participants and study was approved by institutional review committee of BMC. All participants provided their feedback; the response rate was 100%. The data collected was checked for completeness, accuracy and consistency; entered in microsoft excel and analyzed for the central tendency.

The feedback questionnaire had four questions: first was on "rating training workshop on scale 1 to 10 (1=poor, 10=excellent) for usefulness, content, relevance, facilitation and overall"; second was on confidence in developing MCQs after participation on Likert scale 1 to 4 (1=not confident; extremely confident); third was on perception of the participants on strengths of training workshop and fourth was on areas for improvement.

MCQ SUBMISSION FORM

MCQ SUBMISSION FORM

MCQ Number

Department:

Course: MBBS

Subject:

Module:

Theme:

Topic/Chapter:

MCQ type: Classical or Modified single best option (SBO) or single best answer (SBA)

Question STEM with lead in question (Scenario)

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Options List (Correct option and Distractors)

A	
B	
C	
D	
E	

Write the correct option number: (A or B or C or D or E)

Cognition Level: C1 /C2 / C3

Importance: Essential / Important / Supplementary

Difficulty: Hard / Moderate / Easy

Reference: Author, name of the Text Book with edition / page number

Authors name & signature

Date:

RESULTS

Perceptions rating

The rating of the participants on training workshop on developing MCQs on the scale 1 to 10 (1=poor, 10=excellent) was remarkable. (As shown in Table 1)

Table 1: The rating of the participants on the training workshop on developing MCQs on the scale 1 to 10 (1=poor, 10=excellent)

Items	Scores		
	Mean with Standard Deviation	Median	Mode
a. Usefulness (1-10)	8.82±1.51	10	10
b. Content (1-10)	8.12±1.69	8	8
c. Relevance (1-10)	8.35±1.46	9	9
d. Facilitation (1-10)	8.41±1.46	9	9
e. Overall (1-10)	8.35±1.41	9	9

Level of confidence

The level of confidence in developing MCQs after participating in training workshop on Likert scale 1 to 4 (1=not confident; 4=extremely confident) was noteworthy (3.41±0.51).

Strengths of training workshop shared by the participants

- The resource person was friendly, cooperative and well versed. His deliberations on Miller’s pyramid with reference to the applications of tools of assessment and on Bloom’s modified cognitive taxonomy with reference to learning higher order of thinking skills and developing MCQs from lower order to higher order was remarkable
- Making ground rules by the participants to follow during workshop.
- Positive learning environment
- Examples of MCQs shared was impetus for learning
- Active interaction between participants and resource person

Areas for improvement suggested by the participants

- Include more practice sessions for individual and group learning in writing MCQs
- Provide certificate to the participants that likely motivate to them for continuing learning
- Organize such workshops on other methods of assessment.

DISCUSSION

A comprehensive training workshop was organized for the faculty members of BMC for Boys, LUMHS which meticulously trained the basic sciences faculty members on how to develop MCQs. Faculty members perceived that the training workshop was valuable as evident from the central tendency of rating score on usefulness, content, relevance, facilitation and overall (global) rating of the participants in

feedback obtained at the end of training workshop. After participation in training workshop, their confidence level in developing MCQs seemed to be noticeable too as obvious from their rating. Deliberations on Miller’s pyramid with reference to the applications of tools of assessment and on Bloom’s modified cognitive taxonomy with reference to learning at higher order of thinking skills and developing MCQs from lower order to higher order, learning through example were among the strengths of training workshop. They suggested to include more practice sessions for individual and group learning in writing MCQs. The findings of present study are consistent with the findings of other studies in recent past. The high level of satisfaction of participants was reported by Sadiq et al.¹¹ in their study.

Ali et al.¹² documented good to excellent rating of the participants on the knowledge gained and understanding of the content of the workshop in their study. Sezari et al.¹³ documented in their study reported that one-day short workshop on MCQs as a faculty development program improves capacities of the faculty members revealed by the participants. Participants reported a significant improvement in item writing skills and ability to identify flawed items immediately after participation in training workshop mentioned by Beg et al.² in their study.

The limitations of the present study include limited number of the participants, purposive sampling technique, conducted in one medical college and assessment of immediate feedback i.e., reaction of the participants.

CONCLUSIONS

The perceptions of the participants (immediate reaction) after the training workshop were positive. Their confidence in developing MCQs seemed to be noticeable.

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CONFLICTS OF INTEREST: None declared

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REFERENCES

1. Douthit NT, Norcini J, Mazuz K, Alkan M, Feuerstein MT, Clarfield AM, et al. Assessment of global health education: The role of multiple-choice questions. *front. Public Health.* 2021;9:640204. DOI: 10.3389/fpubh.2021.640204 PMID: 34368038.

2. Beg MA, Tabassum A, Ali S. Role of faculty development workshop for improving MCQS quality in basic medical sciences. *Biomedica*. 2021;37(1): 51-5. DOI: 10.51441/BioMedica/5-170
3. Abdulghani HM, Ahmad F, Irshad M, Khalil MS, Al-Shaikh GK, Syed S, et al. Faculty development programs improve the quality of Multiple Choice Questions items' writing. *Sci. Rep.* 2015;5:9556. DOI: 10.1038/srep09556 PMID: 25828516.
4. Mirbahai L, Adie J. Applying the utility index to review single best answer questions in medical education assessment. *Arch Epid Pub Health*. 2020;1:1-5. DOI: 10.15761/AEPH.1000113
5. Kurtz J, Holman B, Monrad SU. Training medical students to create and collaboratively review multiple-choice questions: A comprehensive workshop. *MedEdPORTAL*. 2020;16:10986. DOI: 10.15766/mep_2374-8265.10986 PMID: 33083537.
6. Webb EM, Phuong JS, Naeger DM. Does educator training or experience affect the quality of multiple choice questions? *Acad Radiol*. 2015;22(10):1317- 22. DOI: 10.1016/j.acra.2015.06.012 PMID: 26277486.
7. Gupta P, Meena P, Khan AM, Malhotra RK, Singh T. Effect of faculty training on quality of multiple-choice questions. *Int J App Basic Med Res*. 2020;10:210-4. DOI: 10.4103/ijabmr PMID: 33088746.
8. Abdulghani HM, Ahmad F, Irshad M, Khalil MS, Al-Shaikh GK, Syed S, et al. Faculty development programs improve the quality of Multiple Choice Questions items' writing. *Sci Reports*. 2015;5(1):1-7. DOI: 10.1038/srep09556 PMID: 25828516.
9. Naeem N, Van der Vleuten C, Alfariis EA. Faculty development on item writing substantially improves item quality. *Adv Health Sci Educ*. 2012;17(3):369-76. DOI: 10.1007/s10459-011-9315-2 PMID: 21837548.
10. Chandra S, Katyal R, Chandra S, Singh K, Singh A, Joshi HS. Creating valid multiple-choice questions (MCQs) bank with faculty development of Pharmacology. *Indian J Physiol Pharmacol*. 2018;62(3):359-66.
11. Sadiq T, Yasmeen R, Arif N, Zia Q. Workshop on construction of case cluster MCQs what, why and how: reaction of faculty. *PJMHS*. 2019;13(2):389-393.
12. Ali R, Sultan AS, Zahid N. Evaluating the effectiveness of MCQ development workshop using cognitive model framework: A pre-post study. *J Pak Med Assoc*. 2021;71(1(A)):119-121. DOI: 10.47391/JPMA.1068 PMID: 33484534.
13. Sezari P, Tajbakhsh A, Massoudi N, Arhami Dolatabadi A, Tabashi S, Sayyadi S, et al. Evaluation of one-day multiple-choice question workshop for anesthesiology faculty members. *Anesth Pain Med*. 2020;10(6):e111607. DOI: 10.5812/aapm.111607 PMID: 34150580.

Academic performance of medical students during COVID-19 pandemic at a medical college in Kaski, Nepal

Neebha Amatya*¹, Rajesh Prajapati¹, Rajab Rana Magar¹, Ripti Shrestha¹

¹Department of Physiology, Gandaki Medical College Teaching Hospital, Pokhara, Nepal

ABSTRACT

Introduction: The world has faced a disastrous period at the time of the pandemic of corona virus- 19. The education system was hampered along with all the sectors of life and therefore, it was realized that a switch from the conventional way of teaching to online teaching is needed. The current study was done to analyze the impact of the COVID-19 lockdown on the academic performance of medical students at Gandaki medical college of Pokhara, Nepal. **Methods:** It was a descriptive study of the first and second-year medical students of Gandaki Medical College. The Likert scale was used to measure the effect of the COVID-19 lockdown on academic performance and to evaluate online education. A census sampling technique was used to collect the data. **Results:** A total of 171 participants answered the questionnaire with a response rate of 87%. The data showed that covid-19 lockdown affected the academic performance of most participants of 98.2% with varying degrees. The mean evaluation score for online theory education was 4.7 ± 2.06 while for the practical lessons was 2.06 ± 1.4 . **Conclusions:** COVID-19 pandemic lockdown affected the academic performance of most participants to varying degrees. The academic performance of medical students with the online teaching method is effective during COVID-19 lockdown.

Keywords: Academic performance, coronavirus, COVID-19, medical students, online learning.

*Correspondence:

Dr. Neebha Amatya
Department of Physiology
Gandaki Medical College Teaching Hospital
and Research Center,
Pokhara, Nepal
Email: neevaamatya123@gmail.com
ORCID iD: <https://orcid.org/0000-0001-8084-2715>

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INTRODUCTION

Coronavirus disease 2019 (COVID-19) outbreak from Wuhan city, China in December 2019 as pneumonia of unknown origin.¹ The causative agent of COVID-19 was identified as a novel coronavirus, severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) according to the international committee on taxonomy of viruses (ICTV).² It was announced as a pandemic on March 12, 2020 by World Health Organization.³ Authorities in several countries worldwide declared either lockdowns, travel restrictions, social distancing, school and universities closure as a measure to break the chain of the spread of virus infection.⁴ These measures have a negative worldwide effect on business, education, health, and tourism.⁵

The COVID-19 pandemic has affected all levels of the education system.⁶ It has tested the limits of healthcare systems and challenged conventional practices in medical education.⁷ Due to the suspension of classroom teaching in many colleges and universities, a switch to online teaching for students is started. However, many students have no access to online teaching due to a lack of either the means or the instruments.⁸ This form of learning minimize the contact among the students themselves.⁹

Digital learning has become a boon to students however, it has created inequality in access to education which can affect the

academic performance of the students. Nepal, like any other low-income country, has big gaps among its citizen in terms of their socio-economic and education/literacy background. The existing system of education and the uneven distribution of its resources have often been blamed for the widening gaps between the haves and have-nots; in the advent of COVID-19, the digital device and the uneven access to e-learning and e-resources will increase the gaps even further by widening the inequalities between the advantaged and disadvantaged children.¹⁰

Recently, few studies were conducted that highlighted COVID-19 in relation to educational studies as COVID-19 has a profound impact on medical students.¹¹ In the second week of May 2020, United Nations Educational, Scientific and Cultural Organization (UNESCO) (2020) estimates that nearly nine million (8,796,624) students in Nepal are affected due to school/university closures in response to the pandemic.¹²

So, the COVID-19 pandemic lockdown has affected the academic performance of students. The most common problems associated with online education, included the availability of the internet in provincial and rural areas, the speed and cost of the internet, and the lack of interaction between students and lecturers. While specific problems associated with online education of subjects of medical science included lack of application of the clinical setting, lack of online information about certain subjects, and challenges of teaching practical lessons. These common problems vary from country to country and place to place.¹³

There are very few studies in Nepal that let us know about the academic performance of medical students due to the impact of the pandemic. This study can represent the importance and effectiveness of online classes which directly affect the academic performance of the medical students, at Gandaki Medical College, Pokhara, Nepal. This study was conducted to analyze the impact of the COVID-19 pandemic on the academic performance of medical students.

METHODS

This is a descriptive cross-sectional study carried out among all medical students in the first and second year of Gandaki Medical College Teaching Hospital and Research Center, Pokhara, Nepal over a period of five months from January to May 2022. Informed written consent was obtained from all the participants and confidentiality was assured. A census sampling technique was used to collect the data. Ethical clearance was obtained from the Institutional ethical review committee board, Gandaki Medical College (Ref no: 131/078/079).

After fulfilling the inclusion criteria (all the healthy individual medical students of the first and second year without cold, cough, and fever), a database proforma including the demographic details and the questionnaire (supplementary file) is given to the participants. They were asked to answer the questionnaire for research purposes. The final questionnaire for this study consisted of 19 questions¹³ (13 closed-ended and 6 open-ended) which is divided into two sections based on the previous paper as follows: The first section included seven questions about the demographic characteristics of participants (sex, age, country, residence place, university, program level, and academic year). The second section evaluated the effect of the COVID-19 pandemic on the study or research, and online learning during the lockdown (the effect of lockdown on academic performance, electronic device used to study online, virtual learning tools used, time spent per day in online learning, evaluation of online learning both in the theoretical or practical parts, common problems encountered in the online learning, suggestions to improve the online learning, views about the effectiveness of the online learning system over the conventional learning system). This section consisted of twelve questions as follow: two single-choice questions, two multiple-choice questions, three Likert-scale questions, and five questions with free-text answer.

To measure the effect of the COVID-19 lockdown on the academic performance of medical students, 5-Point Likert Scale was used. Answers were converted into numeric values as follows (greatly affected = 5 points; considerably affected = 4 points; moderately affected = 3 points; slightly affected = 2 points; not affected = 1 point).¹⁴ To evaluate online education during the pandemic lockdown, a 10-Point Likert Scale was used. Participants were asked to evaluate online education in general, and online education in practical lessons during the lockdown (1 was the lowest evaluation and 10 was the highest evaluation). The data were entered into the excel sheet and analyzed using statistical package for social sciences (SPSS) version 25.0 (IBM Corporation). Descriptive statistics were presented as counts and percentages to summarize the collected data.

RESULTS

Demographic Characteristics of Participants

The total number of responses was 171 responses out of 196 (response rate was 87%); 74(43.27%) were males and 97(56.7%) were females. The reason for the 13% non-response rate was they were not present during the study. The age of participants ranged from 18 to 25 years (mean±SD = 24.10±5.93 years). Most of the participants

were from the MBBS Stream 154(90.05%) while from the BDS very few 17(9.92%). Most of the students who participated in this lived-in city areas 142(83.04%) while in the rural area quite less 29(16.95%) (Table 1).

Table 1: Sociodemographic characteristics of participants

Variables	Total N (%)	Male N (%)	Female N (%)
	171 (100%)	74 (43.27%)	97 (56.73%)
Educational Stream			
MBBS	154 (90.06%)	67 (43.50%)	87 (56.50%)
BDS	17 (9.94%)	7 (41.17%)	10 (58.83%)
Residential area			
City	142(83.04%)	66 (46.47%)	76 (53.53%)
Rural	29(16.95%)	6 (20.68%)	23 (79.32%)

The effect of COVID-19 pandemic lockdown on academic performance

The result showed that the average evaluation was 3.53 ± 0.96 points (the highest is 5 and the lowest is 1 point). Most of the participants 98.2% (n=168) believed that the COVID-19 pandemic lockdown affected their academic performance to varying degrees. One-sixth of the participants 28(16.37%) were greatly affected whereas 60(35.08%) were considerably affected, 59(34.5%) were moderately affected, and 20(11.69%) were slightly affected while only 3(1.75%) stated that lockdown had no effect on their academic performance (Table 2).

Table 2: Academic performance of the participants during the lockdown

Variables	Not Affected	slightly Affected	Moderately Affected	Considerately Affected	Markedly Affected
Students	3(1.75%)	20(11.69%)	59(34.5%)	60(35.08%)	28(16.37%)

Evaluation of online education during COVID-19 pandemic lockdown

Our participants used several electronic devices to study online. The most used device was the laptop, 113(66.08%) followed by Smartphone, 68(39.76%), and tablet, 7(4.09%), while the least used device was the personal computer, 2(1.16%) (Figure 1). The study hours spent for online learning ranged from 1 h/day to 10 h/day with an average of 4.98 ± 1.39 hour/day. Regarding the frequency of online studying hours, about 4(2.33%) of participants spent up to 2 hours/day in online learning, while 152(88.88%) of participants spent 3 to 6 hour/day, and 15(8.77%) of participants spent 7 to 10 hours/day. The mean evaluation score (the highest score is 10 and the lowest is 1) for online education, in general, was 4.7 ± 2.06 while that for the practical parts was 2.06 ± 1.4 . About 102(59.6%) of participants evaluated online learning in general with 1 to 5 of 10 points, while 169(98.8%) of participants evaluated

online learning in practical lessons with 1 to 5 of 10 points (Figure 2). Participants showed that the online study materials were available mostly through online classes and youtube videos followed by pdf lectures, e-books, educational websites, university platforms, and educational applications (Figure 3).

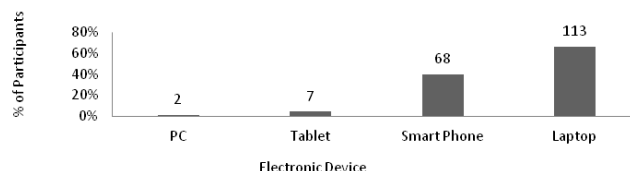


Figure 1: Device used by students to access online learning

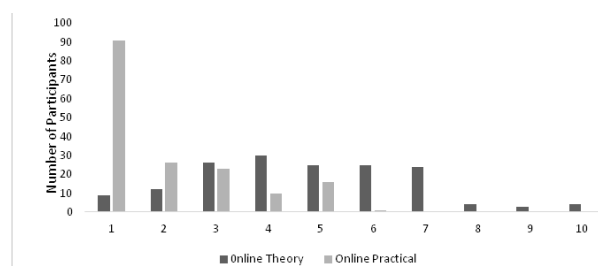


Figure 2: Evaluation of online classes

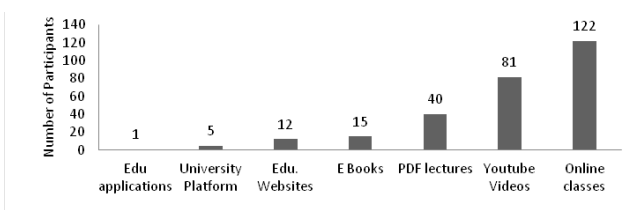


Figure 3: Available online study materials

The common problems with online learning of medical sciences

According to the participants' responses the common problems with online learning are:

- Lack of concentration
- Lack of interaction
- Internet Problems- decreased availability in mostly rural areas
- Slow speed and higher cost of internet
- Lack of online information about some subjects like anatomy
- Difficult to learn practical lessons

Recommendations to improve online learning in medical sciences

The students' recommendations to improve online were summarized as follows:

- The platforms for gaining online learning should be standardized for easy access to learning subject material.

- Improvement of internet speed and minimum charging of internet packages specially for online learning
- Improve the way of teaching to encourage students to learn
- Provide training for lecturers on online teaching
- Interaction between teachers and students should be increased by asking questions and taking online tests.
- Practical learning by interactive tools such as videos and 3D animation.

DISCUSSION

The novel COVID-19 disease which originated in Wuhan city, China in December 2019 extended vigorously, along with other countries of the world. Hence, governments around the world have either temporarily closed educational institutions which affected over 60% of the student population worldwide.¹⁵ About 155 countries worldwide have introduced various tools and learning platforms as a solution to continue the education process during the pandemic.¹⁶ Almost all over the world many universities have minimized gatherings by suspending or canceling all educational activities including suspension of classroom teaching to decrease the rapid spread of the virus. Hence, several colleges and universities worldwide switch to online teaching for students to minimize the contact either between the students and lecturers or between students themselves.⁸

The study showed that the COVID-19 pandemic lockdown affected the academic performance of most participants by 98.2% with varying degrees. This is in accordance with a previous study,¹⁷ which reported that COVID-19 has a profound impact on medical students, dental medical students, and radiology trainees. Attending online courses has not so a good effect on students; a reduction in students' progress and success has been reported to be associated with taking online college courses, instead of traditional in-person courses.

The current study showed that the most popular device that students used to access online materials was the laptop followed by a smartphone, while the least used tool was the personal computer. This result is in accordance with the previous report that showed students use laptops and smartphones at higher rates than other equipment to access online lessons.¹⁸ It is worth mentioning that many students have no access to online teaching due to a lack of either the means or the instruments because of economical and digital devices.⁹ However, there were no such issues reported in the current study.

The most common problems associated with online education, in general, included the availability of the internet in provincial and rural areas, the speed and cost of the internet, the availability of electronic devices to access the internet, and the lack of interaction between students and lecturers. While specific problems associated with online education of medical subjects are lack of application of the clinical setting, lack of online information about certain subjects, such as human anatomy, challenge of teaching practical lessons online, and lack of the use of cadavers in anatomy practical studies.

To improve online education in general it is recommended to provide platforms for online learning, provide students with electronic devices to access the internet, improve the internet speed, provide cheaper or even free internet packages during the pandemic, provide professional training for lecturers, and enhance the interaction between students and teachers. Additionally, to improve online education it is recommended to provide virtual resources to mimic the laboratory work, teach practical lessons by interactive tools, such as videos and 3D animation, and provide accessible e-books and instructional videos for practical lessons.

The results obtained in this study are based on the retrospective observational study. They are therefore subject to biases and confounding that may have influenced our result, however, we took precautions and scrutinized the procedure effectively to avoid the bias. Further, the outcome may change with time, increasing the number of participants, and the individual experience.

CONCLUSIONS

The current study showed that the COVID-19 pandemic lockdown affected the academic performance of most participants with varying degrees. Our findings have important implications as a future reference to improve Online Learning in Medical Science by making it more interactive, showing medical procedures in real situations, giving concise information, and providing 3D virtual tools to mimic the real situation.

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REFERENCES

1. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A novel coronavirus from patients with pneumonia in

- China, 2019. *N Engl J Med.* 2020;382:727–33. DOI: 10.1056/NEJMoa2001017
2. WHO. WHO Announces COVID-19 Outbreak a Pandemic. 2020. Available from: <https://www.euro.who.int/en/health-topics/healthemergencies/coronavirus-covid-19/news/news/2020/3/who-announcescovid-19-outbreak-a-pandemic> [Accessed 25th August, 2020]
3. Paital B, Das K, Parida SK. Inter nation social lockdown versus medical care against COVID-19, a mild environmental insight with special reference to India. *Sci Total Environ.* 2020;728:138914. DOI: 10.1016/j.scitotenv.2020.138914
4. Pragholaipati A. COVID-19 impact on students. EdArXiv [Preprint]. 2020;1–6. DOI: 10.35542/osf.io/895ed
5. Nicola M, Alsafi Z, Sohrabi C, Kerwan A, Al-Jabir A, Iosifidis C. et al. The socio-economic implications of the coronavirus pandemic (COVID-19): a review. *Int J Surg.* 2020;78:185–93. DOI: 10.1016/j.ijisu.2020.04.018
6. Harries AJ, Lee C, Jones L, Rodriguez RM, Davis JA, Osborn MB. Effects of the COVID-19 pandemic on medical students: a multicenter quantitative study. *BMC Med Educ.* 2021;21:14. DOI: 10.1186/s12909-020-02462-1
7. Iyer P, Aziz K, Ojcius DM. Impact of COVID-19 on dental education in the United States. *J Dent Educ.* 2020;84:718–22. DOI: 10.1002/jdd.12163
8. Sahu P. Closure of universities due to Coronavirus Disease 2019. (COVID-19): impact on education and mental health of students and academic staff. *Cureus.* 2020; 12:e7541. DOI: 10.7759/cureus.7541
9. UNESCO. Universities Tackle the Impact of COVID-19 on Disadvantaged Students. 2020. Available from: <https://en.unesco.org/news/universitiestackle-impact-covid-19-disadvantaged-students> [Accessed 24th May, 2020]
10. Rose S. Medical student education in the time of COVID-19. *JAMA.* 2020;323:2131–2. DOI: 10.1001/jama.2020.5227
11. Sandhu P, de Wolf M. The impact of COVID-19 on the undergraduate medical curriculum. *Med Educ Online.* 2020;25:1764740. DOI: 10.1080/10872981.2020.1764740
12. Dawadi S, Giri R, Simkhada P. Impact of COVID-19 on the Education Sector in Nepal - Challenges and Coping Strategies. Sage Submissions. 2020. DOI: org/10.31124/advance.12344336.v1
13. Mahdy MAA. The impact of COVID-19 pandemic on the academic performance of veterinary medical students. *Front Vet Sci.* 2020;7:594261. DOI: 10.3389/fvets.2020.594261
14. Mayer JD, Cavallaro R. Brief Mood Introspection Scale (BMIS): Technical and Scoring Manual, 3rd ed. New Hampshire, NH: University of New Hampshire 2019.
15. UNESCO. Education: From Disruption to Recovery. 2020. Available from: <https://en.unesco.org/covid19/educationresponse> [Accessed 24th May, 2020]
16. UNESCO. National Learning Platforms and Tools. 2020. Available from: <https://en.unesco.org/covid19/educationresponse/nationalresponses> [Accessed 9th June, 2020]
17. Bettinger EP, Fox L, Loeb S, Taylor ES. Virtual classrooms: how online college courses affect student success. *Am Econ Rev.* 2017;107:2855–75. DOI: 10.1257/aer.20151193
18. Mulenga EM, Marbán JM. Is COVID-19 the gateway for digital learning in mathematics education? *Contemp Educ Technol.* 2020;12:ep269. DOI: 10.30935/cedtech/7949

Is daycare tonsillectomy a safe outpatient surgery at Pokhara ENT Center, Nepal

Rajendra Nepali*¹, Tulika Dubey², Neeraj KC³, Banita Gurung⁴

¹Department of ENT- HNS, Pokhara ENT Center, Pokhara, Nepal, ²Department of ENT-HNS, Fewacity Hospital, Pokhara, Nepal, ³Department of ENT-HNS, Metrocity Hospital, Pokhara, Nepal, ⁴Department of pathology, Nepal Cancer Hospital and Research Center, Kathmandu, Nepal

ABSTRACT

Introduction: Tonsillectomy is one of the most common surgical procedure in the world performed by Ear, Nose and Throat surgeon. Over the past decade, there has been progress in surgical techniques for tonsillectomy, yet pain and bleeding after tonsillectomy remain important surgical complications. With the increasing need to reduce healthcare costs in developing countries, there is currently a trend towards performing tonsillectomy on a daycare basis and this study aims at evaluating how efficacious it may be in our setting. **Methods:** A retrospective review of all the daycare tonsillectomy surgeries performed at the Pokhara ENT Center, Pokhara, Nepal from February 2018 to January 2019. Patients aged 15 years and up of either sex who met the paradise criteria were included while patients who met the same but had a contraindication for tonsillectomy surgery were excluded. Demographic information as well as complications within six hours of surgery before discharge and on follow-up on the seventh post-operative day were evaluated, as were any emergency room visits in the first 24 hours and any complications requiring a visit to a healthcare facility. **Results:** On day of surgery 17% had worst pain and on seventh post-operative day 75% had no pain, only 2% presented with primary hemorrhage and 3% presented with secondary hemorrhage. None of them required revision surgery. **Conclusions:** Daycare tonsillectomy is being done in only some of the centers owing to the risk of postoperative complications in our country. In our study, the number of complications was lower and not life-threatening. It can be considered a safe and cost-effective method, though patient selection is crucial.

Keywords: Daycare, post-tonsillectomy hemorrhage, tonsillectomy.

*Correspondence:

Dr. Rajendra Nepali
Department of ENT- HNS
Pokhara ENT Center, Pokhara, Nepal
Email id: drrajendra28@gmail.com

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INTRODUCTION

Tonsillectomy is one of the most common surgical procedures in the world performed by Ear, Nose and Throat (ENT) surgeon. The first description of a surgical technique for tonsillectomy was performed by Aulus Cornelius Celsus, a Roman physician of the time of Christ, who extracted the tonsils using just his fingernails.¹ Since then, there has been progress in surgical and anesthetic techniques for tonsillectomy, resulting in faster surgical time with fewer complications.² However, post-operative pain and bleeding remain important surgical complications.^{3,4} The procedure is done as an inpatient surgery because of the risk of post-tonsillectomy hemorrhage, which can be serious. With the increasing need to reduce healthcare costs, spare precious hospital beds, and reduce the expense of these procedures, there is currently a trend towards performing tonsillectomy on a daycare basis in many major medical centers.^{5,6} Daycare tonsillectomies are being performed in many western countries, and the procedure is found to be safe.^{7,8} Post-tonsillectomy pain is a considerable problem, leading to suffering and unplanned health-care contact. Post-operative pain can be assessed by the visual analogue scale (VAS) after tonsillectomy,

which shows validity and reliability.⁹ Bleeding is another important complication after tonsillectomy. It can be primary, occurring within 24 hours of the post-surgical period and after the recovery of the patient from anesthesia, or secondary, occurring after 24 hours of the post-operative period. These complications after surgery can be studied to see the effectiveness of the method of surgery performed.

This study aims to find out the frequency of post-tonsillectomy complications that include pain and bleeding in the daycare setup at the Pokhara ENT Center in Pokhara, Nepal.

METHODS

This is a retrospective study and all the necessary data was collected from the medical records of the patients by using the semi-structured Performa who underwent daycare tonsillectomy surgery at Pokhara ENT Center, Pokhara Nepal from February 2018 to January 2019. The protocol had the approval from Nepal Health Research Council (NHRC Ref No:1935). Complication that were considered major primary hemorrhage- occurring within 24 hours of post-surgical period and secondary hemorrhage which occurs after 24 hours of surgery and minor complication post-operative pain were evaluated. Post-operative pain assessment of patients was done by using the universally accepted VAS (visual analogue score) system in which 0 represents “no pain”, 1 to 3: “mild pain”, 4 to 6: “moderate pain”, 7 to 9: “severe pain” and 10 represents “worst pain” (on the VAS). The patient was briefed about VAS before the surgery. Post-operative pain was measured two times for each patient; the first at six hours post-operative period after recovering from anesthesia before discharge and the seventh post-operative day during follow-up. Age, gender, and emergency department visit with complications such as surgical site bleeding and pain were all recorded.

All the patients above the age of 15 years, of both genders, with recurrent attacks of tonsillitis fulfilling the paradise criteria. Recurrent tonsillitis (without any history of acute tonsillitis within 4 weeks prior to surgery). Upper airway obstruction symptoms or sleep apnea, recurrent peritonsillar abscess and unilateral tonsillar hypertrophy. After an anesthetist evaluation, the patient is deemed fit for surgery. The presence of an adult guardian who could arrange an immediate visit to the hospital of a patient in case of an emergency were included. Exclusion criteria were: patients with acute attacks of tonsillitis, bleeding disorders, quinsy, uncontrolled medical illness, anemia, pregnancy and lactation. Patients who are medically unfit for surgery after assessment by an anesthetist.

The family was verbally informed in great detail regarding the operation, the discharge process, and about any potential complications. After six hours of surgery, the patient was instructed to sip ice cold liquid. Patients were scheduled for discharge:

- If patients were awake, alert and their vital signs (temperature, blood pressure, heart rate and respiratory rate) were within the normal range.
- The patient moving around and tolerating fluids.
- The oropharynx of the patient has been checked for post-operative hemorrhage.
- Emesis was controlled and pain was reduced by oral medication.

RESULTS

There were 59 daycare tonsillectomy cases in 12 months duration of which patients with age group 15-20; 21-25; 26-30; 31 and above were (n=23; 38.98%), (n=17; 28.81%),

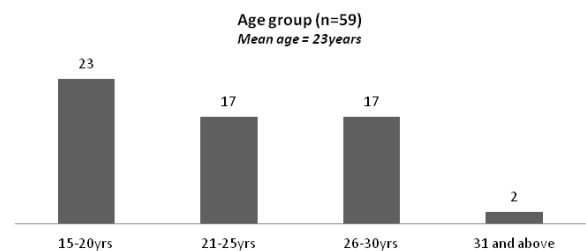


Figure 1: Age distribution of patients who underwent tonsillectomy surgery

(n=17; 28.81%) and (n=2; 3.39%) respectively. Most of the patients were between the age 15-20 years. Mean age was 23 years. Males were higher in frequency (38,65%) than female (21,35%)

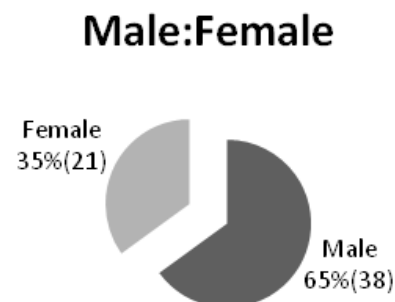


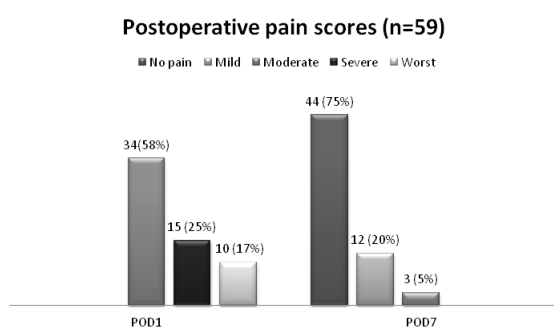
Figure 2: Sex distribution of patients who underwent tonsillectomy surgery

Among 59 patients all had pain on day of tonsillectomy surgery and (n=15; 25%) had pain on seventh post-operative day. Only (n=1; 2%) had primary bleeding and (n=2; 3%) had secondary bleeding.

Table 1: Complication rate among daycare tonsillectomy

Post-Operative Complications	
Pain POD 1 st	59 (100%)
Pain POD 7 th	15 (25 %)
Primary Bleeding	1 (2%)
Secondary Bleeding	2 (3%)

On the day of tonsillectomy surgery 34(58%) had moderate pain, 15(25%) had severe pain and 10(17%) had worst pain as on the seventh post-operative day pain was absent in 44(75%), mild pain was present in 12(20%) and moderate pain in 3(5%).

**Figure 3:** Distribution by intensity of pain on day of operation and on seventh post-operative day of tonsillectomy surgery

DISCUSSION

Daycare tonsillectomy is a well-established procedure in adults and children in the developed world, but due to the lack of resources, most of the patients have to be admitted in our part of the world.¹⁰ One of the major pros of daycare surgery is reduced health care costs for patients. It requires minimal post-operative care, which can be easily made available at home with appropriate instructions. Daycare surgery leads to less physical and psychological trauma, an increased sense of safety, minimally affects the lifestyle and patients can return to their normal day-to-day life very quickly.¹¹ However, there are some limitations of daycare surgery, which include management of post-operative unplanned admissions, management of the consequences of delayed treatment of complications if required.¹¹

The most common group of patients who underwent daycare tonsillectomy in our study was 15-30 years (n=23), which is similar to the findings of Tong et al. and Sapana et al., where the maximum number of daycare surgeries were performed in the age group of 13-36 years.^{12,13} In our study, we mainly evaluated two major complications following this surgery which are hemorrhage and post-operative pain.

Primary post-operative hemorrhage:

One of the complications that needs immediate care following daycare surgery might be post-operative

hemorrhage. Tewary, in his review of literature, found that the rate of primary post-operative hemorrhage in the setting of daycare surgery was 0.5%.⁷ Schloss et al. in his surgery found primary post-operative hemorrhage was found to be 3.5%.¹⁴ In his study, Tami et al. found primary post-operative hemorrhage to be 1.5%.¹⁵ Our study showed almost similar findings, in which out of 59 patients, primary was 2%. In our case, the patient with primary hemorrhage was immediately controlled by bi-polar cautery under local anesthesia.

Secondary post-operative hemorrhage:

The secondary post-operative hemorrhage in our study was presented on the fifth and eighth post-operative days in two patients (3%). Both the cases had minimal bleeding and were managed conservatively with hydrogen peroxide and betadine gargles, after which they were uneventful. Tewary, Schloss et al. and Tami et al. in their studies found that secondary post-operative hemorrhage was 1.02%, 5.1%, and 3.7% respectively.^{7,14,15}

Pain is another most common complication after tonsillectomy surgery which leads patients to seek outpatient medical attention within two weeks of surgery.¹⁶ Optimizing pain management is necessary to maximize the benefits of ambulatory surgery for both patients and healthcare providers. In our study, we saw that all 59 of our patients presented with moderate to worst pain on the first post-operative day, which was similar to other study Karatzias et al.¹⁷, moderate to severe pain on the first postoperatively and Francisco et al.¹⁸, mild to severe pain on the first post-operative day. On the seventh post-operative day, 12 patients presented with mild pain and only three patients presented with moderate pain in our study, which was managed by oral paracetamol. In the studies by Lachanas et al.¹⁹ and Stavroulaki et al.²⁰ they described mild to moderate pain in seventh post-operative day which is similar to our study. None of the patients were re-admitted due to severe pain or inability to eat or drink due to pain. So, we concluded that post-operative pain in most cases of the cases in daycare tonsillectomies can be managed very efficaciously with oral analgesics.

For any surgery to be considered safe as a day-care procedure, the incidence of the complications resulting in readmission should be very low and shouldn't be life-threatening or debilitating to the patients. The complications in our study were too low to be considered unsafe.

CONCLUSIONS

Daycare tonsillectomies are being practiced at very limited centers in Nepal but have great potential. We hope that this

publication will shed some light on the efficacy and safety of this procedure in a developing country like ours, though patient selection, their co-operation and proper counseling regarding the procedure and complications are crucial.

CONFLICTS OF INTEREST: None declared

SOURCE OF FUNDING: None

REFERENCES

- Sah MK, Neupane Y, Guragain RPS. Comparison of ultrasonic device versus bipolar diathermy tonsillectomy in children. *JNHRC*. 2019;17(42):71-5. DOI: 10.33314/jnhrc.1751
- Horii A, Hirose M, Mochizuki R, Yamamoto K, Kawamoto M, Kitahara T, et al. Effects of cooling the pharyngeal mucosa after bipolar scissors tonsillectomy on postoperative pain. *Acta Otolaryngol*. 2011;131(7):764-8. DOI: 10.3109/00016489.2011.566580
- Robinson SR, Purdie GL. Reducing post-tonsillectomy pain with cryoanalgesia: a randomized controlled trial. *Laryngoscope*. 2000;110(7):1128-31. DOI: 10.1097/00005537-200007000-00011
- Wiikmann V, Prado FAP, Caniello M, Di Francesco RC, Miziara ID. Post-operative complications in adenotonsillectomy. *Braz J Otorhinolaryngol*. 2004;70(4):464-8. DOI: 10.1590/S003-72992004000400005
- Raymond CA. Study questions safety economic benefits of outpatient tonsil/ adenoid surgery. *JAMA*. 1986;256(3):311-2. DOI: 10.1001/jama.1986.03380030013002
- Guida RA, Mattucci KF. Tonsillectomy and adenoidectomy: An inpatient or outpatient procedure. *Laryngoscope*. 1990;100(5):491-3. DOI: 10.1288/00005537-199005000-00009
- Tewary AK. Day-case tonsillectomy: a review of the literature. *J Laryngol Otol*. 1993;107(8):703-5. DOI: 10.1017/s0022215100124181
- Laureyns G, Lemkens P, Jorissen M. Tonsillectomy as a day-case surgery: a safe procedure? *B-ENT*. 2006;2(3):109-16. PMID: 17067079.
- Warnock FF. Pain progression, intensity and outcomes following tonsillectomy. *Lander J*. 1998;75(1):37-45. DOI: 10.1016/s0304-3959(97)00202-9
- Riding K, Laird B, O'Connor G, Googell AS, Bitts B, Salkeld L. Daycare tonsillectomy and/or adenoidectomy at the British Columbia Children Hospital. *J Otolaryngol*. 1991;20(1):35-42. PMID: 2030535.
- Granell J, Gete P, Villagruela M, Bolanos C, Vicent JJ. Safety of outpatient tonsillectomy in children: A review of 6 years in a tertiary hospital experience. *Otolaryngol Head Neck Surg*. 2004;131(4):383-7. DOI: 10.1016/j.otohns.2004.03.027
- Tong WH, Hui TS, Wee CA. Is daycare tonsillectomy safe? *Iran J Otorhinolaryngol*. 2016;28(3):183-8. PMID: 27429946.
- Sapana RP, Mubarak MK. Is day care tonsillectomy a safe procedure. *Indian J Otolaryngol Head Neck Surg*. 2019;71(1):918-22. DOI: 10.1007/s12070-019-01587-0
- Schloss MD, Tan AK, Schloss B, Tewfik TL. Outpatient tonsillectomy and adenoidectomy: complications and recommendations. *Int J Pediatr Otolaryngol*. 1994;30(2):115-22. DOI: 10.1016/0165-5876(94)90194-5
- Tami TA, Parker GS, Taylor RE. Post-tonsillectomy bleeding: an evaluation of risk factors. *Laryngoscope*. 1987;97(11):1307-11. DOI: 10.1288/00005537-198711000-00011
- Nunez DA, Provan J, Crawford M. Post-operative tonsillectomy pain in pediatric patients. *Arch Otolaryngol Head Neck Surg*. 2000;126(7):837-41. DOI:10.1001/archotol.126.7.837
- Karatzias GT, Lachanas VA, Sandris VG. Thermal welding versus bipolar tonsillectomy: a comparative study. *Otolaryngol Head Neck Surg*. 2006;134(6):975-8. DOI: 10.1016/j.otohns.2006.03.003
- Francisco et al. Factors Related to Post-tonsillectomy pain in Adults. *Acta Otolaryngol*. 2016;67(1):23-32. DOI: 10.1016/j.otorri.2015.01.004
- Lachanas VA, Hajioannou JK, Karatzias GT, Filios D, Koutsias S, Mourgelas C. Comparison of LigaSure vessel sealing system, harmonic scalpel, and cold knife tonsillectomy. *Otolaryngol Head Neck Surg*. 2007;137(3):385-9. DOI: 10.1016/j.otohns.2007.05.012
- Stavroulaki P, Skoulakis C, Theos E, Kokalis N, Valagianis D. Thermal welding versus cold dissection tonsillectomy: a prospective, randomized, single-blind study in adult patients. *Ann Otol Rhinol Laryngol*. 2007;116(8):565-570. 2008;139(2):228-34. DOI: 10.1177/000348940711600802

Factors associated with final visual outcome in traumatic hyphema

Bishow Raj Timalisina^{*1}, Jyoti Baba Shrestha², Pragati Gautam², Kabiraj Poudel³

¹Department of Ophthalmology, Karnali Academy of Health Sciences, Jumla, Nepal, ²Department of Ophthalmology, Institute of Medicine, Maharajgunj, Kathmandu, Nepal, ³Department of Dental Surgery, Karnali Academy of Health Sciences, Jumla, Nepal

ABSTRACT

Introduction: Hyphema is the accumulation of blood in anterior chamber of the eye that can directly affect our vision. Various factors play role in final visual outcome among patients with hyphema, and there are very few related studies. Therefore, this study aimed to determine the factors related to final visual outcome among patients with traumatic hyphema. **Methods:** This cross-sectional study was conducted among 62 cases of traumatic hyphema presenting to the emergency department of Tribhuvan University Teaching Hospital and outpatient department of Bisheshwar Prasad Koirala Lions Centre for Ophthalmic Studies from July 2018 to July 2019. A detailed clinical history was obtained, followed by an ophthalmic examination and relevant investigation. Data was analysed using descriptive and inferential statistics at 5% level of significance using IBM statistical package for the social sciences. **Results:** Projectile (54.8%) and fall injury (12.5%) were the most common mode and causes of trauma, respectively. The best visual acuity of the involved eye at presentation was 6/9 (6.5%), and the worst was non-perception of light (3.2%). At presentation, the most common grade of hyphema was grade I (48.4%), and the least common was microhyphema (6.5%). Grades of hyphema ($p=0.014$) were significantly associated with the final visual outcome. Anterior segment findings such as of lid ($p<0.001$) and lens ($p=0.014$) and posterior segment findings such as of vitreous ($p<0.001$) and retina ($p=0.048$) were also significantly associated with final visual acuity. **Conclusions:** For the most optimal visual outcome in traumatic hyphema, all associated periocular and intraocular findings must be prioritized and addressed accordingly.

Keywords: Closed globe, hyphema, injury, traumatic, visual outcome.

*Correspondence:

Dr. Bishow Raj Timalisina
Department of Ophthalmology
Karnali Academy of Health Sciences, Jumla,
Nepal
Email: rajbishow@gmail.com
ORCID iD: <https://orcid.org/0000-0002-9146-2811>

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INTRODUCTION

Hyphema is “the accumulation of blood within the eye’s anterior chamber”.¹ Accumulation of blood in this region occurs due to disruption of vessels of the iris or ciliary body, usually due to trauma.²

Traumatic hyphema is found in every 12 out of 100,000, with peak incidence occurring in children.³ About 70% of the cases are seen in children, mostly males between the age of 10 years to 20 years.³ The injury is usually related to sports in the case of children. In contrast, adolescents and adults are more likely to be injured by a high-energy blow to the eye, such as assault, paintball guns, airsoft guns and airbag deployment.⁴

According to the national population-based survey (1981), the blindness prevalence rate was 0.84% in Nepal, with trauma responsible for 7.9% of monocular blindness. Studies have shown that traumatic hyphema due to blunt injury is associated with an increased risk of compromised visual function, even though ocular trauma is one of the most important preventable causes of blindness.⁵⁻⁷ Recognition of factors related to poor final visual outcome may be helpful to reduce this complication associated with traumatic hyphema. Lens opacity, choroidal rupture, angle recession, glaucoma, and retinal detachment are causes of poor vision after

blunt injury.⁸ However, the relative importance of these factors in determining the final visual outcome following traumatic hyphema has not been well established. Early recognition of these factors, appropriate treatment and careful follow-up could help improve the final visual acuity. Thus, this study aims to determine the factors related to the final visual outcome in traumatic hyphema.

METHODS

A cross-sectional study was conducted among 62 cases of traumatic hyphema due to blunt injury presenting to the Emergency Department of Tribhuvan University Teaching Hospital (TUTH) and Outpatient Department of Bisheshwar Prasad Koirala Lions Centre for Ophthalmic Studies (BPKLCOS), Maharajgunj Medical College, Institute of Medicine, Kathmandu, Nepal from July 2018 to July 2019. Ethical clearance for the study was obtained from the Institute of Medicine's Institutional Review Committee (IRC) (Ref no: 237(6-11-E)6[^]2/874/075). The study included all cases of traumatic hyphema due to blunt injury presenting to the emergency department of TUTH and outpatient department of BPKLCOS during the study period. Hyphema associated with a bleeding disorder, intraocular surgery, systemic and ocular diseases and open globe injury were excluded from the study. A detailed history was followed with the ocular examination that included: visual acuity, grading of hyphema, intraocular pressure measurement, and as needed and possible gonioscopy, B-scan, Ocular Computed Tomography (OCT), X-ray, Complete Blood Count (CBC), Bleeding Time (BT), Clotting Time (CT) were performed. The patient was treated or admitted as per requirement and compliance. Resolution of hyphema, rebleeding as well as visual acuity, intra-ocular pressure (IOP), gonioscopy, and clinical photography was made on week 1, week 4, and week 6, whichever was required and feasible.

To measure the association of various variables with final visual acuity, the subjects were divided into two groups. Group 1 consisted of subjects with final visual acuity of 6/12 or better whereas group 2 consisted of subjects with final visual acuity of 6/18 or worse.¹² Since the individual grades of hyphema consisted of very few subjects, the groups were merged for statistical analysis. Microhyphema, grade I and grade II were combined as one group and grade III and grade IV were combined as next group. Fischer's exact test was applied for analysis since more than 20% of cells had an expected count of less than five. The p value of <0.05 was considered statistically significant.

RESULTS

The present study comprised 62 patients, of which 50

(80.6%) were males, and 12(19.4%) were females. Their mean age was 27.98 years. The majority of patients, 21(33.9%), were 11 to 20 years old. All the patients had unilateral ocular involvement, with the right eye being more commonly involved (53.2%) than the left eye (46.8%). Most injuries were due to projectile objects (54.8%), followed by blows (32.3%). The injury mainly occurred at home (53.2%) and the majority of the patients (35.5%) presented on the first day of injury. Fall injury (12.5%) was found to be the most common cause of trauma, followed by injury from coke bottle cap (9.7%) (Table 1).

Table 1: Demographic data and distribution of subjects in the study (n=62)

Variables	Frequency (%)
Gender	
Male	50 (80.6)
Female	12 (19.4)
Age group	
1-10	5 (8.1)
11-20	21 (33.9)
21-30	19 (30.6)
31-40	3 (4.8)
41-50	7 (11.3)
>50	7(11.3)
Eye involved	
Right eye	33 (53.2)
Left eye	29 (46.8)
Mode of trauma	
Projectile	34 (54.8)
Blow	20 (32.3)
RTA/Fall	8 (12.9)
Place of trauma	
Home	33 (53.2)
Away from Home [#]	29 (46.77)
Day of presentation	
1	22 (35.5)
2	20 (32.3)
3	3 (4.8)
4	10 (16.1)
≥5	7(11.3)
Cause of trauma	
Fall injury	8 (12.9)
Coke bottle cap	6 (9.6)
Stone	5 (8)
Others [*]	43 (69.3)

[#]Away from home: Office, school, cafe, college, road, playground

^{*}Others: Wooden stick, tv remote, thread roll, syringe, stapler pin, shuttle cork, rubber band, pillar injury, physical assault, ox horn, nail, hand, fruit, fist blow, door strike, door knob, cricket ball, cow tail, cooker blast.

Figure 1 shows the distribution of subjects based on initial visual acuity of the involved eye. Most of the patients (22.6%) presented with visual acuity of 6/36. The best visual acuity at presentation was 6/9 among 6.5%, and the worst was non perception of light (NPL) among 3.2% of the patients.

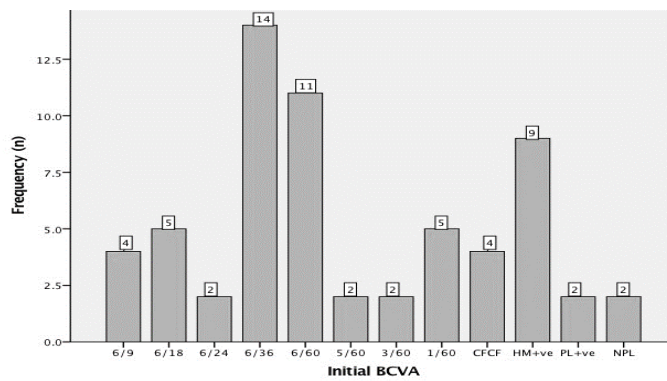


Figure 1: Bar diagram showing the distribution of subjects based on initial visual acuity of the involved eye

Figure 2 shows the distribution of subjects based on final visual acuity of the involved eye. In most of the patients (45.2%), the final visual acuity of the involved eye was recorded as 6/6, followed by 6/9 among 22.6%. There was no improvement in visual acuity in two patients (3.2%) with non-perception of light (NPL).

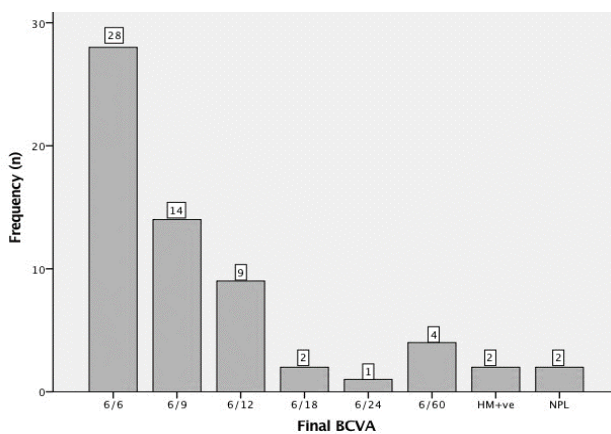


Figure 2: Bar diagram showing the distribution of subjects based on final visual acuity of the involved eye

Table 2 shows the distribution of grades of hyphema among the respondents. Nearly half of the patients (48.4%) presented with grade I hyphema and microhyphema was present among the least number of patients (6.5%) (Table 2).

Table 2: Frequency distribution of subjects according to grades of hyphema

Grades of Hyphema	Frequency	Percentage
Microhyphema	4	6.5
Grade I	30	48.4
Grade II	12	19.4
Grade III	9	14.5
Grade IV	7	11.3

The association between hyphema grades and final visual acuity were evaluated through Fischer’s exact test, which

showed statistically significant differences between the groups (p=0.014). The association between anterior and posterior segment findings and final visual acuity were also evaluated using the same test. The differences were statistically significant in the lid (p<0.001), lens (p=0.014), vitreous (p<0.001) and retina (p=0.048) (Table 3).

Table 3: Association of hyphema and various ocular and periocular injuries with final visual acuity

Variables	Group 1 N (%)	Group 2 N (%)	p-value
Hyphema			
Microhyphema, Grade I, Grade II	42 (80.8)	4 (40)	0.014*
Grade III & IV	10 (19.2)	6 (60)	
Lid			
Normal	42 (80.8)	1 (10)	<0.001*
Contusion, Laceration & Edema	10 (19.2)	9(90)	
Conjunctiva			
Normal	26 (50)	6 (60)	0.733
Subconjunctival hemorrhage & Congestion	26 (50)	4 (40)	
Iris			
Normal	13 (25)	5 (50)	1.37
Sphincter tear & Iridodialysis	39 (75)	5 (50)	
Cornea			
Normal	50 (96.2)	10 (100)	1.00
Epithelial defect	2 (3.8)	0 (0)	
Pupil			
Round, regular, reactive	38 (73.1)	6(60)	0.457
Irregular, Traumatic mydriasis	14 (26.9)	4(40)	
Lens			
Normal	42 (80.76)	4 (40)	0.014*
Cataractous, Subluxated, Dislocated & Vossius ring	10 (19.23)	6 (60)	
Vitreous			
Clear	50 (96.2)	4 (40)	<0.001*
Hemorrhage, opacities	2 (3.8)	6 (60)	
Retina			
Normal	49 (94.2)	7 (70)	0.048*
Detachment, Commotio-retinae and pre-retinal hemorrhage	3 (5.8)	3 (30)	
Choroid			
Normal	52 (100)	9 (90)	0.161
Hemorrhage with thickening	0(0)	1 (10)	

*Statistically significant

Out of 62 patients, 5 (8.1%) patients showed complications of traumatic hyphema. In all five cases, rebleeding was the associated complication which was seen on the second day in one patient, on the third day in two patients and on the fourth day in two patients.

DISCUSSION

Eye injuries are the third most common injuries occurring due to trauma after hand injuries and feet injuries.⁹ It is still considered the most common cause of unilateral blindness worldwide. Traumatic hyphema occurs mostly as a result of blunt eye injuries.¹⁰ Two-thirds of traumatic hyphema cases are due to blunt ocular trauma, and one-third are due to traumatic rupture of the globe.⁵ The complications associated with hyphema and the concomitant injuries to ocular structures are considered the vision-threatening sequelae of blunt trauma.⁵ In our present study, we have

tried to recognize the factors related to the final visual outcome in the case of traumatic hyphema. A total of 62 patients clinically diagnosed with traumatic hyphema were included. The mean age of the patients in the study was 27.98 ± 15.85 years. Most of them were males (80.6%) and belonged to the age group of 11 to 20 years, which agrees with several other studies reported in the literature.^{11,12} This may be because males are engaged in more violent activities than females, and sports-related injuries are more common in ages below 20 years.¹²

In our present study, we have tried to recognize the factors related to the final visual outcome in the case of traumatic hyphema. A total of 62 patients clinically diagnosed with traumatic hyphema were included. The mean age of the patients in the study was 27.98 ± 15.85 years. Most of them were males (80.6%) and belonged to the age group of 11 to 20 years, which agrees with several other studies reported in the literature.^{11,12} This may be because males are engaged in more violent activities than females, and sports-related injuries are more common in ages below 20 years.¹²

All the patients in our study had unilateral ocular involvement, with the right eye more commonly involved than the left eye. This result is similar to Ulagantheran et al.¹³ We observed that the most common trauma mode was projectile followed by blow. However, Cho et al. found a blow the most common mode of injury, with projectile being the second most common.¹² Our study showed home as the most common place of injury, followed by school and office. One of the studies involving 472 cases of traumatic hyphema has also reported home as the single most frequent place of injury.¹⁰ This may reflect the amount of time spent in these locations. Our data also showed that the most common cause of trauma was fall injury. One of the reasons for this could be a sports-related injury which is more common among teenagers, and the majority of patients in our study were from this group. Most of the patients in our study presented within 24 hours of the injury, following the findings of Mela et al.¹⁴ This suggests that people are conscious of the sudden diminution of vision. The other reason for this could be the easy access to health care centers. It has been suggested that the final visual outcome is better in patients who receive treatment within 24 hours after injury.⁵

Most of the patients in this study presented with grade I hyphema, followed by grade II and III. One similar study from Qatar also reported that most patients had grade I hyphema followed by grade II.¹⁵ There have been opinions regarding the association between grades of hyphema and final visual outcome. Read and Goldberg suggested that, in

about 10% of patients, the poor visual outcome is directly linked to grades of hyphema.¹⁶ Ng et al., in their review involving 425 cases of traumatic hyphema, found poor final visual outcomes in patients with large hyphema.¹¹ In contrast to these studies, Al Ali et al. and Rahmani et al. could not establish a significant association between the final visual outcome and the size of hyphema.^{15,17} However, in the present study, similar to Ng et al.¹¹, we also found a significant association between final visual outcome and grades of hyphema ($p=0.014$). In the present study, we observed that anterior segment findings such as lid, and lens were significantly associated with final visual acuity which was similar to the findings of Cho et al.¹²

In traumatic hyphema, posterior segment injuries have been considered in the literature concerning final visual acuity. The findings of our study suggested that posterior chamber findings such as vitreous and retina were significantly associated with final visual acuity. This finding is in agreement with the findings of several other authors.^{12,13,15} In a study done by Ng et al., almost all the patients with worse visual outcomes had incurred retinal damage. They have further mentioned that, though this may not be visible at the time of initial examination through the hyphema, retinal damage is confirmed as an important contributor to worse final visual outcome following traumatic hyphema.¹¹ Talmon et al. have mentioned retinal tear or detachment as the most frequent injury responsible for visual outcome.¹⁵

Several complications are associated with traumatic hyphema, such as rebleeding, secondary glaucoma, corneal blood staining, and optic atrophy. However, rebleeding was the only complication in our study and very few patients presented with this complication. Studies have shown that the rate of rebleeding is comparatively lower in the Asian population compared to the American population, especially African Americans. This conclusion has been attributed to racial differences in the melanin content of the iris as melanin prolongs the resorption of blood, thereby affecting the rate of rebleeding.^{15,18}

Thus, in the present study, we observed that the final visual outcome in patients with traumatic hyphema is associated with various factors. Anterior segment findings such as lid and lens are significantly associated with the final visual outcome. There was no direct relationship between final visual acuity and anterior segment findings. Nevertheless, these findings may reflect severe injuries (both anterior and posterior) with more frequent concurrent posterior segment injuries.¹² Similarly, posterior segment findings such as vitreous and retina are also significantly associated with the final vision. As in the anterior segment, these

findings could also result from concurrent findings in the anterior segment.

Based on our observations and previous reports, researchers suggest that the earlier factors should be paramount when determining the appropriate medical therapy and surgical interventions in patients with traumatic hyphema. However, further studies with many samples need to validate our preliminary observations.

CONCLUSIONS

The final visual outcome in patients with traumatic hyphema is associated with various factors. In addition to grade of hyphema, posterior segment findings such as of vitreous and retina along with anterior segment findings such as of lid and lens, are significantly associated with the final visual outcome. For the most optimal visual outcome in traumatic hyphema, all associated periocular and intraocular findings must be prioritized and addressed accordingly.

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REFERENCES

1. Wilson FM. Traumatic Hyphema: Pathogenesis and Management. *Ophthalmology*. 1980;87(9):910-9. DOI: 10.1016/S0161-6420(80)35144-0
2. Gragg J, Baker MB. Hyphema. *StatPearls* [Internet]. StatPearls Publishing; 2019.
3. Kennedy RH, Brubaker RF. Traumatic hyphema in a defined population. *Am J Ophthalmol*. 1988;106(2):123-30. DOI: 10.1016/0002-9394(88)90822-7 PMID: 3400754.
4. Haring RS, Sheffield ID, Canner JK, Schneider EB. Sports-related eye injuries. *JAMA Ophthalmol*. 2016;134(12):1382-90. DOI: 10.1001/jamaophthalmol.2016.4253 PMID: 27812702.
5. GW S, Farinthska G, Simanjuntak GA, Artini W, Natali R. Risk factors for poor visual outcome in traumatic hyphema: Jakarta eye trauma study. *Niger J Clin Pract*. 2018;21(7):921-4. DOI: 10.4103/njcp.njcp_251_17
6. Kinderan Y, Shrestha E, Maharjan I, Karmacharya S. Pattern of ocular trauma in the Western Region of Nepal. *Nepal J Ophthalmol*. 1970;4(1):5-9. DOI: 10.3126/nepjoph.v4i1.5843
7. Limbu B, Saiju R, Ruit S. A retrospective study on the causes for evisceration at Tilganga Eye Centre. *Kathmandu Univ Med J*. 2009;7(26):115-9. DOI: 10.3126/kumj.v7i2.2702 PMID: 20071842.
8. CS N, JM S, NP S, AR R. Factors related to the final visual outcome of 425 patients with traumatic hyphaema. *Eye*. 1992;6:305-7. DOI: 10.1038/eye.1992.60 PMID: 1446766.
9. Nordberg E. Injuries as a public health problem in sub-Saharan Africa: epidemiology and prospects for control. *East Afr Med J*. 2000;77(12 suppl):1-43. PMID: 12862115.
10. Ashaye AO. Traumatic Hyphaema: A report of 472 consecutive cases. *BMC Ophthalmol*. 2008;8(1):24. DOI: 10.1186/1471-2415-8-24
11. Ng CS, Strong NP, Sparrow JM, Rosenthal AR. Factors related to the incidence of secondary haemorrhage in 462 patients with traumatic hyphaema. *Eye*. 1992;6(3):308-12. DOI: 10.1038/eye.1992.61 PMID: 1446767.
12. Cho J, Jun BK, Lee YJ, Uhm KB. Factors associates with the poor final visual outcome after traumatic hyphema. *Korean J Ophthalmol*. 1998;12:122-9. DOI:10.3341/kjo.1998.12.2.122
13. Ulagantheran V, Fauzi MSA, Reddy S. Hyphema due to blunt injury: A review of 118 patients. *Int J Ophthalmol*. 2010;10(11):272-6. DOI: 10.3980/j.issn.2222-3959.2010.03.22 PMID: 22553571.
14. Mela EK, Dvorak GJ, Mantzouranis GA, Giakoumis AP, Blatsios G, Andrikopoulos GK, et al. Ocular trauma in a Greek population: Review of 899 cases resulting in hospitalization. *Ophthalmic Epidemiol*. 2005;12:185-90. DOI: 10.1080/09286580590964801 PMID: 16036477.
15. Al Ali AK, Al Mass D, Bener A. Poor final visual outcome after traumatic hyphema: A retrospective study of associated factors. *J Emerg Med Trauma Acute Care*. 2012;2012(1):16. DOI: 10.5339/jemtac.2012.16
16. Read J, Goldberg MF. Comparison of medical treatment for traumatic hyphema. *Transactions of the American Academy of Ophthalmology and Otolaryngology*. 1974.
17. Rahmani B, Jahadi HR, Rajaeefard A. An analysis of risk for secondary hemorrhage in traumatic hyphema.

Ophthalmology. 1999;106(2):380-5. DOI: 10.1016/S0161-6420(99)90080-5 PMID: 9951494.

18. Lai WW, Bhavnani VD, Tessler HH, Edward DP. Effect of melanin on traumatic hyphema in rabbits. Arch Ophthalmol. 1999;117(6):789-93. DOI:10.1001/archophth.117.6.789

Perception of faculties towards online teaching-learning activities during COVID-19 pandemic: A cross-sectional study at a tertiary care center in Eastern Nepal

Deependra Prasad Sarraf^{*1}, Gajendra Prasad Rauniar¹, Robin Maskey², Rajiv Maharjan³, Ashish Shrestha⁴, Basant Kumar Karn⁵, Shashi Keshwar⁴, Ramayan Prasad Kushwaha¹, Pramendra Prasad Gupta⁶

¹Department of Clinical Pharmacology and Therapeutics, ²Department of Internal Medicine, ³Department of Orthopedics, ⁴Department of Oral Pathology, College of Dental Surgery, ⁵Department of Child Health Nursing, College of Nursing, ⁶Department of General Practice and Emergency Medicine, B.P. Koirala Institute of Health Sciences, Dharan, Nepal

ABSTRACT

Introduction: Online teaching learning activities is totally a new modality of medical education in the country with new opportunities, experiences and challenges. Objectives of the study were to explore the perception of faculties towards online teaching learning activities conducted during the COVID-19 pandemic and to find out barriers and facilitators to conducting online teaching learning activities in our context. **Methods:** A web-based cross-sectional study was conducted among medical, dental, nursing and public health faculties using a semi-structured questionnaire. A Google Form was prepared and its link was sent to the faculties via email. Descriptive statistics were calculated using statistical package for the social sciences. **Results:** Out of 158 faculties, 105(66.46%) were male and 121(85.44%) were medical faculties. Only 16(10.13%) faculties had received formal training regarding preparing and/or delivering online teaching learning activities. Out of 158, 133(84.18%) faculties faced technical and internet issues. The most common advantage and disadvantage of online teaching-learning activities perceived by the faculties were 'not limited to time or place' (149, 94.30%) and 'lack of interaction with the students' (130, 82.28%) respectively. Majority (149, 94.3%) of them had positive perception towards online teaching-learning activities conducted during COVID-19 pandemic. Slow internet connection (145, 91.77%) and frequent electricity interruption (131, 82.91%) were the most common perceived barriers to online teaching learning. **Conclusions:** Most of the faculties had positive perception towards online teaching learning activities. Academic leaders and stakeholders should provide uninterrupted internet and electricity connectivity, training on online teaching-learning platform and timely technical support.

Keywords: COVID-19 pandemic, faculties, medical education, perception.

*Correspondence:

Dr. Deependra Prasad Sarraf
Department of Clinical Pharmacology and Therapeutics
BPKIHS, Dharan, Nepal
E-mail: deependraprasadsarraf@gmail.com

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INTRODUCTION

Coronavirus disease-19 (COVID-19) has affected every corner of human life globally. Educational institutes including medical colleges around the world canceled face-to-face teaching-learning activities for the safety of students, faculty and staffs.¹ The government of Nepal issued lockdown on March 24, 2020 which led to suspension of physical classes.² Medical institutions rapidly shifted from the traditional style of face-to-face classroom teaching to an online teaching-learning (OTL) format.³ OTL engaged the students in the difficult time of the pandemic and it also helped them to continue their medical education up to certain extent.

In the same scenario, faculties started taking online lectures in B.P. Koirala Institute of Health Sciences (BPKIHS). OTL is totally a new modality of medical education in the country with new opportunities, experiences and challenges.⁴ In Nepal, OTL was not practiced

in medical education before the COVID-19 pandemic; however, it became the only choice during the lockdown period to ensure the continuity of medical education in medical colleges across the country. The sudden transition to online mode of teaching-learning might be difficult for most of the faculties and students as well. The faculties are involved mainly in traditional face-to-face classroom teaching, and they might have faced problems towards online teaching learning due to inadequate technical skills and lack of prior experiences. There is still lack of evidence on the effectiveness of online teaching-learning activities in the context of low- and middle-income countries like Nepal. Understanding of the perception of OTL activities among the faculties is needed for the advancement and progression of the system. Therefore, the present study was conducted to explore the perception of faculties towards OTL activities conducted during the pandemic and to find out barriers and facilitators to conducting OTL activities in our context.

METHODS

A cross-sectional descriptive study was conducted among medical, dental, nursing and public health faculties at BPKIHS, Dharan, Nepal between October to December 2021. The faculties who were involved in OTL activities during the COVID-19 pandemic were enrolled. The sample size of 157 was calculated using the formula $n = Z^2 * p * q / L^2$ where p=prevalence of faculty members who preferred the OTL module in the routine curriculum⁵, $q = 1 - p$ at 95% confidence interval, 12% margin of error (L) and 10 % as non-responders. Convenience sampling was used.

A semi-structured questionnaire was prepared based on the study objectives and in accordance with the relevant literature.⁶⁻⁹ It consisted of eight sections: socio-demographic data, prior experience, and training of OTL activity, technical aspects of OTL activity, advantages and disadvantages of OTL activity, perception of OTL activities, barriers to OTL activities and recommendations towards OTL activities. The questionnaire was reviewed by the research team and the subject experts for confirming its relevance, simplicity, and internal consistency as a part of validation. It was pilot tested in 10% of the study population and the sample used for pilot test was not used for the final data analysis. Ethical clearance was obtained from the Institutional Review Board, BPKIHS (IRC/2142/021).

A Google Form (docs.google.com/forms) was prepared, and its link was sent to the faculties via email. Consent for participation was implied by the completion of the questionnaire and its submission. Personal identification (phone number, name, etc.) was not recorded to maintain the confidentiality of the study participants. The filled questionnaires were extracted from google forms and

exported to microsoft excel 2016. Descriptive statistics like mean, frequency, percentage and standard deviation (SD) were calculated using microsoft excel 2016. The findings were presented as tables and graphs.

RESULTS

Out of 260 faculties, 158 (60.7%) participated in the study. One hundred and five faculties (66.46%) were males (Table 1).

Table 1: Socio-demographic characteristics of the study participants (n=158)

S.N.	Variables	Frequency	Percentage
1. Gender	Male	105	66.46
	Female	53	33.54
2. Age group (years)	30-45	135	85.44
	46-60	22	13.92
	More than 60	1	0.63
3. Faculty	Medical	121	76.58
	Dental	28	17.72
	Nursing	9	5.70
4. Designation	Professor	21	13.29
	Additional professor	17	10.76
	Associate professor	35	22.15
	Assistant professor	74	46.84
	Lecturers/ demonstrators	11	6.96
	Up to 5	46	29.11
5. Teaching experience (years)	6-10	70	44.30
	11-15	23	14.56
	15-20	11	6.96
	More than 20	8	5.03

Only 16(10.13%) faculties had received formal training regarding preparing and/or delivering OTL activities. Out of 158, 133(84.18%) faculties faced technical and internet issues during the delivery of the OTL activity. Slow speed of the internet (102,76.69%), unstable internet connection (73, 54.89%) and frequent electricity interruption (55, 41.35%), poor sound quality (24, 18.05%) and inadequate knowledge of online platform (23, 17.29%) were the most common technical and internet issues faced by the faculties during the delivery of the OTL activity. The advantages and disadvantages of OTL activities perceived by the faculties were 'not limited to time or place' (149, 94.30%) and 'lack of interaction with the students' (130, 82.28%) respectively (Table 2).

Table 2: Advantages and disadvantages of online teaching-learning activities as perceived by the faculties (n=158)

Advantages	Frequency	Percentage
Not limited to time or place	149	94.30
Overcoming the circumstances of the current lockdown	140	88.61
It allows students to study at their own pace by reviewing the archive later.	69	43.67
Electronic documentation of the online teaching-learning activities	67	42.41
The class times are flexible.	50	31.65
No crowding	2	1.27
Disadvantages		
Lack of interaction with the students	130	82.28
Lack of student motivation and engagement	100	63.29
The discomfort of teaching and learning without face-to-face mode	96	60.76
Lack of clinical training and communication skills	92	58.23
Technically demanding	61	38.61
Attendance issue	39	24.68
Expensive	23	14.56
Clueless of students' understanding	1	0.63

One hundred and twenty-five (79.11%) faculties rated their experience of OTL activities conducted during the COVID-19 pandemic as satisfactory. Majority (149, 94.3%) of the faculties had positive perception towards OTL activities conducted during COVID-19 pandemic (Table 3).

Table 3: Perception of online teaching-learning activities among faculties (n=158)

S.N.	Variables	Frequency	Percentage
1	COVID-19 pandemic has given me an unexpected opportunity to know more about online teaching-learning activities.	Strongly agree	75 47.47
		Agree	67 42.41
		Neutral	12 7.59
		Disagree	2 1.27
		Strongly disagree	2 1.27
2	Kindly rate your experience of online teaching-learning activities conducted during the COVID-19 pandemic	Excellent	5 3.16
		Satisfactory	125 79.11
		Poor	21 13.29
		Unsatisfactory	6 3.80
3	Kindly rate the perceived ease of using the online learning platform during the pandemic.	Worst	1 0.63
		Easy	3 1.90
		Satisfactory	122 77.22
4	My institution offered enough assistance and formal training on the online teaching-learning mode of education during the COVID-19 pandemic.	Difficult	33 20.89
		Strongly agree	4 2.53
		Agree	26 16.46
		Neutral	41 25.95
		Disagree	64 40.51
	Strongly disagree	23 14.56	

Slow internet connection (145, 91.77%) and frequent electricity interruption (131, 82.91%) were the most common perceived barriers to OTL activities followed by 'not suitable for all practical classes' (119, 75.32%), 'technical problems' (103, 65.19%), 'poor infrastructure'

(67, 42.41%) and 'logistic issues with the recognition of the academic degree by the respective council body of Nepal' (52, 32.91%). Out of 158, 109 (68.99%) faculties agreed that practical classes should be taught through face-to-face classroom teaching (Table 4).

Table 4. Faculties' recommendations towards online teaching-learning activities (n=158)

S.N.	Recommendations towards online teaching-learning activities	Frequency	Percentage
1.	Which domain(s) of learning can be incorporated in the online teaching-learning activities?	Cognitive domain	141 89.24
		Affective domain	97 61.39
		Psychomotor domain	45 28.48
2.	Theory classes should be taught through online teaching-learning activities.	Agree	39 24.68
		Neutral	72 45.57
		Disagree	47 29.75
3.	Practical classes should be taught through traditional face-to-face classroom teaching.	Agree	109 68.99
		Neutral	20 12.66
		Disagree	29 18.35
4.	Online teaching-learning should be a supplementary method to traditional face-to-face classroom teaching.	Agree	114 72.15
		Neutral	28 17.72
		Disagree	16 10.13
5.	Online quizzes would be ideal for online teaching-learning activities.	Agree	98 62.03
		Neutral	51 32.28
		Disagree	9 5.70
		DUDAL	28 17.72
		ZOOM	122 77.22
6.	In your opinion, which online tool/platform could be appropriate for teaching theory classes?	Google Meet	95 60.13
		Microsoft team	3 1.90
		Any platform that caters to LMS for online mode	2 1.27
		DUDAL	13 8.23
7.	In your opinion, which online tool/platform could be appropriate for teaching practical (LABEX)?	ZOOM	93 58.86
		Google Meet	71 44.94
		Others	5 3.16
		None of the above	31 19.62
		DUDAL	13 8.23
8.	Which of the following could be the appropriate online tool/platform for conducting Case-Based Learning?	ZOOM	106 67.09
		Google Meet	71 44.94
		Neutral response	7 4.43
		None of the above	19 12.03
		Simulation software	1 0.63
9.	Which online tool/platform could be appropriate for conducting Problem Based Learning?	DUDAL	13 8.23
		ZOOM	114 72.15
		Google Meet	79 50.00
		None of the above	8 5.06
		Simulation software	1 0.63

Out of 158, 53 (33.54%) faculties opined to not to incorporate OTL modules in the curriculum and 34 (21.52%) faculties favored 90% or more face-to-face lectures and up to 10% online lectures (Figure 1).

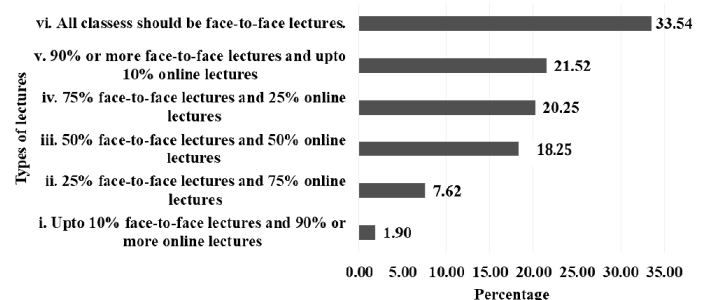


Figure 1: Faculties' recommendation for incorporation of online teaching-learning modules in the curriculum (n=158)

The important factors that would motivate the faculties to participate in online teaching-learning activities were quick technical and administrative support (114, 72.15%), hands-on training on the online platform for conducting teaching-learning activities (103, 65.19%), hands-on training on “how to prepare and conduct OTL activities” (94, 59.49%) and free high quality fast internet connection (65, 41.14%).

DISCUSSION

In the present study, majority (89.87%) of the faculties had not received any formal training on the preparation and/or delivery of OTL activities and similar finding was also reported in other studies as well.^{6,10,11} Nonetheless, all of the faculties put their efforts to conduct OTL activities during the lockdown period which shows their willingness to adapt as per the need. Majority of the faculties faced technical and internet issues during the delivery of the OTL activity. Slow speed of the internet, unstable internet connection and frequent electricity interruption were the most common issues faced by them. Similar finding were also reported by Ebohon et al.¹¹ Timely assistance from the institute during OTL activities might also enhance their participation and performance as well.

The most common advantages of OTL activities perceived by the faculties were ‘not limited to time or place’. In contrast to this, flexibility and convenience was the most commonly cited advantages in a study by Kapoor et al.⁶ The students can access the teaching-learning activities at their convenience from anywhere through their smartphones or laptops. Similarly, the most common disadvantages of OTL activities perceived by the faculties were ‘lack of interaction with the students’. This finding was in accordance with other reports.^{6,11} However, poor internet connectivity, lack of human interface and poor sound or acoustics were the major disadvantages in an Indian study.⁵ The interactions between students and faculties create a community of inquiry where learning is the product of discussion and debate.¹² Use of quizzes, brainstorming sessions and students giving presentations are some of the methods to improve student participation and attention during the OTL activities.¹³

Majority of the faculties had positive perception towards OTL activities. Similar finding was also reported by Joshi et al.¹⁴ Majority of them rated their perceived ease of using the online learning platform during the pandemic as satisfactory which was similar to other finding.¹⁰ The most common perceived barriers to OTL activities were slow internet connection followed by frequent electricity interruption. Similar findings were also reported by Kapoor

et al.⁶ Uninterrupted internet and electricity connectivity must be provided for a smooth OTL activities. Lack of adequate institutional support, lack of technical skills and poor internet connectivity along with lack of institutional learning management system affect the quality of the online teaching. Therefore, these barriers should be addressed for achieving an effective OTL activities. Around half of the faculties disagree that the institution offered enough assistance and formal training on the online teaching-learning mode of education during the COVID-19 pandemic. The stakeholders should train the faculties on OTL activities, and enough assistance should be provided to overcome the various technical difficulties faced during delivery of the online lectures.

Learning in medicine is a conglomerate of acquiring knowledge, skill, and art of dealing with the patients.¹⁵⁻¹⁶ Majority of the faculties opined that only cognitive and affective domains of learning can be incorporated in the OTL activities. These findings were consistent with results obtained in a study by Kapoor et al.⁶ More than two-thirds faculties agreed that practical classes should be taught through face-to-face classroom teaching. Majority of them also agreed that OTL activities should be a supplementary method to traditional face-to-face classroom teaching. Their thought might be influenced by the fact that it is difficult to teach the skills of therapeutic touch required during examination and treatment, compassion, and empathy through online mode.¹⁶ However, videos eliciting history taking and various physical examinations of the patients can be created through various simulation software and its link can be shared with the students to teach psychomotor skills.

Majority opined that be ZOOM would be the appropriate online tool/platform for conducting theory classes and practical classes, case-based learning and problem-based learning. Zoom, Google Meet, Google Classroom, WebEx, Moodle, Microsoft Teams, D2L are the most used online platforms by medical institutes globally.¹⁷ It is suggested that the Institute facilitate better online learning management system. There is need to find out the way to use online clinical simulation activities for teaching clinical and other soft skills in the pandemic situation. Majority of the faculties opined to incorporate OTL modules in the curriculum. Similar finding was also reported by other studies.^{5,9} The faculties who did not opine integration of OTL activities might have concern of producing doctors without social skills through complete OTL activities. There might be a risk of producing highly qualified doctors with severely underdeveloped human or social skills if we rely on OTL activities. Therefore, blended learning, which

combines digital learning with the existing traditional face-to-face lectures, might be a good option in our context and it was also supported by the faculties.¹⁸ One-out-five faculties favored 90%:10% distribution of face-to-face and online lectures. In contrast to this, majority suggested a 70%:30% distribution of traditional and online classes in a study by Gupta et al.⁵ The acceptance of blending online and face-to-face instruction has been growing in the academic community as learning is comparatively superior in a blended learning environment.^{19,20} It is high time for the academic leaders and medical educators to utilize this opportunity of pandemic to review the existing curriculum to incorporate some component of online mode of teaching-learning activities. However, in a setting like ours, we need to address the challenges associated with online learning to get optimal results.²¹

It was interesting to find out the important factors that would motivate the faculties to participate in OTL activities that include quick technical and administrative support, hands-on training on online platform for conducting teaching-learning activities and free high quality fast internet connection. There is an urgent need to have own official online platform to conduct teaching-learning activities along with standard and timely technical support in terms of software expertise, data management, data privacy and confidentiality. The findings can also guide the development of academic leadership and management tools. The authors also recommend the need for periodic workshops on OTL activities for the faculty to develop additional skills regarding innovative and new teaching resources and to identify the appropriate curriculum content. Educational administrators and policymakers can use this crisis as an opportunity to introduce new learning modes that can reach everyone, to prepare for emergencies, and to make the system more resilient. It was a single-center study, therefore, the study findings might not be generalized to whole country.

CONCLUSIONS

Majority of the faculties had positive perception towards OTL activities. Uninterrupted internet and electricity connectivity must be provided for a smooth OTL activities. A blended learning might be a good option in our context. There is an unmet need to make the faculties more competent and skilled on OTL methodologies by organizing workshops and seminars. We should have our own official online learning management system to conduct teaching-learning activities. Further studies are needed to assess the efficacy of OTL activities.

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REFERENCES

1. COVID-19 Educational Disruption and Response. UNESCO, 2020. [Available at <https://en.unesco.org/news/covid-19-educational-disruption-and-response>. Accessed on May 21, 2021.]
2. Government decides to lift the four-month-long coronavirus lockdown, but with conditions. The Kathmandu Post, Nepal, 2020. [Available at <https://kathmandupost.com/national/2020/07/21/government-decides-to-lift-the-four-month-long-coronavirus-lockdown-but-with-conditions>. Accessed on May 21, 2021.]
3. Ahmed H, Allaf M, Elghazaly H. COVID-19 and medical education. *Lancet Infect Dis.* 2020;20(7):777-778. DOI: 10.1016/S1473-3099(20)30226-7
4. Ruiz JG, Mintzer MJ, Leipzig RM. The impact of E-learning in medical education. *Acad Med.* 2006;81(3):207212. DOI: 10.1097/00001888-200603000-00002 PMID: 33612936.
5. Gupta S, Dabas A, Swarnim S, Mishra D. Medical education during COVID-19 associated lockdown: Faculty and students' perspective. *Med J Armed Forces India.* 2021;77(Suppl 1):S79-S84. DOI: 10.1016/j.mjafi.2020.12.008
6. Kapoor A, Kapoor A, Charokar K, Mishra A, Motagi MV, Sadawarte SK. A Faculty survey about online teaching during early lockdown period of COVID-19 pandemic in a medical college in central India. *J Health Res.* 2020;7(4):265-270. DOI: 10.4103/cjhr.cjhr_115_20.
7. Zalat MM, Hamed MS, Bolbol SA. The experiences, challenges, and acceptance of e-learning as a tool for teaching during the COVID-19 pandemic among university medical staff. *PLoS One.* 2021;16(3):e0248758. DOI: 10.1371/journal.pone.0248758 PMID: 33770079.
8. Callinan J. Barriers and facilitators to e-learning in palliative care. *Int J Palliat Nurs.* 2020;26(8):394-402. DOI: 10.12968/ijpn.2020.26.8.394 PMID: 33331215.
9. Alqudah NM, Jammal HM, Saleh O, Khader Y, Obeidat N, Alqudah J. Perception and experience of academic

- Jordanian ophthalmologists with E-Learning for undergraduate course during the COVID-19 pandemic. *Ann Med Surg (Lond)*. 2020;59:44-47. DOI: 10.1016/j.amsu.2020.09.014 PMID: 32934810.
10. Rajab MH, Gazal AM, Alkattan K. Challenges to online medical education during the COVID-19 Pandemic. *Cureus*. 2020;12(7):e8966. DOI: 10.7759/cureus.8966 PMID: 32766008.
 11. Ebohon O, Obieniu AC, Irabor F, Amadin FI, Omoregie ES. Evaluating the impact of COVID-19 pandemic lockdown on education in Nigeria: Insights from teachers and students on virtual/online learning. *Bull Natl Res Cent*. 2021;45(1):76. DOI: 10.1186/s42269-021-00538-6 PMID: 33897254.
 12. Brown JS, Collins A, Duguid P. Situated cognition and the culture of learning. *Educational researcher*. 1989;18(1):32-42. DOI:10.3102/0013189X018001032
 13. Atreya A, Acharya J. Distant virtual medical education during COVID-19: half a loaf of bread. *Clin Teach*. 2020;17(4):418-419. DOI: 10.1111/tct.13185 PMID: 32558269.
 14. Joshi KP, Jamadar D, Dixit R. Perception of faculty toward online teaching and learning in the undergraduate medical students during coronavirus disease-19 pandemic. *Int J Med Sci Public Health*. 2020;9(8):484-7. DOI: 10.5455/ijmsph.2020.09149202008092020
 15. Sultana J, Ara I, Talukder HK, Khan MH. Current practice of bedside teaching in undergraduate medical education of Bangladesh. *Bangladesh J Med Ed*. 2013;4(1):2-7.
 16. Sasidharan S, Dhillon HS, Singh S. Medical Pedagogy in the time of COVID-19. *Kathmandu Univ Med J*. 2020;COVID-19 Special Issue 70(2):105-106. DOI: 10.3126/kumj.v18i2.33067 PMID: 33605249.
 17. Haroon Z, Azad AA, Sharif M, Aslam A, Arshad K, Rafiq S. COVID-19 era: challenges and solutions in dental education. *J Coll Physicians Surg Pak*. 2020;30(10):129-131. DOI: 10.29271/jcpsp.2020.supp2.129 PMID: 33115587
 18. Burg G, French LE. Hautarzt. The age of Gutenberg is over: a consideration of medical education-past, present and future. *Hautarzt*. 2012;63 Suppl 1:38-44. DOI: 10.1007/s00105-011-2301-z. PMID: 22543945.
 19. Edgington A, Holbrook J. A blended learning approach to teaching basic pharmacokinetics and the significance of face-to-face interaction. *Am J Pharm Educ*. 2010;74(5):88. DOI: 10.5688/aj740588 PMID: 20798797.
 20. Sadeghi R, Sedaghat MM, Sha Ahmadi F. Comparison of the effect of lecture and blended teaching methods on students' learning and satisfaction. *J Adv Med Educ Prof*. 2014;2(4):146-150. PMID: 25512938.
 21. Tuladhar SL, Pradhan D, Parajuli U, Manandhar P, Subedi N. Study on the effectiveness of online classes for undergraduate medical and dental students of Gandaki Medical College during COVID-19 pandemic period in Nepal. *OJN*. 2020;10(2):36-40. DOI: 10.3126/ojn.v10i2.31146

Shock Index in predicting fluid resuscitation in patients with hypovolemic shock

Manohar Pradhan*¹, Alok Pradhan¹, Hari Prasad Upadhyay², Ayasha Shrestha²

¹Department of General Practice and Emergency Medicine, ²Department of Community Medicine, College of Medical Sciences and Teaching Hospital, Chitwan, Nepal College of Medical Sciences and Teaching Hospital, Chitwan, Nepal

ABSTRACT

Introduction: Hypovolemic shock is diagnosed by the signs of hemodynamic instability and when the source of volume loss is obvious. Among various types, hypovolemic shock is the most common which results either from the loss of blood from hemorrhage or from the loss of plasma alone due to extravascular fluid sequestration or gastrointestinal, urinary, and insensible losses. The objective of this research was to find the use of shock index in predicting fluid resuscitation in patients with hypovolemic shock. **Methods:** An analytical cross-sectional study was conducted among 120 patients with hypovolemic shock visiting to the Emergency department of College of Medical Sciences and Teaching Hospital from July 2022 to September 2022. Data was collected from patients and checked for completeness, accuracy and then entered and analyzed using SPSS-20. Data was analyzed using descriptive and inferential statistical tools. P-value <0.05 was considered as statistically significant. **Results:** Out of 120 patients, majority of the patients were >50 years. Minority of the patients only required blood transfusion. Among total patients 60% of the patients were admitted in ICU, 25% of them were admitted in ward and 4.17% of them were expired. In 60% cases shock index was <1 while in 40% case shock index was ≥1. The number of patients receiving blood transfusion at ER increased with increase in shock index and that the number of patients with hypovolemic shock are admitted in hospital more in shock index category ≥1 as compared to shock index <1 (p-value <0.05). **Conclusions:** This study reveals that shock index is accurate in predicting the amount of fluid. The risk of all clinical complication is increased with increase in shock index.

Keywords: Blood transfusion, emergency, fluid resuscitation, hypovolemic shock, shock index.

*Correspondence:

Dr. Manohar Pradhan
Department of General Practice and Emergency
Medicine
College of Medical Sciences and Teaching
Hospital, Chitwan, Nepal
Email: drmpcms@gmail.com

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INTRODUCTION

Shock is defined as the clinical syndrome that results from inadequate tissue perfusion, irrespective of cause, due to hypoperfusion, between supply and demand of oxygen and substrates leads to cellular dysfunction; ultimately causing multiple organ failure and, if not interrupted, leads to death.¹ Among various types, hypovolemic shock is the most common which results either from the loss of blood from hemorrhage or from the loss of plasma alone due to extravascular fluid sequestration or gastrointestinal, urinary, and insensible losses.²

Hypovolemic shock is diagnosed by the signs of hemodynamic instability and when the source of volume loss is obvious. The following symptoms and signs reflect the underlying pathophysiology: tachycardia, skin pallor, hypotension, confusion, aggression, drowsiness and coma, tachypnoea, general weakness, thirst, oliguria.³ The aim of resuscitation includes infusion of fluids thus preventing the onset of irreversible haemorrhagic shock and death.¹ Crystalloids are typically used for initial fluid resuscitation but the 2-L crystalloid fluid challenge previously recommended is no longer standard practice. Colloids are more expensive than

crystalloids and are associated with risk of anaphylaxis and have no significant advantages over crystalloids in the early stages of resuscitation.³

Although the heart rate (HR) and systolic blood pressure (SBP) alone have been shown unreliable in determining the presence of hypovolemic shock, their ratio as reflected by the Shock index (SI) is a capable measure for hemodynamic instability and can be used to assess the presence of hypovolemic shock if point-of-care testing technology is not available.⁴⁻⁶ The SI, first introduced by Allgöwer and Buri in 1967 is a bedside assessment defined as HR divided by SBP. Its normal value ranges from 0.5 to 0.7 in healthy adults. Even with apparently stable vital signs, shock index is a specific indicator of acute circulatory failure and can be used for early recognition of hypoperfusion and the severe illness which would later need intensive resuscitation therapy. Also SI maybe a valuable tool for tracking progress of resuscitation.⁷⁻¹⁰ There are numerous patients who present daily in our emergency ward who are in great risk of going into hypovolemic shock. The evaluation and treatment of shock is commonly guided in emergency by variables like HR, BP and mean arterial pressure (MAP). But studies have shown that normalization of these parameters did not improve the morbidity or mortality.¹¹ Previous researches have shown that SI (HR/BP) has been used to gauge the degree of hypovolemia in hemorrhagic states and can be used as a predictor of poor outcomes including mortality in patients with shock. In our setup, SI is easy and reliable parameter to predict severity and to risk-stratify the patient with hypovolemic shock, thereby triggering the attending physician to initiate aggressive treatment early and improving the possible morbidity and mortality.¹² The objective of this research was to find the use of SI in predicting fluid resuscitation in patients with hypovolemic shock.

METHODS

An analytical cross-sectional study was conducted at the Emergency Department of College of Medical Sciences and Teaching Hospital from July 2022 to September 2022. Ethical approval was taken from Institutional Review Committee of College of Medical Sciences (Ref No. COMSTH-IRC/2022-20/3). All the cases with hypovolemic shock and who had given the consent for data collection were included in this study. Sample was selected by using non-probability purposive sampling technique. Research conducted by Bajracharya et.al,¹³ in 2016 showed the prevalence of hypovolemic shock as 26.3% by taking this as a prevalence, $p = 0.263$, $q = 0.737$ and margin of error as 8%. Using formula, $n = Z^2 * p * q / e^2 = (1.96)^2 * 0.263 * 0.737 / (0.08)^2 = 116$.

By adding 5% non-response error, this research was conducted among 120 patients with hypovolemic shock. Sociodemographic data was recorded from emergency ticket while other information was asked with patients/visitors. A systematic medical examination was done and recorded in the questionnaire and then collected data was checked for completeness, accuracy and then entered and analyzed using statistical package for social sciences (SPSS) version 20.0. Data was analyzed using descriptive and inferential statistical tools. In the descriptive statistics for categorical variables frequency and percentage was calculated. While for continuous variable mean and standard deviation will be calculated. In the inferential Statistics to find the association between levels of shock index with others categorical variable chi-square test was used. To find the association of level of shock with other continuous variable independent t-test were used (after checking normality of the data). P-value <0.05 was considered as statistically significant.

RESULTS

Out of 120 patients, majority of the patients were >50 years 52(43.33%) of age group followed by 40 to 50 years 26(21.67%) and least belonged to 16 to 30 years 18(15%) of age group. Among them majority were males 64(53.33%). Majority of them were road traffic accident (RTA) patients (38%) followed by upper gastrointestinal (GI) bleeding (29%). Most of them were given normal saline (NS) (55%) followed by NS + ringer lactate (RL) 37(30.83%). Minority of the patients only required blood transfusion 10(8.33%) with only one pint of blood 108(90%). Majority of them required didn't require inotropic support 113(94.17%) and intubation 116(96.67%). Only fluid was given to majority 90(75%) of the patients. Among 120 patients, 72(60%) of the patients were admitted in ICU, 30(25%) of them were admitted in ward and 5(4.17%) of them were expired (Table 1).

Table 1: Sociodemographic characteristics of patients with shock (n=120)

Variables	Frequency	Percentage (%)
Age		
16-30	18	15
30-40	24	20
40-50	26	21.67
>50	52	43.33
Gender		
Male	64	53.33
Female	56	46.67
Heart rate (Mean+SD)	85.32±7.85	
SBP Mean+SD	81.31±12.42	

Diagnosis		
Acute gastroenteritis	24	20
RTA	46	38.33
Upper GI Bleeding	35	29.17
Burn	4	3.33
Others	12	10
Fluid		
NS	66	55
RL	4	3.33
NS+RL	37	30.83
NS+DNS	12	10
RL+DNS	1	0.83
Amount of fluid required		
Blood transfusion		
Yes	10	8.33
No	110	91.67
Unit of Blood		
1	108	90
2	12	10
Inotropic support		
Yes	7	5.83
No	113	94.17
Need for intubation		
Yes	4	3.33
No	116	96.67
Treatment Category		
Fluid only	90	75
Fluid with support	30	25
Outcome		
Admitted in ward	30	25
ICU	72	60
LAMA	6	50
Expire	5	4.17
Discharge	7	5.83

Table 2: Prevalence of Shock index (n=120)

Shock index category	Frequency	Percentage
<1	72	60
≥1	48	40

Finding showed that in 60% patients had SI <1 had while in 40% patients had SI ≥1 (Table 2). The mean heart rate in SI category (SI <1) was 73.1 ± 3.2 and that in second Group (SI ≥1) was 103.64 ± 21.9. The mean SBP in SI category (SI <1) was 85.24 ± 3.6 and that in second group (SI ≥1) was 75.4 ± 8.66. The mean amount of fluids received by the patients enrolled in the study was 2700 ± 643.15 in SI category <1 and 3404 ± 1102.47 in SI category ≥1. The number of patients receiving blood transfusion at ER increased with increase in SI and that the number of

patients with hypovolemic shock are admitted in hospital more in SI category ≥1 as compared to SI <1 (p value <0.05) (Table 3).

Table 3: Association of Shock index with others variables (n=120)

Variable	Shock index category		Chi-Square/t-value	p-value
	<1	≥1		
Gender				
Male	38(53.3)	20(42.2)	1.42**	0.233
Female	34(46.7)	28(57.8)		
Age	45.72±11.87	41.71±13.90	1.68*	0.09
Heart rate (beats/minute) (mean ± SD)	73.11 ± 3.24	103.64 ± 21.94	11.64*	<0.001†
SBP (mm of Hg) (mean ±SD)	85.24 ± 3.63	75.42 ± 8.66	8.57*	<0.001†
Urine output(ml) (mean± SD)	1815.56 ± 452.24	1850 ± 653.84	0.34*	0.73
Diagnosis				
Acute gastroenterities	11(15.2)	13(27.1)	10.59**	0.032
RTA	34(47.2)	11(22.9)		
Upper GI Bleeding	20(27.8)	15(31.2)		
Burn	3(4.1)	1(2.08)		
Others	4(5.6)	8(16.7)		
Fluid				
NS	46(63.8)	20(41.6)	16.69**	0.002†
RL	4(5.6)	-		
NS+RL	20(27.8)	17(35.41)		
NS+DNS	2(2.8)	10(20.8)		
RL+DNS	-	1(2.08)		
Amount of fluids received (ml) (mean ±SD)	2700 ± 643.15	3404 ± 1102.47	15.016*	<0.001†
Blood transfusion				
Yes	4(5.6)	6(12.5)	1.82**	<0.001†
No	68(94.4)	42(87.5)		
Units of blood transfused	0.07+0.024	0.64+1.09	1.82*	0.178
Inotropic support				
Yes	-	7(14.6)	11.52**	0.001†
No	72(100)	41(85.4)		
Need for intubation				
Yes	-	4(8.3)	6.21**	0.013†
No	72(100)	44(91.7)		
Treatment Category				
Fluid only	64(88.9)	26(54.1)	18.52**	<0.001†
Fluid with support	8(11.1)	22(45.9)		
Outcome				
Admitted	32(44.4)	40(83.3)	18.15**	<0.001†
Others	40(55.6)	8(16.7)		

*Independent t-test, **Chi-square test, †Statistically significant

DISCUSSION

This study has emphasized the role of SI by demonstrating that it may discriminate the presence of hypovolemic shock with respect to the need for fluid resuscitation and transfusion requirements, as compared to similar studies. The study revealed that majority of the patients were >50 years (43.33%) of age group and least belonged to 16 to 30 years (15%) of age group. Among them 53.33% of them were males. Similar results were revealed in the previous study.¹¹ Majority of them were RTA patients (38.33%) followed by upper GI bleeding (29.17%). Most of them were given NS (55%) followed by NS+RL (30.83%). Minority of the patients only required blood transfusion (8.33%) with only one pint of blood (90%). Majority of them didn't require inotropic support (94.17%) and intubation (96.67%). Only fluid (75%) was given to majority of them. 72 (60%) of the patients were admitted in ICU. Similar results were seen in a study conducted by Mutschler et al.¹⁴ In this study, the mean heart rate in SI category (SI <1) was 73.1 ± 3.2 and that in second Group (SI ≥ 1) was 103.64 ± 21.9 which is lower than in study done by Mutschler et al. in which it was 91.3 ± 15.1 and 109.1 ± 17.9 respectively. This study shows that the mean SBP in SI category (SI <1) was 85.24 ± 3.6 and that in second group (SI ≥ 1) was 75.4 ± 8.66 which is lower than in study done by Mutschler et al., in which it was 124.1 ± 20.2 and 96.9 ± 16.8 respectively. This variation is most probably because the study done by them included trauma patients irrespective of their hypovolemic shock status. The mean amount of fluids received by the patients enrolled in the study was 2700 ± 643.15 in SI category <1 and 3404 ± 1102.47 in SI category ≥ 1 which is different from the study done by Mutschler et al. i.e, 2148 ± 2490 and 3071 ± 2690 respectively.¹⁴ This may be because the study done by them has divided the amount of intravenous fluids received at scene and at emergency department into different categories. However point to be noted is that higher the SI more is the amount of fluids administered. This study shows that the number of patients receiving blood transfusion at ER increased with increase in shock index (3 vs 14, p-value=0.003); similar to study done by Mackenzie et al. states that SI was significantly associated with emergency blood use.¹⁵ This result is also similar to that of another study done by Berger et al. which states that patients with abnormal shock index,⁸ were more likely to be transfused; and to that of study done by Kelsall et al. showing that SI ≥ 1 has very high specificity (93.5%) for predicting any blood transfusion in the first four hour of in-hospital resuscitation.¹⁶

This study shows that increase in shock index is associated with more number of blood transfused (p value <0.05),

similar to study done by Andrea et al.³ The study shows that the number of patients with hypovolemic shock are admitted in hospital more in SI category ≥ 1 as compared to SI <1 (p value <0.05), similar to a study by Rady et al. done in 1994 which showed that the group with SI >0.9 had a significantly higher proportion of patients who required admission to the hospital.¹¹ Another study also shows similar result of higher hospitalization rate with increase in shock index, done by Cevik et al.¹⁷

CONCLUSIONS

Shock index is a most commonly used bedside tool which is reliable and consistent marker to predict the requirement for any amount of blood transfusion, particularly for those patients with hypovolemic shock. The risk of clinical complication is high among patients whose shock index is more than one.

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REFERENCES

1. Jameson J, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J. Harrison's Manual of Medicine, 20e. Available at: <https://accessmedicine.mhmedical.com/content.aspx?bookid=2738§ionid=227555068>. [Accessed December 15, 2022]
2. Sakwari V, Mkony C, Mwafongo V. Rapid resuscitation with small volume hypertonic saline solution for patients in traumatic haemorrhagic shock. *East Afr J Surg*. 2007;12(1):131-8.
3. Arend E. Plasma adipokines levels and functional fitness with concurrent combined aerobic and resistance training in older adults. Available at: <https://repositorio-aberto.up.pt/handle/10216/114535>. [Accessed 2018]
4. Guly HR, Bouamra O, Little R, Dark P, Coats T, Driscoll P, et al. Testing the validity of the ATLS classification of hypovolaemic shock. *Resuscitation*. 2010;81(9):1142-7. DOI: 10.1016/j.resuscitation.2010.04.007 PMID: 20619954.
5. Zarzaur BL, Croce MA, Fischer PE, Magnotti LJ, Fabian TC. New vitals after injury: shock index for the young and age x shock index for the old. *J Surg Res*. 2008;147(2):229-36. DOI: 10.1016/j.jss.2008.03.025 PMID: 18498875.
6. Vandromme MJ, Griffin RL, Kerby JD, McGwin Jr G, Rue III LW, Weinberg JA. Identifying risk for massive

- transfusion in the relatively normotensive patient: utility of the prehospital shock index. *J Trauma Acute Care Surg.* 2011;70(2):384-90. DOI: 10.1097/TA.0b013e3182095a0a PMID: 21307738.
7. Salottolo KM, Mains CW, Offner PJ, Bourg PW, Bar-Or D. A retrospective analysis of geriatric trauma patients: venous lactate is a better predictor of mortality than traditional vital signs. *Scand J Trauma Resusc Emerg Med.* 2013;21(1):1-7. DOI: 10.1186/1757-7241-21-7 PMID: 23410202.
 8. Berger T, Green J, Horeczko T, Hagar Y, Garg N, Suarez A, et al. Shock index and early recognition of sepsis in the emergency department: pilot study. *West J Emerg Med.* 2013;14(2):168. DOI: 10.5811/westjem.2012.8.11546 PMID: 23599863.
 9. Shippy CR, Appel PL, Shoemaker WC. Reliability of clinical monitoring to assess blood volume in critically ill patients. *Crit Care Med.* 1984;12(2):107-12. DOI: 10.1097/00003246-198402000-00005 PMID: 6697726.
 10. Shippy CR, Appel PL, Shoemaker WC. Reliability of clinical measures to assess blood volume in critically ill patients. *Crit Care Med.* 1982;10(3):219. DOI: 10.1097/00003246-198203000-00074
 11. Cannon CM, Braxton CC, Kling-Smith M, Mahnken JD, Carlton E, Moncure M. Utility of the shock index in predicting mortality in traumatically injured patients. *J Trauma Acute Care Surg.* 2009;67(6):1426-30. DOI: 10.1097/TA.0b013e3181bbf728 PMID: 20009697.
 12. Sloan EP, Koenigsberg M, Clark JM, Weir WB, Philbin N. Shock index and prediction of traumatic hemorrhagic shock 28-day mortality: data from the DCL Hb resuscitation clinical trials. *West J Emerg Med.* 2014;15(7):795. DOI: 10.5811/westjem.2014.7.21304 PMID: 25493120.
 13. Bajracharya S, Shrestha A, Shrestha R, Thapa R, Acharya S, Hada K. Assessment of patients presenting in shock at emergency department in a tertiary care teaching hospital Hospital. *J Patan Acad Health Sci.* 2016;3(1):18-22. DOI: 10.3126/jpahs.v3i1.20285
 14. Mutschler M, Nienaber U, Münzberg M, Wöfl C, Schoechl H, Paffrath T, et al. The Shock Index revisited—a fast guide to transfusion requirement? A retrospective analysis on 21,853 patients derived from the Trauma Register DGU. *Crit Care.* 2013;17(4):1-9. DOI: 10.1186/cc12851 PMID: 23938104.
 15. Mackenzie CF, Wang Y, Hu PF, Chen SY, Chen HH, Hagegeorge G, et al. Automated prediction of early blood transfusion and mortality in trauma patients. *J Trauma Acute Care Surg.* 2014;76(6):1379-85. DOI: 10.1097/TA.0000000000000235 PMID: 24854304.
 16. Kelsall NK, Bowyer GW. Injuries sustained at a temporary ice-skating rink: prospective study of the Winchester experience 2007–2008. *Injury.* 2009 Dec 1;40(12):1276-8. DOI: 10.1016/j.injury.2009.02.006 PMID: 19524911.
 17. Cevik AA, Dolgun H, Oner S, Tokar B, Acar N, Ozakin E, et al. Elevated lactate level and shock index in nontraumatic hypotensive patients presenting to the emergency department. *Eur J Emerg Med.* 2015;22(1):23-8. DOI: 10.1097/MEJ.0000000000000110 PMID: 24390005.

Comparison of collum angle and labial crown-root angle of maxillary central incisor in Class I and Class II division 2 malocclusion

Manju Pandey*¹, Umesh Parajuli¹, Anita Dahal²

¹Department Orthodontics, Gandaki Medical College Teaching Hospital, Pokhara, Kaski, Nepal, ²Nepal Army Institute of Health Sciences, Kathmandu, Nepal

ABSTRACT

Introduction: Variation in tooth morphology widely influences the achievement of optimum esthetics and stable occlusal relationship. This study was conducted to compare the collum angle and labial crown root angles in class I, class II division 2 malocclusions, using cephalometric radiographs, and to find a correlation between these angles. **Methods:** This cross-sectional study was conducted from March 2018 to January 2021 among patients visiting the department of Orthodontics at Gandaki Medical College. A total of 62 lateral cephalograms were included and equally divided into 2 groups: Angle's Class I and Class II division 2. Cephalometric tracing was done to measure the collum angle and labial crown root of maxillary central incisors. Pearson's correlation test and independent t-test were used. **Results:** There was a weak positive correlation ($r=+0.348$) between the angles in Class I group, ($p=0.27$) and a moderate positive correlation ($r=+0.547$) between the angles in Class II division 2 group ($p<0.001$). The mean collum angle was found to be greater in class II division 2 (11.90 ± 6.86) than in class I (4.51 ± 4.13) which was statistically significant ($p<0.001$). The mean labial crown root angle was found to be greater in class II division 2 (39.65 ± 8.57) than in class I (30.23 ± 5.20) which was statistically significant ($p<0.001$). **Conclusions:** There was no statistically significant correlation between collum angle and labial crown-root angle in class I groups. The mean of collum angle and labial crown-root angle was found to be greater in class II division 2 which were statistically significant in both angles.

Keywords: Class II division 2, collum angle, labial crown-root angle.

*Correspondence:

Dr. Manju Pandey
Department of Orthodontics
Gandaki Medical College Teaching Hospital
and Research Center
Pokhara, Nepal
Email: manju.pandey@gmail.com
ORCID iD: <https://orcid.org/0000-0001-9950-0977>

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INTRODUCTION

The stability in occlusal relationship is influenced widely by the anatomy of the dentition.¹ According to Andrews, for the establishment of the proper occlusion, the labiolingual inclination of teeth is one of the important factors. It is generally assumed that longitudinal axis of the crown and root coincides with each other but, studies have shown that the crown of maxillary incisors is angled in a peculiar way to the root of a tooth.² This variations in the crown-root angle has been described by several authors as occurring in various types of malocclusions, particularly class II division 2 patients.^{3,4} The crown-root angulation occurring in class II division 2 malocclusions may impede orthodontic intrusion and torque of the incisors and, in severe cases, may give rise to the hazard of perforating the palatal cortical plate.⁵ Thus, for the greater predictability in root position, and to predict difficulties with different mechanics like intrusion, extrusion, or torquing, we should have a thorough understanding of crown-root relationships in the bucco-lingual plane. A new crown-to-root angle has been defined by Bauer and is known as "labial crown root angle" (LCRA).⁶ This angle can be easily identified on lateral cephalometric radiographs, and may have the closer approximation

with the particular position of the straight wire bracket on the labial surface of an incisor. If the LCRA is correlated with the collum angle (CA) of a given tooth, then difficulties with abnormal root positioning might be anticipated directly from this easy measurement.

There are few studies in the literature, regarding the comparison of CA and LCRA.⁶⁻⁸ However, no study has been conducted so far in Nepalese population. Thus, the aim of this study was to compare the CA and LCRA in class I malocclusion and class II division 2 malocclusions and to correlate LCRA with the CA.

METHODS

This is a hospital based cross-sectional study which included lateral cephalograms of patients dated from March 2018 to January 2021 in the Department of Orthodontics at Gandaki Medical College. Ethical approval for the study was obtained from institutional review board (Ref no: 122/2077/2078). Sample size calculation was based on 80% power and based on the standard deviation of 3.10.9 Now applying the formula, $N = 2 SD^2 (Z\alpha + Z\beta)^2 / d^2$, $N = 2 \times 9.61 (1.96 + 0.84)^2 / 4.79 = 31.4$ where, $d = \text{mean difference}$ $N = \text{sample size}$. The total sample was calculated as 62 with 31 samples in each group. The inclusion criteria were 1) Angle's Class I malocclusion, 2) Angle's Class II division 2 malocclusion, 3) Proper image quality and clarity of cephalograms. A total of 62 cephalograms which fulfilled the inclusion criteria were studied of which 35 were female and 27 were male. The study was categorized into two groups using study model based on the Angle's classification of malocclusion: Class I malocclusion and Class II division 2 malocclusion. The cephalometric tracings of included samples were done. Cephalometric tracings of maxillary central incisors was done on lead acetate paper. The measurements of CA and LCRA of maxillary central incisors was recorded for each patient and was compared between the two groups. All the measurements were taken by single examiner (principal author) to reduce inter-examiner variability.

Description of Measurements

The CA is measured by the three points on the most anterior maxillary central incisor: the incisal edge (incisor superius, IS), the bisection of the facial and lingual cemento-enamel junctions (fCEJ and lCEJ, respectively), and the anatomic root apex (upper incisor apicale, UIA). The CA is the supplement ($180 \text{ degrees} - x$) of this angle.¹⁰ The labial crown root angle (LCRA), is constructed on a cephalometric radiograph with three points on the most anterior maxillary central incisor: IS, fCEJ, and UIA. The LCRA is the supplement ($180 \text{ degrees} - x$) of this angle.⁶

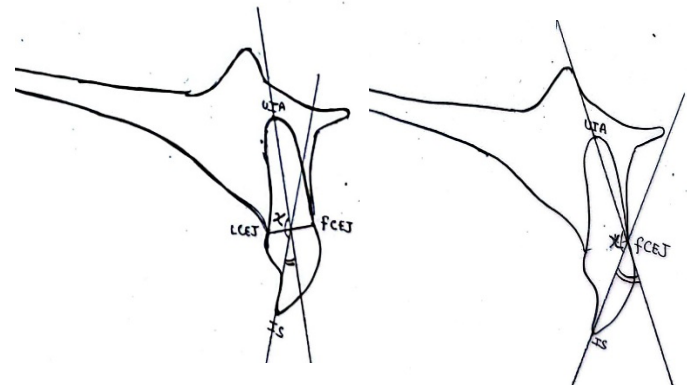


Fig 1: Collum Angle

Fig 2: Labial crown root angle

The statistical analysis was done using IBM SPSS (statistical package for social science) statistical version 16.0. All quantitative variables were assessed using measures of central location (mean) and measures of dispersion (standard deviation). The comparison of angles between the two groups was done by comparing the means using independent t- test where, $p\text{-value} < 0.05$ was considered to be statistically significant. For the correlation of two parameters, Pearson's correlation test was used

Table 1: Interpretation of Pearson's correlation coefficient

0.0 - 0.19	No correlation
0.20 - 0.39	Weak correlation
0.50 - 0.59	Moderate correlation
0.60 - 0.79	Strong correlation
0.80 - 1.0	Perfect correlation

RESULTS

Among the total sample of 62 lateral cephalograms, 31 samples were in Class I group and 31 samples were in Class II Division 2 group. The age ranges from 13 to 35 years. The average age in class I group was 18.87 ± 4.82 with 15 females and 16 males. Similarly, the average age in class II division 2 group was 18.96 ± 4.30 years with 20 females and 11 males.

Table 2 shows the correlation between CA and LCRA in class I and class II division 2 group. The correlation between CA and LCRA in class I group showed weak positive correlation ($r = +0.348$) which was statistically insignificant ($p = 0.27$). The correlation between CA and LCRA in class II division 2 group showed moderate positive correlation ($r = +0.547$) which was statistically significant ($p = 0.001$) (Table 2).

Table 2: Correlation between CA and LCRA in Class I and Class II division 2 group

Pearson Correlation in Class I and Class II division 2 group					
		Collum Angle		Labial Crown Root Angle	
		Class I (n=31)	Class II div2 (n=31)	Class I (n=31)	Class II div2 (n=31)
CA	Pearson's Correlation	1	1	+0.348	+0.547
	p-value			0.27	0.001*
LCRA	Pearson's Correlation	+0.348	+0.547	1	1
	p-value	0.27	0.001*		

*Statistically significant

When comparing the mean CA and mean LCRA in Class I and Class II division 2 malocclusion, both of the angles i.e., CA and LCRA was found to be greater in Class II division 2 group when compared with Class I group which was found to be statistically significant (Table 3).

Table 3: Comparison of mean CA and LCRA in Class I and Class II division 2 group

Angle	Class I group	Class II Div 2 group	Mean Difference	p-value	95% Confidence Interval	
	Mean ± SD (n=31)	Mean ± SD (n=31)			Lower limit	Upper limit
CA	4.51±4.13	11.90±6.86	-7.39	<0.001*	-10.26	-4.51
LCRA	30.23±5.20	39.65±8.57	-9.42	<0.001*	-13.02	-5.81

*Statistically significant

DISCUSSION

The treatment or the post-treatment phase of orthodontic treatment can be affected by the discrepancies in morphologies of the maxillary central incisor. With the development of cephalometry, the angulation of central incisors has been evaluated and studied.

According to the illustrations of crown inclination given by Andrews,¹¹ this may have assumed that the CA is zero for each tooth. This assumption may have originated with development of the straight wire appliance. Andrews never addressed the possibility that the crown and root of a tooth may be inclined relative to each other. Most of the treatment approaches in the various techniques are based on this assumption, but over time, various authors have found this belief to be incorrect.²⁻⁴

It is noted that, root resorption occurs to some degree in most patients undergoing orthodontic treatment,¹² but it has been reported to occur more frequently and more severely in maxillary incisors whose roots are translated into the palatal cortex.¹³⁻¹⁵

The crown-root angulation occurring in class II division 2 malocclusions may impede different types of orthodontic tooth movement like intrusion and torque of the incisors. and, in severe cases, may give rise to the hazard of perforating the palatal cortical plate.⁵ To avoid excessive palatal displacement and root resorption, the torquing mechanics in class II division 2 need to be moderated.

In the study conducted by Baumrind et al. have shown that the amount of error in landmark identification increases when it is constructed (a bisection or tangent line), interpreted (a point on a curve), or confounded by noise of adjacent structures (superimposition).¹⁶ Since CA of maxillary central incisor is constructed by drawing a line from incisal edge bisecting the fCEJ and ICEJ and anatomic root apex, this measurement may have poor reliability and this limits the clinical utility because it is constructed and the point is often superimposed by other structures. Due to all these disadvantages, the point on the labial surface of cemento-enamel junction was proposed by Bauer.⁶ The advantage of the point was easy location by different observers.

In this study, the correlation between CA and LCRA in class I group showed weak positive correlation and in Class II division 2 group showed moderate positive correlation. The study conducted by Bauer also showed the positive correlation between CA and LCRA in both Class I and Class II division group.⁶ In the study conducted by Singh, showed that there was a positive significant correlation between CA and LCRA in Class I, Class II division 1 and Class II division 2 groups.⁷

This study was also conducted to compare the mean CA in Class I and Class II division 2 groups. The results of this study shows that the CA in Class II division 2 malocclusion group is significantly greater than the Class I group, which is similar to the studies conducted by Delivanis, Bryant and Williams.^{3,4,17}

Bauer conducted the study to compare the means of CA and LCRA in Class I and Class II division 2 group, which showed that the mean CA as well as mean LCRA in the Class II division 2 group was significantly greater than that in the Class I group.⁶ In our study also, the means of both the CA and LCRA was significantly greater in Class II division 2 groups. In the study conducted by Singh, comparison of mean of LCRA in different malocclusion showed that there was no significant difference between Class I and Class II division 1 group, but there was a statically significant difference between Class I and Class II division 2 groups.⁷ Since there was a positive correlation between CA and LCRA in Class I and Class II division 2 groups in this study, relatively easily identified angle, LCRA also can be used like a CA to access crown and root angle of a given tooth.

Only handful studies have been conducted regarding LCRA angle. Hence, this study introduces a newer yet relatively easily identifiable angle that can help clinicians to assess crown-root angulation. To reduce the bias, this simple cephalometric technique, could be applied on other

malocclusions like Class II division 1 and Class III in future studies. The study could be conducted among a greater number of sample size and in different ethnicity. Since this study was done in maxillary central incisor, which is typically the only tooth that is measurable on a standard lateral cephalometric radiograph. With the introduction of cone beam computed tomography (CBCT), similar future studies could be conducted for every tooth, using analogous measurements.

CONCLUSIONS

A statically insignificant correlation was seen between CA and LCRA in class I groups. Statistically significant correlation was seen between CA and LCRA in class II division 2 groups. Comparing the mean CA and mean LCRA in Class I and Class II division 2 malocclusion, both of the angles i.e., CA and LCRA was found to be greater in Class II division 2 group when compared with Class I group which was found to be statistically significant.

CONFLICTS OF INTEREST: None declared

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REFERENCES

1. Tong H, Kwon D, Shi J, Sakai N, Enciso R, Sameshima GT. Mesiodistal angulation and faciolingual inclination of each whole tooth in 3-dimensional space in patients with near-normal occlusion. *Am J Orthod Dentofac Orthop.* 2012;141(5):604–17. DOI: 10.1016/j.ajodo.2011.12.018 PMID: 22554755.
2. Nouri M, Hosseini S, Asefi S, Abdi A, Bagheban A. Three-dimensional measurement of tooth inclination: A longitudinal study. *Dent Res J.* 2019;16(4):225–32. DOI: 10.4103/1735-3327.261127 PMID:31303876.
3. Delivanis HP, Kuftinec MM. Variation in morphology of the maxillary central incisors found in Class II, Division 2 malocclusions. *Am J Orthod.* 1980;78(4):438–43. DOI: 10.1016/0002-9416(80)90024-X PMID:6933852.
4. Bryant RM, Sadowsky PL, Dent M, Hazelrig JB. Variability in three morphologic features of the permanent maxillary central incisor. *Am J Orthod.* 1984;86(1):25–32. DOI: 10.1016/0002-9416(84)90273-2 PMID:6588757.
5. Kaley J, Phillips C. Factors related to root resorption in edgewise practice. *Angle Orthod.* 1991;61(2):125–32. DOI: 10.1043/0003-3219(1991)061 PMID:2064070.
6. Bauer TJ. Maxillary central incisor crown-root relationships in Class I normal occlusions and Class II division 2 malocclusions. 2014.
7. Singh R, Mandeep B, Sanjay B, Divya M, Isha S. Comparison of Crown-Root Relationships of Maxillary Central Incisors in Various Malocclusions. *Dent J Adv Stud.* 2019;1:28–34.
8. Raj P, Pillai AR, Jayarajan J, Shaj F, Rajeev S. A Comparative Cephalometric Evaluation of Maxillary Central Incisor Crown Root Relationships in Various Malocclusions. 2021;4(4):116–26.
9. Srinivasan B, Kailasam V, Chitharanjan A, Ramalingam A. Relationship between crown-root angulation (collum angle) of maxillary central incisors in Class II, division 2 malocclusion and lower lip line. *Orthodontics (Chic).* 2013;14(1):e66–74. DOI: 10.11607/ortho.841 PMID: 23646340.
10. Rakoshi T. *An Atlas and Manual of Cephalometric Radiography.* Wolfe Medical Publications, Munich, 1982. 54-58. p.
11. Andrews LF. *Straight Wire, the Concept and Appliance.* CA: L.A. Wells Company. 1989. 1989 p.
12. DeShields RW. A study of root resorption in treated Class II, Division I malocclusions. Vol. 39, *Angle Orthodontist.* 1969. p. 231–45. DOI:10.1043/0003-3219(1969)039<0231:ASORRI>2.0.CO;2 PMID: 5259932.
13. Goldson L, Henrikson CO. Root resorption during Begg treatment: A longitudinal roentgenologic study. *Am J Orthod.* 1975;68(1):55–66. DOI: 10.1016/0002-9416(75)90159-1 PMID:1056144.
14. Ten Hoeve A MR. The effect of antero-postero incisor repositioning on the palatal cortex as studied with laminagraphy. *J Clin Orthod.* 10(11):804–22. PMID:1069732.
15. JH H. Directional forces revisited. *J Clin Orthod.* 1986;20(9):626–37. PMID: 3465750.
16. Baumrind S, Frantz RC. The reliability of head film measurements. 1. Landmark identification. *Am J Orthod.* 1971;60(2):111–27. DOI: 10.1016/0002-9416(71)90028-5 PMID: 5283996.
17. Williams A, Woodhouse C. The Crown to Root Angle of Maxillary Central Incisors in Different Incisal Classes The Crown to Root Angle of Maxillary Central Incisors in Different Incisal Classes. 2016;10(3):4–7. DOI: 10.1179/bjo.10.3.159 PMID: 6575826.

Detection of *Salmonella* carriers among apparently healthy cafeteria food handlers in tertiary care centre Pokhara

Sushil Kumar Chaudhary *¹, Sanjib Mani Regmi¹, Sunita Devkota¹, Gyanendra Gautam¹, Shanti Pradhan¹, Amar Nagila²

¹Department of Microbiology, Gandaki Medical College Teaching Hospital, Pokhara, Nepal, ²School of Health and Allied Sciences, Faculty of Health Sciences, Pokhara University, Nepal

ABSTRACT

Introduction: Foodborne illnesses are caused by consumption of contaminated foods. The risk of food getting contaminated depends largely on the health status of the food handlers, their personal hygiene, knowledge and practice of food hygiene. Hence, this study aimed to assess the proportion of *Salmonella* among food handlers working in the cafeteria of Gandaki Medical College Teaching Hospital, Pokhara, Nepal. **Methods:** An institutional based cross-sectional analytical study was conducted from March 2018 to February 2019. A structured questionnaire was used to collect the sociodemographic characteristics, the knowledge and the risk factors of the participants. A total of 62 stool samples were collected and processed according to the standard microbiological procedures. All the *Salmonella* isolates were identified by biochemical tests. Additionally, antimicrobial susceptibility tests were performed according to Clinical and Laboratory Standards Institute guidelines 2017, using Kirby-Baur disk diffusion method. Data were analyzed by Statistical Package for Social Service for window version 21.0. Descriptive statistics were computed and chi-square test was applied at 5% level of significance. P-value <0.05 was considered to be statistically significant. **Results:** Total of 62 food handlers were included in the study. Majority of the cafeteria workers 46(74.2%) were not aware of proper hand washing technique. Of the 62 food handlers working in the cafeteria, *Salmonella* were isolated from 12(19.4%) stool specimens. All the *Salmonella* isolates were sensitive to amikacin (100%), followed by imipenem (91.7%) and cefotaxime (91.7%). However, the highest rate of antibiotic resistance among *Salmonella* isolates was noted for amoxicillin (58.3%). **Conclusions:** This study showed increased proportion of *Salmonella* carriers among the food handlers of cafeteria. *Salmonella* carriage among food handlers is of great concern as they can be the source of foodborne illness. Therefore, educating the food handlers of cafeteria about personnel hygiene may play a pivotal role in minimizing the incidence of foodborne illness and the associated morbidity.

Keywords: Antibigram, food handlers, personnel hygiene, *Salmonella*.

*Correspondence:

Sushil Kumar Chaudhary
Department of Microbiology
Gandaki Medical College Teaching Hospital
Pokhara, Nepal
Email: sushilkc2011@gmail.com
ORCID iD: <https://orcid.org/0000-0003-1683-5187>

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INTRODUCTION

Foodborne illnesses are caused by consumption of contaminated foods by both infectious (viral, bacterial, fungal and parasitic) and non-infectious toxins, chemicals, physical agents.¹ The risk of food getting contaminated depends largely on the health status of the food handlers, their personal hygiene, knowledge and practice of food hygiene.² Although foodborne diseases have significant global health burden, these infectious diseases can be preventable if public health measures are followed to prevent contamination of food during its production, processing, distribution and preparation.³

A report from Foodborne Disease Burden Epidemiology Reference Group (FERG) mentioned that South-east Asia Region recorded more than 150 million illnesses and 175,000 deaths by food borne diseases in 2016.⁴ Of the bacterial agents *Salmonella*, *Shigella*, *Listeria*, *Escherichia coli*, *Campylobacter* are the major pathogens responsible for foodborne illness.⁵⁻⁷, *Salmonella* species is one of the

major causes of foodborne gastroenteritis in human, and remains an important public health problem with 25 million annual incidences and more than 200000 associated deaths globally.⁸ The main cause of Salmonellosis is asymptomatic carriers. An individual can asymptotically carry *Salmonellae* for years without showing any of the symptoms of *Salmonella* infection. In such carriers, *Salmonellae* continue to multiply in the gall bladder and reach the intestine through the bile duct and are excreted out in the feces. In case of poor hygienic practices, these bacterial agents reside in the skin and finger nails of the food handlers and get transmitted to the food they process and prepare. So, as to cause food borne Salmonellosis in food consumers.⁹

Nepal, being an underdeveloped country, has a high burden of foodborne illness, mainly because of lack of proper knowledge of personal hygiene and sanitations among food handlers. Herein, we investigated proportion of *Salmonella* carriers among food handlers working in the cafeteria of Gandaki Medical College Teaching Hospital (GMCTH), Pokhara, Nepal. Moreover, antibiotic sensitivity pattern of the isolates were also determined.

METHODS

Study design and period

The study was a cross-sectional analytical study conducted from March 2018 to February 2019. The study was conducted on all the cafeteria workers of Gandaki Medical College and Teaching Hospital (GMCTH) Pokhara, Nepal.

Study population and size

All the individuals working in the cafeteria of GMCTH were included in the study. Convenient sampling method was used to collect the clinical samples and sample size was calculated by using following formula,

$$\begin{aligned} n &= z^2 \times (p \times q) / e^2 \\ &= (1.96)^2 \times (0.091 \times 0.90) / 0.08^2 \\ &= 49.14 \end{aligned}$$

Sample size = 50

Where,

n = required sample size

p = prevalence of study¹⁸, 9.1%

q = 1-p

e = margin of error, 8%

z = 1.96 at 95% confidence interval

All food handlers working in GMCTH's cafeterias were included in the study. Food handlers who had recent history of fever, diarrhea, antibiotic therapy and who did not provide consent were excluded from the study.

Data Collection Tool and Procedure

A structured questionnaire was used for data collection on sociodemographic characteristics (gender, age and educational status) and associated risk factors (nail growing habit, knowledge of hand washing technique and use of gloves while handling food).

Sample Collection and Processing

Stool specimen was collected in sterile wide mouthed container from the food handlers working in the cafeterias of GMCTHRC. The specimens were transported from the collection site to the laboratory in ice bag. Stool specimens were inoculated in Selenite F broth and incubated for six hours at 37°C followed by subculture on Salmonella-Shigella (SS) agar at 37°C for 24 hours. In case of positive growth, bacterial smear was prepared from colonies and stained by Gram staining technique to find gram negative organism. Identification of bacteria was done based on the colony morphology and change in the physical appearance of the differential media and by using standard biochemical tests used for identification of *Salmonella*.

Antimicrobial susceptibility testing

Antimicrobial susceptibility pattern of the isolated *Salmonella* was performed by Kirby Bauer disc diffusion method as per the Clinical and Laboratory Standards Institute (CLSI) recommendations. Briefly, colonies were inoculated in sterile peptone water and incubated to reach the concentration of 0.5 McFarland standards. Sterile swab was dipped into the suspension, excess fluid was squeezed out and the swab was spread over the Muller-Hinton agar plate. Antimicrobial discs were placed onto the media and incubated at 37°C for 18 hours. All *Salmonella* isolates were tested against antibiotic disks (Hi-Media); amikacin (30 µg), amoxicillin (30 µg), cefixime (5 µg), cefpodoxime (5 µg), cefotaxime (30 µg), ciprofloxacin (5 µg), imipenem (10 µg) and ofloxacin (5 µg). The zone of inhibition was measured in millimeter for each disc using sliding caliper and was compared with comparative chart provided by the manufacturer. Results were reported as sensitive or resistant to the antimicrobial agents according to CLSI guidelines 2017.¹⁰

Ethical considerations

Ethical clearance was obtained from Institutional Ethical Committee (reference no. 07-11-074). Informed consent

was taken from all the food handlers participated in the study.

Statistical Analysis

All the data were entered in MS Excel (Microsoft office 2007) and then analyzed by Statistical Package for Social Service (SPSS) for window version 21.0. Descriptive statistics were computed and Chi-square test was applied at 5% level of significance. P-value <0.05 was considered to be statistically significant.

RESULTS

Characteristics of study population and *Salmonella* carrier status

Among the total 62 food handlers participated in the study; 32(1.6 %) were male and 30/62(48.4%) were females. *Salmonella* species were isolated from 12 out of 62 stool specimens. The age of participants in the study ranges between 20 to 60 years. Majority of the food handlers working in the cafeteria were in the age range of 20 to 40 years 46 (74.2%). Majority of the food handlers are literate holding either primary level 32(51.6%) or secondary level 20(32.2%) or with higher level 4(6.4%) of education as shown in Table 1.

Table 1: Characteristics of the study population and *Salmonella* carrier status

Characteristics	Number	Percent (%)
Gender		
Male	32	51.6
Female	30	48.4
Age group		
20-40 years	46	74.2
41-60 years	16	25.8
Education Level		
Illiterate	6	9.7
Primary	32	51.6
Secondary	20	32.2
Higher	4	6.4
Training – Certificate of Food Handling		
Trained	12	19.4
Untrained	50	80.6
<i>Salmonella</i> carrier		
Positive	12	19.4
Negative	50	80.6
Knowledge of Hand washing Technique		
Yes	16	25.8
No	46	74.2
Use Gloves while Handling Food		
Yes	2	3.2
No	60	96.8
Nail Growing Habit		
Yes	20	32.3
No	42	67.7

In this study 12(19.4%) food handlers had certificate of

food training. However, majority of them did not take food handling training 50(80.6%). Although majority did not have habit of nail growing 42(67.7%), they did not have knowledge of proper hand washing technique 46(74.2%). Among the participants, majority of the cafeteria workers did not use gloves during food handling 60 (96.8%).

Of the 62 food handlers working in the cafeteria, *Salmonella* were isolated from 12(19.4%) stool specimens in the study population. Among the *Salmonella* carriers 6/32(18.8%) were male and 6/30(20%) were females. Chi square analysis did not show association between *Salmonella* carrier status and gender (p=0.901) as shown in Table 2.

Table 2: Distribution of *Salmonella* carrier across socio-demographic variables

	Salmonella carrier		Chi-square value	P- value
	Positive n(%)	Negative n (%)		
Gender				
Male	6 (18.8)	26 (81.3)	0.016	0.901
Female	6 (20.0)	24 (80.0)		
Age group				
20-40 years	10 (21.7)	36 (78.3)	0.714*	0.343
41-60 years	2 (12.5)	14 (87.5)		
Training -Certificate of Food processing				
Trained	3 (25.0)	9 (75.0)	0.686*	0.422
Untrained	9 (18.0)	41 (82.0)		

* Fisher’s Exact Test

Distribution of *Salmonella* carrier across behavioral variables

Among the total *Salmonella* carrier positive food handlers 6(30%) had the habit of nail growing, 2 (12.5%) had the knowledge of hand washing technique and 1(50.0%) used gloves while handling food as shown in Table 3.

Table 3: Distribution of *Salmonella* carrier across behavioral variables.

	Salmonella-carrier		Chi-square value	P- value
	Positive n(%)	Negative n(%)		
Nail Growing Habit				
Yes	6 (30.0)	14 (70.0)	2.143	0.143
No	6 (14.3)	36 (85.7)		
Knowledge of Hand washing Technique - six steps				
Yes	2 (12.5)	14 (87.5)	0.714*	0.343
No	10 (21.7)	36 (78.3)		
Use of Gloves while Handling Food				
Yes	1 (50.0)	1 (50.0)	0.352*	0.352
No	11 (18.3)	49 (81.7)		

* Fisher’s Exact Test

Antibiogram of *Salmonella* species

The antibiotic sensitivity of the isolated *Salmonellae* were tested against the eight antibiotics as shown in Table 4.

We found that all of the isolates were sensitive to amikacin. Most of the isolates showed variable sensitivity pattern against the antibiotics used; 11/12(91.7%) isolates were sensitive to cefotaxime and imipenem, 10/12(83.3%) were sensitive to ofloxacin ciprofloxacin. Whereas, 9/12(75.0%) and 8/12(66.7%) of sensitivity was shown by cefixime and cefpodoxime respectively. In contrast more than half of the isolates 7/12(58.3%) were resistant to amoxicillin.

Table 4: Antimicrobial patterns of *Salmonella* species isolated from food handlers

Antibiotics (μ g)	Salmonella species			
	Sensitive		Resistant	
	No.	%	No.	%
Amikacin (30)	12	100	0	0
Amoxicillin (30)	5	41.7	7	58.3
Cefixime (5)	9	75.0	3	25.0
Cefpodoxime (5)	8	66.7	4	33.3
Cefotaxime (30)	11	91.7	1	8.3
Ciprofloxacin (5)	10	83.3	2	16.7
Imipenem (10)	11	91.7	1	8.3
Ofloxacin (5)	10	83.3	2	16.7

DISCUSSION

Food handlers may carry a wide range of enteropathogens and participated in the transmission of many infections to the public in the community and to patients in hospitals. The spread of disease via food handlers is a common and persistent problem worldwide.¹¹ Herein, we investigated the proportion of *Salmonella* carrier state and the associated risk factors among food handlers working in cafeteria of GMCTHRC.

Our study found that 19.4% of the food handlers were positive for *Salmonella* isolates. The proportion of *Salmonella* (19.4%) among the food handlers was in agreement with the study conducted in Tamil nadu, India (17.1%).¹² However, higher percentage of *Salmonella* was isolated in the studies carried out in Nigeria like Owerri (66.7%),¹³ Karu Local Government Area of Nasarawa State (62.7%)¹⁴ and federal Capital Territory of Nigeria (42.3%).¹⁵ In contrast, several other studies conducted in food handlers working in cafeteria have 1 to 9.1% positivity for *Salmonella* carriage.¹⁶⁻¹⁸ The discrepancy of these bacterial isolates in different places might be due to difference in sample processing method, sample size, epidemiological distribution of pathogens, level of environmental sanitation and personal hygiene.

In this study a high proportion of *Salmonella* carrier was alarming which could be due to lack of proper hand washing knowledge and nail growing habit. Prevalence of

Salmonellosis was significantly associated with untrimmed nail and improper hand washing procedure of food handlers after going to toilet, after touching body and before preparing food.¹⁹ Hence, food handlers with *Salmonella* carrier state should not be allowed to work in cafeteria until they are treated and cured.

In present study, *Salmonella* species was 100% sensitivity to amikacin which is in the line with the studies done in Addis Ababa, Ethiopia 100%¹⁸ and Chitwan, Nepal 100%.²⁰ Antibiotic resistant *Salmonella* species is a global concern; especially resistance to extended spectrum- β -lactamase.²¹ We found that 58.3% of *Salmonella* isolated from the food handlers in our study are resistant to broad spectrum β -lactam antibiotic amoxicillin. However, in a study carried out in Ethiopia, 100% resistance for amoxicillin was reported against *Salmonella* recovered from cafeteria food handlers.¹⁸ Additionally, emergence of multidrug resistance *Salmonella* led the use of quinolones as a therapeutic treatment option. A study conducted in 2003 in Bangladesh has demonstrated 100% sensitivity to ciprofloxacin.²² Again, in 2010 a study conducted in North India showed 91% of *Salmonella* isolates were sensitive to ciprofloxacin.²³ However, the present study showed only 83.3% of the *Salmonella* isolates being sensitive ciprofloxacin and ofloxacin. Our results were not in agreement to the study conducted in cafeteria of Kasturba Medical College, Mangalore, India wherein the *Salmonella* isolates were 63% sensitive to ciprofloxacin.²⁴ These results suggested increasing trend in quinolone resistance which is a treatment option for enteric fever, is quite alarming. This potentially points towards the irrational use of antibiotics in our community.

CONCLUSIONS

The study revealed a high proportion of *Salmonella* carrier in asymptomatic food handlers. This study also showed increased resistance to stool culture and sensitivity to commonly used antibiotics such as amoxicillin and cephalosporin. Hence, there should be rationale use of antibiotics in patients. *Salmonella* carriage among food handlers is of great concern as they can be the source of foodborne illness. Therefore, health education intervention on food safety and hygiene should be strengthened to ensure food safety during its preparation and storage in food service establishments and all the *Salmonella* carriers must be refrained from the work until they are treated and cured.

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REFERENCES

- Aidara-Kane A, Tritscher A, Miyagishima K. The WHO and Its Role as an International Organization Influencing Global Food Policy [Internet]. Reference Module in Food Science. Elsevier; 2016. 1-6. DOI:10.1016/B978-0-08-100596-5.03255-8
- Mead PS, Slutsker L, Dietz V, McCaig LF, Bresee JS, Shapiro C, et al. Food-related illness and death in the United States. *Emerg Infect Dis*. 1999;5(5):607-25. DOI:10.3201/eid0505.990502
- Bari ML, Yeasmin S. Foodborne Diseases and Responsible Agents. *Food Safety and Preservation*, Elsevier.2018;195-229. DOI:10.1016/B978-0-12-814956-0.00008-1
- World Health Organization. Burden of foodborne diseases in the South-East Asia Region. WHO Library Cataloguing-in-Publication data. 2016. 57 p.
- Gould LH, Walsh KA, Vieira AR, Herman K, Williams IT, Hall AJ, Cole D. Centers for Disease Control and Prevention. Surveillance for foodborne disease outbreaks - United States, 1998-2008. *MMWR Surveill Summ*. 2013 Jun 28;62(2):1-34. PMID: 23804024.
- Dewey-Mattia D, Manikonda K, Hall AJ, Wise ME, Crowe SJ. Surveillance for Foodborne Disease Outbreaks - United States, 2009-2015. *MMWR Surveill Summ*. 2018;67(10):1-11. DOI:10.15585/mmwr.ss6710a1 PMID: 30048426.
- Scallan E, Hoekstra RM, Mahon BE, Jones TF GP. An assessment of the human health impact of seven leading foodborne pathogens in the United States using disability adjusted life years. *Epidemiol Infect*. 2015;143(13):2795-804. DOI:10.1017/S0950268814003185
- Dekker JP, Frank KM. Salmonella, Shigella, and Yersinia. *Clin Lab Med*. 2015;35(2):225-46. DOI:10.1016/j.cll.2015.02.002 PMID: 26004640.
- Tappes SP, Chaves Folly DC, Da Silva Santos G, De Aquino Feijó C, Pustiglione M. Food handlers and foodborne diseases: Grounds for safety and public and occupational health actions. *Rev Bras Med do Trab*. 2019;17(3):431-40. DOI:10.5327/Z1679443520190316
- CLSI, Dolinsky AL, Ohiro RK, Fan W, Xiao C, Wu F. National Committee for Clinical Laboratory Standards. 2000. Performance standard for antimicrobial susceptibility testing. Document M100-S10. *J Int Med Res* [Internet]. 2019;46(September):18. DOI:10.1108/08876049410065598
- Mohan V, Mohan U, Dass L, Lal M. An Evaluation of health status of food handlers of eating establishments in various educational and health institutions in Amritsar City. *Indian Journal of Community Medicine*. 2001;26(2):80-84.
- Senthilkumar B, Prabakaran G. Multidrug resistant *Salmonella typhi* in asymptomatic typhoid carriers among food handlers in Namakkal district, Tamil Nadu. *Indian J Med Microbiol*. 2005;23(2):92-4. DOI:10.1016/S0255-0857(21)02646-3
- Gbodo EE, Anumudu CK. Prevalence of *Salmonella typhi* Infection among Food Handlers in Imo State University Owerri Nigeria and its Environs. *J Trop Dis*. 2019;7(4):1-4. DOI: 10.4172/2329-891X.1000315
- Abioye J, Salome B, Adogo L. Prevalence of *Salmonella typhi* Infection in Karu Local Government Area of Nasarawa State, Nigeria. *J Adv Microbiol*. 2017;6(2):1-8. DOI:10.9734/JAMB/2017/37074
- Ifeadike C, Ironkwe O, Nnebue C, Nwabueze S, Ubajaka C, Adogu POU, et al. Prevalence and pattern of bacteria and intestinal parasites among food handlers in the Federal Capital Territory of Nigeria. *Niger Med J*. 2012;53(3):166. DOI:10.4103/0300-1652.104389
- Feglo PK, Frimpong EH, Essel-Ahun M. *Salmonella* carrier status of food vendors in Kumasi, Ghana. *East Afr Med J*. 2004;81(7):358-61. DOI:10.4314/eamj.v81i7.9191
- Aklilu A, Kahase D, Dessalegn M, Tarekegn N, Gebremichael S, Zenebe S, et al. Prevalence of intestinal parasites, *Salmonella* and *Shigella* among apparently health food handlers of Addis Ababa University student's cafeteria, Addis Ababa, Ethiopia. *BMC Res Notes*. 2015;8(1):4-9. DOI:10.1186/s13104-014-0967-x
- Siddiqui TR, Bibi S, Mustufa MA, Ayaz SM, Khan A. High prevalence of typhoidal *Salmonella enterica* serovars excreting food handlers in Karachi-Pakistan: a probable factor for regional typhoid endemicity. *J Health Popul Nutr*. 2015 Dec 8;33:27. DOI: 10.1186/s41043-015-0037-6 PMID: 26825058.

19. Mama M, Alemu G. Prevalence, antimicrobial susceptibility patterns and associated risk factors of Shigella and Salmonella among food handlers in Arba Minch University, South Ethiopia. BMC Infect Dis [Internet]. 2016;16(1):1-7. DOI:10.1186/s12879-016-2035-8
20. Khanal S, Kandel M, Shah MP. Antibigram Pattern of Escherichia coli, Salmonella spp. and Staphylococcus spp. Isolates from Broiler Chicken. Nepalese Veterinary Journal 2005;36:105-10. DOI:10.3126/nvj.v36i0.27763
21. Shigemura H, Sakatsume E, Sekizuka T, Yokoyama H, Hamada K, Etoh Y, et al. Food Workers as a Reservoir of Extended-Spectrum-. Appl Environ Microbiol aem.asm.org. 2020;86(13):1-10. DOI:10.1128/AEM.00072-20
22. Asna SM, Haq JA, Rahman MM. Nalidixic acid-resistant Salmonella enterica serovar Typhi with decreased susceptibility to ciprofloxacin caused treatment failure: a report from Bangladesh. Jpn J Infect Dis. 2003;56(1):32-3. PMID: 12711825.
23. Arora D, Singh R, Kaur M, Ahi RS. A changing pattern in antimicrobial susceptibility of Salmonella enterica serotype isolated In North India. African J Microbiol Res. 2010;4(3):197-203.
24. Meghna C, Vidyalakshmi K, Shrikala B. Prevalence of faecal carriage of salmonella serotypes and their antimicrobial susceptibility pattern among asymptomatic food handlers. iMedPub Journals.2020;11(6):1-11.

Knowledge on child rights among private and government school teachers, Pokhara, Kaski district

Indu Sah^{*1}, Harikala Soti¹, Laxmi Paudyal¹, Nitu S Gautam¹

¹Department of Child Health Nursing, Gandaki Medical College, College of Nursing Sciences, Pokhara, Nepal

ABSTRACT

Introduction: Children play vital role to the nation's present and its future. The healthy and educated child of today is the intelligent and active citizen of tomorrow. Hence, the objective of our study was to assess the level of knowledge regarding child rights among teachers, compare the knowledge about child rights in context of private and government school, measure the association between knowledge regarding child rights with selected demographic variables. **Methods:** This is a cross-sectional comparative study conducted among 200 school teachers 100 each from four government and three private schools of Pokhara using purposive sampling method. Data was collected from November 1 to December 1, 2021. Structured self-administered questionnaire tool on knowledge regarding child rights was prepared by the researcher herself. The data were collected by self-administered tool by researcher herself within 30 minutes. The quantitative data was analyzed using statistical package for social sciences version 20.0 descriptive statistics and non-parametric test were used for analyzing knowledge and association. P-value of <0.05 was regarded as significant. **Results:** Private school teachers had high level of knowledge (68%) while government school teachers had comparatively lower knowledge level (61%) on child rights. There was statistically significant association between knowledge and education level among government school teachers. Similarly, there was statistically significant association between knowledge and ethnicity, religion and information among private school teachers. **Conclusions:** Private school teachers are more knowledgeable about child rights compared to government school teachers which emerges the need for further training to teachers.

Keywords: Child rights, government school teacher, knowledge, private school teacher.

*Correspondence:

Mrs. Indu Sah
Department of Child Health Nursing
Gandaki Medical College Teaching Hospital
and Research Center
College of Nursing Sciences, Pokhara, Nepal
Email: indukali58@gmail.com
ORCID iD: <https://orcid.org/0000-0001-5465-5350>

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INTRODUCTION

Children play vital role to the nation's present and its future.¹ The healthy and educated child of today is intelligent and active citizen of tomorrow.² Children's rights are the human rights with attention to the rights of special protection and care afforded to minors including their right to association with parents, human identity as well as the basic needs.³

It is the responsibility of the parents, teachers and the society to build the children in a constructive way. According to United Nations Convention on the Rights of the Child (UNCRC), child means those human beings whose age is below eighteen years. Children around the world every day live with violence, poverty, discrimination and injustice. It looks like that as soon as one crisis subsides, another emerges.⁴ Universal declaration of human rights 1948 has declared rights of child to be universally accepted and practiced such as right to equality, without distinction on account of race, religion or national origin, right to special protection for the child's physical, mental and social development, right to a name and a nationality, right to adequate nutrition, housing and medical services, right to special education and treatment when a child is physically or

mentally handicapped, right to understanding and love by parents and society, right to recreational activities and free education, right to be among the first to receive relief in all circumstances, right to protection against all forms of neglect, cruelty and exploitation and right to be brought up in a spirit of understanding, tolerance, friendship among peoples and universal brotherhood.¹⁰

According to Nepal Law Commission 2075 child rights are, Rights to live, to name, nationality and identity, against discrimination, to live and meet with the parents, to protection, to participate, to education, to freedom of expression and information, to open organization and assemble peacefully, to privacy, Special rights of children with disabilities, to nutrition and health, to sports and entertainment and culture.⁵ Children and young people have the same general human rights as adults and also specific rights that recognize their special needs. Children are neither the property of their parents nor are they helpless objects of charity. They are individual human beings and are the subject of their own rights.⁶ A study conducted on knowledge of child rights among teachers of primary school in Jammu shows significant difference in knowledge among Government school teachers and private school teachers.⁷ Children's rights are nowadays implemented as social laws, if the teachers have better knowledge about the child rights it would be helpful for the children to lead a better life. Child rights are applicable to every child irrespective of the race, color, sex, creed or other status. Since teachers are in close contact with the child they can make a significant positive impact on the lives of child so teacher's knowledge on child rights is very essential to be assessed.⁹

The school referred as one of the basic institutions for the child development after the families should be used for increasing awareness on child rights. One child spends equal amount of time in school with school teachers as he spends time in home with parents.⁵ Thus, school teacher also play vital role in protecting child rights and fostering child development. The child protectors or teachers are jointly or individually held accountable for the protection of children rights which nurtures and develops a sense of collective responsibility towards practices and attitudes that safeguard the rights of children at all level. Children eventually feel protected, respected and safe in school, at home and within their communities if everyone are aware of the rights of children.⁶

In context of Nepal most of the schools in remote areas doesn't have more access to the technological advancement and different changing perspectives of the world. Students who study in private school seems to be smarter and more

knowledgeable than students of government school. Since the child spends more amount of their time in school environment with their teachers they need to know about child rights and provide environment where each child can enjoy their rights proudly. With this backdrop the present study was undertaken with the objective to assess the level of knowledge regarding child rights among teachers, compare the knowledge about child rights in context of private and government school, to measure the association between knowledge regarding child rights with selected demographic variables.

METHODS

A cross-sectional comparative research design was used to assess the knowledge on child rights among private and government school teachers. This study was conducted in four government and three private schools of Kaski district. Sample size was 200, among them 100 were from private school and 100 from government school.

Purposive sampling technique was used for obtaining the sample. The study included teachers working in private school and government school and teachers who were willing to participate in the study. The study excludes those who were not willing to participate and was not present at the time of data collection also incomplete responders data set was not included in the study.

Data collection was done through the self-administered structured questionnaire tool. The research instrument was divided into two sections.

Section I: Demographic information of respondents.

Section II: Questions related to knowledge regarding child right among government and private school teachers.

The study was carried out after the approval of the research proposal from the concerned authority of Gandaki Medical College. Ethical approval was obtained from Gandaki Medical College Teaching Hospital and Research Center Institution review committee (GMC-IRC) with ethical number 96/77/78. Researcher visited all the private and government schools and received verbal permission from the principal. Verbal and written consent was obtained from the teachers after explaining the objectives of the study to the participants. Privacy and confidentiality were maintained throughout the study. None of the respondents were forced to participate in the study.

Self-administered questionnaire tool on knowledge regarding child rights was administered to each participant by the researcher herself and the time duration to fill the tool was 30 minutes. The data collection period was 1 month from November 1 to December 1, 2021. The collected data was

organized, coded and entered into Statistical Package for Social Science (SPSS) version 20.0 and then analyzed using descriptive and inferential statistics. Descriptive statistics such as frequency, percentage distribution and range was used and inferential statistics such as chi-square test was used to find out the association between the knowledge on child right's and selected demographic variables. Each item had a score one for the correct answer and score zero for the wrong answer. Thus, altogether there were 30 items with a maximum total score of 57 in which there were 21 multiple choice questions with one correct answer and 9 multiple response questions with four correct answers. Knowledge score was categorized below 50% as inadequate, 50-75% as moderate and above 75% as adequate with the score range of <28 as inadequate, 28-42 as moderate and >42 as adequate. The level of significance was considered at 5% with p-value <0.05 and 95% confidence interval.

RESULTS

Organization and presentation of related data

Section I: Description of comparison of socio demographic variables of government and private school teachers

Section II: Comparison of level of knowledge between government and private school teachers

Section III: Association of level of knowledge with selected demographic variables of government and Private school teachers.

Section I: Description of comparison of socio demographic variables of government and private school teachers

Table 1: Comparison of frequency and percentage distribution of sociodemographic variables of government and private school teachers (N=200)

Variables	Government school teachers (n=100)		Private school teachers (n=100)	
	Number	Percentage	Number	Percentage
Age in yrs				
Below 20	22	22%	6	6%
21-39	60	60%	79	79%
40-59	18	18%	15	15%
Sex				
Male	70	70%	42	42%
Female	30	30%	58	58%
Religion				
Hinduism	85	85%	79	79%
Buddhism	7	7%	18	18%
Christian	8	8%	3	3%
Marital status				
Married	71	71%	67	67%
Unmarried	27	27%	32	32%
Widow/widower	2	2%	1	1%

Ethnicity				
Dalit	5	5%	12	12%
Disadvantaged janajati	6	6%	12	12%
Disadvantaged dalit terai	2	2%	3	3%
Religious minorities	9	9%	7	7%
Relatively advantaged janajati	11	11%	10	10%
Upper caste group	67	67%	56	56%
Educational level				
Secondary level	24	24%	20	20%
Bachelor level	29	29%	52	52%
Master's and above	47	47%	28	28%
Years of experience				
0-10 years	59	59%	80	80%
11-20 years	22	22%	18	18%
21-30 years	17	17%	1	1%
31-40 years	2	2%	1	1%
Teacher's income				
Less than 10,000	2	2%	13	13%
10,000 to 36,000	73	73%	69	69%
36,000 to 1,11,000	25	25%	16	16%
Above 1,11,000	-	-	2	2%
Information about child rights				
Yes	100	100%	80	80%
No	-	-	20	20%
Source of information				
Radio	12	12%	10	10%
Television	18	18%	21	21%
Newspaper/magazine	20	20%	12	12%
Internet	22	22%	15	15%
Health personnel	12	12%	7	7%
School/college	7	7%	10	10%
Friends/relatives	5	5%	5	5%
Others	4	4%	-	-
Attended Training/workshop/seminar				
Yes	23	23%	16	16%
No	77	77%	84	84%

As shown in table 1, on comparing sociodemographic variables between government and private school teachers, majority belonged to age group 21-39 years in both government school 60% and private school 79% groups. Male teachers were found to be more in government school 70% while females in private school 58%. Majority of the study participants were hindu in both government schools (85%) and private schools (79%). 71% of the government school teachers were married while in private school, 67% were married. Most of the participants in both the groups belonged upper caste. educational level less than half

Furthermore, 47% government school teachers had completed masters and above while in private schools most of them (52%) had completed bachelor degree. About 59% in government school and 80% in private school had experience between 0 to 10 years. Similarly, 73% of government school teachers and 69% of private school teachers were earning between 10,000 to 36,000.

100% government school teachers and 80% private school teachers had information about child rights. Around 22% of government school teachers have got the information from internet whereas majority (21%) of private school teachers have got information through television. .

Section II: Comparison of level of knowledge between government and private school teacher

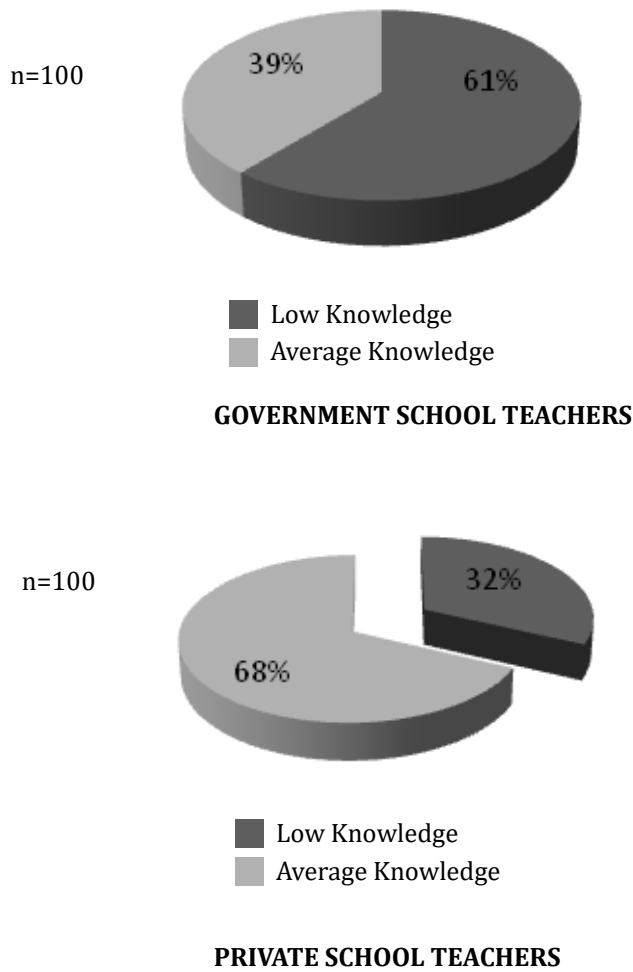


Figure 1: Comparison of level of knowledge between government and private school teachers

As shown in figure 1, among 100 government school majority (61%) had low knowledge and whereas in private schools, 68% had high knowledge regarding child rights.

Section III: Association of level of knowledge with selected demographic variables of government and Private school teachers.

Table 2: Association between level of knowledge with selected demographic variables of government school teachers (n=100)

Demographic Variables	Level of knowledge		χ ²	p-value
	Low knowledge (no)	Average knowl- edge(no)		
Age in years				
Below 39	51	31	0.274	0.601
39 years and above	10	8		
Sex				
Male	39	31	2.740	0.098
Female	22	8		
Religion				
Hinduism	52	34	0.074	0.786
Buddhism & Christian	9	5		
Ethnicity				
Upper caste group	37	30	2.847	0.092
Others	24	9		
Marital status				
Married	44	27	0.097	0.755
Unmarried & widow	17	12		
Educational level				
Basic & secondary	22	2	12.483	0.001*
Bachelor & master's	39	37		
Years of experience				
0-20 yrs	48	33	0.543	0.461
21-40 yrs	13	6		
Teacher's income				
Less than 36,000	42	33	3.153	0.076
36,000 and above	19	6		
Attended training				

*Statistically significant

As shown in Table 2 there is significant association between knowledge regarding child rights among government school teachers and educational level ($\chi^2= 12.48, df=2$) at 5% level (i.e, $p<0.05$).

Table 3: Association between level of knowledge with selected demographic variables of private school teachers (n=100)

Demographic Variables	Level of knowledge		χ ²	p-value
	Average knowledge (no)	High knowledge (no)		
Age in years				
Below 39	29	56	1.168	0.280
39 years and above	3	12		

Sex				
Male	13	29	0.037	0.848
Female	19	39		
Religion				
Hinduism	32	47	12.509	0.001*
Buddhism & Christian	0	21		
Ethnicity				
Upper caste group	30	38	14.340	0.001*
Others	2	30		
Marital status				
Married	20	47	0.431	0.511
Unmarried & widow	12	21		
Educational level				
Basic & secondary	9	11	1.942	0.163
Bachelor & master's	23	57		
Teacher's income				
Less than 36,000	28	54	0.964	0.326
36,000 and above	4	14		
Information				
Yes	30	50	5.561	0.018*
No	2	18		
Attended training				
Yes	8	8	2.836	0.092
No	24	60		

*Statistically significant

As shown in Table 3 there is significant association between knowledge regarding child rights among private school teachers and religion ($\chi^2=12.50$, $df=2$), ethnicity ($\chi^2= 14.34$, $df=2$) and information regarding child rights ($\chi^2= 5.56$, $df=2$) at 5% level(i.e, $p<0.05$).

DISCUSSION

In the current study, majority of the school teachers from both government and private sectors belonged to age-group 21 to 39 years. The present study is supported by the similar study done by Arora et al.⁷ in Jammu among government and private school personnel, which revealed that majority of the government school personnel 49% were in the age group of 31-40 years. Less than half of the private school personnel.

41% were in the age group of 41-55 years. Most of the school personnel in both government and private school 69% were female. Majority of the government school personnel 66% in government school were educated upto post graduation. Equal percentage of the private school personnel 39% were educated upto graduation and postgraduation. .

Meanwhile, similar study done by Naik⁵ in Davangere city school Karnataka, which showed that majority of the teachers 75% in government schools were between the age group of 30 to 40 years and 15% teachers fall under the age group of 40-55 years and 10% teachers were in the age group of 20-30 years Whereas, in private schools almost all the teachers 38% were between the age group of 30-40 years, 32% teachers were in the age group of 20 to 30 years and 30% teachers fall under the age group of 40-55 years. Regarding sex most of the teachers 73% in government schools were female and 27% teachers were males whereas, in private schools more than half of the teachers 72% were females and 28% teachers were males. Regarding education majority of the teachers 80% in government schools were educated up to post graduation. Few teachers 20% in government schools were educated up to graduation whereas most of the teachers 60% in private schools were educated up to graduation and less than half of the teachers 38% were educated up to post graduation. Only 2% of the teachers in private schools were educated up to higher secondary.

The analysis of knowledge of child rights among government and private school teachers of the present study revealed that among 100 government school teachers more than half 61% had low knowledge and only 39% had average knowledge regarding child rights whereas among 100 private school teachers more than half 68% had high knowledge and 32% had average knowledge regarding child rights. This indicates that there is need to update the knowledge about child rights among government school teachers to promote the rights of children studying in schools. Naik had done the similar study in schools of Davangere city Karnataka⁵ with contrast results which showed that in government schools majority of the teachers 47% were having moderate level of knowledge towards child rights and an equal percentage of the teachers 27% were having low and high level of knowledge regarding child rights. Whereas, in private schools most of the teachers 42% were having low and high level of knowledge towards child rights. Only 17% teachers had moderate level of knowledge towards child rights this may be because of the involvement of larger number of government and private schools in the study sample.

Also Shah et al.⁸ had done similar study in Dharan

metropolitan city among 205 primary school teachers of government school. The study revealed that 53.2% of respondents had adequate knowledge and 46.8% had inadequate knowledge regarding child right, results may be similar because of the similarity in the study sample.

Meanwhile Arora et al.⁷ had also supported by the results of the similar study done in government and private school of Jammu which shows that in government schools, majority of the administrative officers 40% and teachers 50% were having average level of knowledge regarding child rights. Less than half of the helpers 50% were having low level of knowledge of child rights. Whereas in private schools, most of the administrative officers 43% were having average level of knowledge of child rights. Less than half of the teachers 38% were having high level of knowledge about child rights. Most of the helpers 47% were having low level of knowledge regarding child rights. Overall, in both government 43% and private 35% school personnel were having average level of knowledge regarding child rights it may be because of the involvement of different level of school personnel in the study.

The present study showed that there is significant association between knowledge regarding child rights among government school teachers and educational level ($\chi^2= 12.48$, $df=2$) at 5% level (i.e, $p<0.05$) whereas there is significant association between knowledge regarding child rights among private school teachers and religion ($\chi^2=12.50$, $df=2$), ethnicity ($\chi^2= 14.34$, $df=2$) and information regarding child rights ($\chi^2= 5.56$, $df=2$) at 5% level (i.e., $p<0.05$).

The present study is supported by the study done by Shah et al.⁸ in Dharan metropolitan city which shows there was association between attitude and teaching experience as the p-value was 0.032 which indicates that teachers with more teaching experience had positive attitude towards child rights this may be because of the difference in study setting.

CONCLUSIONS

The present study aimed to compare the knowledge about child rights among government and private school teachers the results of the study concludes that private school teachers have good knowledge about child rights when compared to government school teachers which emerges the need for providing further information and training related with rights of children among teachers. Larger scale and a comparative study could be done among more schools in Kaski district including administrative staffs for the generalizability of the study.

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REFERENCES

1. Institute of Medicine Staff, National Research Council (US). Committee on Evaluation of Children's Health, Institute of Medicine (US), Board on Children, Youth, Families Staff, National Research Council, Institute of Medicine (Washington, DC). Division of Behavioral, Social Sciences. Children's health, the nation's wealth: assessing and improving child health. National Academies Press; 2004. Available from: <http://www.ncbi.nlm.nih.gov>
2. Verma DS. Juvenile justice. The high court of judicature. Varanasi UP.Aurangabad; Sep 22, 2017
3. Lansdown G. Children's welfare and children's rights. In Child welfare and social Policy. Bristol University Press; 2005.p.117-26. DOI: 10.2307/j.ctt1t89237.14
4. Park K. Park's Textbook of Preventive and social medicine, 20th edition. Jabalpur: Banarasidas Bhanot Publishers; 2009.p.375,474-5.
5. Naik R. A study on knowledge of child rights among teachers of primary school. Internat J of Res in Edu and Psy.2017;3(3).
6. UNICEF: Child rights and why they matter. Convention on the rights of the child. Available from: <https://www.unicef.org/child-rights-convention/child-rights-why-they-matter>
7. Arora S, Thakur R. Knowledge and attitudes towards child rights: A comparative study between Government and Private school personnel in Jammu. Internat J of Appl Home Sci. 2017;4:447-53.
8. Shah SB, Shrestha R, Thapa S. Knowledge and attitude regarding child rights among primary school teachers of government school of Dharan sub-

metropolitan. Nurs Care. 2016;5(3):2167-1168. DOI: 10.4172/2167-1168.C1.017

9. Sathiyaraj A, Jayaraman K. A study on child rights awareness among the primary school teachers in Tiruchirappalli District of Tamil nadu.

International Journal of Scientific and Research Publications.2013;3(6):1-3.

10. Maharjan M, Kisi D, Acharya S. Comprehensive Textbook of child health nursing. Kathmandu: Samiksha publication; 2022.21p.

Satisfaction with life among senior citizens in Pokhara metropolitan city: A cross-sectional study

Ranjita Karmacharya*¹, Nirupa Thapa¹

¹Institute of Medicine, Pokhara Nursing Campus, Tribhuvan University, Nepal

ABSTRACT

Introduction: The number of senior citizens in the world is growing rapidly so life satisfaction is the best indicator for evaluating successful aging. The aim of the study was to assess life satisfaction among senior citizens in Pokhara metropolitan city. **Methods:** This community-based cross-sectional study was conducted among 325 samples from 17 cluster of Pokhara metropolitan city. Life satisfaction were measured through life satisfaction index-A. Descriptive statistics and inferential statistics were computed at a 5% level of significance. Study participants were aged 60 years and above, residing permanently in the study sites. Wards, households, and respondents were selected randomly. Data were entered in Epi Data and analyzed using statistical package for the social sciences 16.0 version. **Results:** Findings revealed that 53.5% respondents were not satisfied with their life. Likewise, age below 70 (52.4%), male respondents (53.7%), senior citizens (60+) living with partner (50.8%) were more satisfied. In multivariate analysis pension (OR=0.482, CI=0.248, 0.935), sufficient money for expenditure (OR=2.370, CI=1.362, 4.123), family income (OR=4.391, CI=2.019, 9.551), state of health (OR= 0.464, CI= 0.215, 0.923) and role in family decision making (OR=2.001, CI=1.055, 3.793) were positively associated with life satisfaction. **Conclusions:** More than half of the senior citizens were dissatisfied with their life. Financial state, state of health and role in family decision making are the main determinant factors of life satisfaction. Therefore, the authority body needs to be developing proper old age policies to resolute the socioeconomic problems of old people.

Keywords: Life satisfaction, life satisfaction index, role in family, senior citizens.

*Correspondence:

Ms. Ranjita Karmacharya
Adult health nursing
Tribhuvan University, Institute of Medicine
Pokhara Nursing Campus, Pokhara, Nepal
Email: karmacharyaranjita@gmail.com
ORCID iD: <https://orcid.org/0000-0001-8484-219X>

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INTRODUCTION

Depending on prevailing of the socio-cultural norms and values, countries define men as an old after crossing certain age.¹ Nepal Senior Citizens Act define senior citizen as the citizens of Nepal having completed the age of sixty years.² The concept of life satisfaction (LS) is not just an absence of disease or disability; it includes the satisfaction of person's social and psychological needs. When a person finds joy in their daily lives, finds meaning in the life they are living/has lived, and feels they have achieved most of their goals, this can be characterized as high LS.³ Different factors like culture, physical activity, social interaction, social support, income, health status etc. effect on person's life satisfaction.⁴

A cross-sectional study in Kathmandu showed that 82.7% of the senior citizens were satisfied with their life. Among them 67.3% were satisfied with their living condition, 64.7% were satisfied with their present health status and 79.3% were satisfied with their ability to involve in basic activities.⁵ Likewise, study conducted at Gorgan revealed that 60% of the elderly participants were not satisfied with their lives. Men experience more life satisfaction than female and educated were more satisfied then uneducated.⁶ LS was positively associated with being married, high family income, involvement in

active earning, and a high nutritional score.⁷

In some countries like Nepal and India, senior citizens are taken into consideration as the head of the family but they are not involved in decision making which makes them feel isolated, depressed and demoralized.⁸ True happiness is the center of satisfaction. Aging happiness depends on social behavior towards them, sense of well-being, and compatibility with life processes. Even though the adult life is full of transitional state as is life before twenty. Most research studies have focused only on infancy and adolescence changes and their needs. Studies among elderly also mainly focus on depression, caregiver burden; quality of life. Hence, the objective of the study was to assess the life satisfaction among senior citizens in Pokhara metropolitan city.

METHODS

A cross-sectional descriptive study was conducted from May 25 to July 21, 2019. Considering the definition of elderly population given by the senior citizen act of Nepal, only those who were aged 60 years and above residing permanently in different wards of Pokhara metropolitan city were included.

To calculate sample size, Cochran's formula was used for infinite population $n = Z^2pq/d^2$,⁹ with 5% level of significance and 82.7% of prevalence from LS among senior citizens in a community of Kathmandu.⁵ Hence, the calculated sample size was 217. Then the researcher used the correction formula for finite population by multiplying it with design effect of 1.5 as cluster random sampling the sample was 325. Assuming each ward as a cluster of 50%, i.e. 17 clusters were taken. Since sampling frame of each ward was not available, therefore data was collected assuming that one household consists of one study population. Sampling interval was obtained by dividing the total household by the number of cluster made. Random number was obtained by using decision analyst STAT software. The first random number generated was 306. After obtaining the first random number, subsequent cluster was selected at every 6214 interval. Required number of households from each cluster was calculated by proportionate allocation according to the total number of household present in each ward, so that household from each cluster were ranged from 11 to 35. Households in each cluster were selected using random walk method.¹⁰ Data were collected from households of the selected wards at the place of their residence by face to face interview. If more than one study population were present in households, only one of them was selected randomly by lottery method. Similarly, if the study population was not present in the selected house, sample was taken from

subsequent house. Elderly people who had problems with hearing, speaking or unable to respond were excluded. Ethical clearance was obtained from NHRC (ERB number 2065/2019). Prior to data collection, verbal and written informed consent was obtained from each respondent.

Instrument consisted of two parts. Part I included sex, marital status, education level, economic status, family relationship, health status of the senior citizens. Part II consisted of Life Satisfaction Index -A (LSITA)¹¹ with 35 items. It was categorized into five dimensions.

- i) The zest versus apathy scale measures social or intellectual engagements,
- ii) The resolution and fortitude scale measures acceptance of personal responsibility,
- iii) Congruence between desired and achieved goals scale measures satisfied or dissatisfied with achieved goals in life,
- iv) The self-concept scale measures present emotional, physical, and intellectual dimensions of life, and
- v) The mood tone scale measures optimism and happiness.

Before data collection tool was translated to Nepali language then back translation was done into English with the help of language expert. Six points Likert scale (from 1=strongly disagree to 6= strongly agree) was used to measure LS and reversed scoring was done on natively stated questions. Pretesting of the instrument was done for its feasibility and appropriateness among the 10% of the sample in the different cluster, which was not included in the study. The alpha scale reliability was 0.79.

Descriptive statistical analysis (frequency and percentage) and inferential statistics were done using statistical package for social science (SPSS) version 16.0. Satisfaction was classified into satisfied and not satisfied based on LSITA Scoring Matrix (Mean \pm SD). Chi-square test was carried out to assess the association between different independent variables and level of satisfaction. Those variables significantly associated with level of satisfaction (p -value<0.05) were further subjected to bi-variate regression analysis so that the effect of the confounding factors would be eliminated.

RESULTS

A total of 325 senior citizens were included in this study. The mean age and standard deviation of age was 71.46 ± 8.55 . Eighty four percent of senior citizens were Hindu and 59.4% of them were lived with their spouse.

Similarly, 11.1% respondents had completed SLC or higher level education while 57.5% of them were illiterate. Also, 68.6% respondents lived in joint family and only 63.1% respondents were involved in family decision making (Table 1).

Table 1: Baseline Characteristics and Life Satisfaction (N=325)

Characteristics	Life Satisfaction		Total	χ ²	P-value
	Satisfied Frequency (%)	Not Satisfied Frequency (%)			
Age Group					
Age below 70	89(52.4)	81(47.6)	170	4.974	0.02*
Age above 70	62(40.0)	93(60.0)	155		
Mean ± SD (71.46±8.55)					
Range (60-95 years)					
Sex					
Female	79(41.4)	112(58.6)	191	4.844	0.28
Male	72(53.7)	62(46.3)	134		
Education					
Illiterate	70 (37.4)	117 (62.6)	187	14.431	0.001*
Literate	81 (58.7)	57 (41.3)	138		
Marriage					
Living with partner	98(50.8)	95(49.2)	193	3.558	0.05*
No Partner	53(40.2)	79(59.8)	132		
Types of Family					
Nuclear	37(47.4)	41(52.6)	78	0.040	0.98
Joint	103(46.2)	120(53.8)	223		
Extended	11(45.8)	13(54.2)	24		

* Statistically significant

Economical and health related information of male and female respondents was shown in Table 2. Fifty-three percent of the male respondents were financially independent, whereas 52.4% female respondents partially depend on family members. Allowances are the present income source of 50.0% male respondents as well as 68.0% female respondents. Out of 325, 83.69% respondents had problems in health and major problem is related to sensory.

Table 2: Economical and health related information

Variables	Male n=134(%)	Female n=191(%)
Manage Expenses		
Independent	71(53.0)	74(38.7)
Partially dependent	57(42.5)	100 (52.4)
Fully dependent	6(4.5)	17(8.9)
Present Income source*		
Allowances	67(50.0)	130(68.1)
House Rent/Business	28(20.8)	13(6.2)
Agriculture	24(17.9)	17(8.9)
Daily wages	6(4.5)	6(3.1)
Others	23(17.1)	12 (6.3)
Problem in body system*		
Suffering from health problems	104 (77.6)	168 (88.0)
Vision Problem	73(54.5)	133(69.7)
Cardiovascular	55(41.0)	84(44.0)
Orthopedic	40(29.9)	85(44.5)
Endocrine	24(17.9)	21(11.0)
Respiratory	23(17.2)	55(28.8)
Digestive	22(16.4)	67(35.1)
Urinary/Reproductive	11(8.2)	29(15.2)
Nervous	3(2.2)	16(8.4)

*Multiple Responses

Among different dimensions of LS (Table 3), the mean value of mood tone is found to be higher as compared with other dimensions with SD of 7.63 following resolution and fortitude. After computing all dimension of life satisfaction, 46.5% respondents were satisfied with their life (133.37 ± 5.83) which is low compare to LSTIA mean score.

Table 3: Life satisfaction and its dimensions

Domain of Life Satisfaction	Satisfied Frequency (%)	Not Satisfied Frequency (%)	Mean ± SD Senior Citizens	Mean ±SD LSTIA
Zest vs. Apathy	165 (50.8)	160 (49.2)	25.45 ± 5.83	30.5 ± 5.2
Resolution & Fortitude	139 (42.8)	186 (57.2)	31.08± 6.19	39.4 ± 4.8
Congruence between desired and Achieved goals	142 (43.7)	183 (56.3)	18.73± 4.41	22.2 ± 3.0
Positive self-concept	126 (38.8)	199 (61.2)	14.68 ± 3.49	25.2 ± 3.3
Mood Tone	150 (46.2)	175 (53.8)	35.94 ± 7.63	32.9 ± 6.3
Total score of Life Satisfaction	151 (46.5)	174 (53.5)	133.37± 21.85	151.0 ±19.5

Keeping remaining variables as constant, the total LS among the respondents who do not have pension were less likely (OR= 0.464, CI= 0.215, 0.923) satisfied as compared to the respondents who have pension. Regarding the daily expenditure, the life satisfaction is 2.37 times higher to the respondents who have sufficient money for expenditure then the respondents who do not have sufficient money (OR=2.370, CI=1.362, 4.123). Likewise, the total life satisfaction among the respondents whose family income was more than 10,000 were about 4.39 times more likely satisfied as compared to the respondents whose family income was less than 10,000 per month (OR=4.391, CI=2.019, 9.551).The respondents who have a role in family decision were about 2 times more likely satisfied than the respondents who do not have role in family decision (OR= 2.001, CI= 1.055, 3.793). Regarding the state of health, senior citizens who have problems in health is 0.446 times less likely satisfied as compared to the respondents who do not have problem in health (OR= 0.464, CI=0.215, 0.923). Therefore, this table shows that economical condition, role in decision making and state of the health are the main determinants of life satisfaction (Table 4).

Table 4: Odds ratios from binary logistic regression of life satisfaction among Senior citizens (N=325)

Respondents characteristics	Odds Ratio (β)	95% Confidence Interval (Lower, Upper)	p-value
Present source of Income (Pension)			
No (ref.)	1		
Yes	0.482	0.248, 0.935	0.03*
Daily Expenditure			
Insufficient (ref.)	1		
Sufficient	2.370	1.362, 4.123	0.001*
Family Income/Month			

Less than 10,000(ref.)	1		0.001*
More than 10,000	4.391	2.019, 9.551	
Role in Family Decision Making			
No (ref.)	1		0.03*
Yes	2.001	1.055, 3.793	
Suffering Diseases			
Yes (ref.)	1		0.02*
No	0.446	0.215, 0.923	

*Statistically significant

DISCUSSION

The changing demographic pattern is the new challenges to the world for improving wellbeing of senior citizens. Although, the burden of worsening life satisfaction was significantly higher in low socioeconomic groups, but financial growth isn't simplest the answer for enhancing existence satisfaction.¹²

In this study, 46.5% of senior citizens were satisfied with their lives. Consistent findings were reported by the study of Chehregosha et al.⁶ In regards to financial state, statistically significant association was observed in family income and financial independence with life satisfaction which was similar in the study done in India.¹⁰ There are various factors which directly or indirectly affect on life satisfaction of elderly. Physical conditions, demographic factors, role in family, economic status and so on have influence on life satisfaction. Therefore, it is difficult to interpret the differences between different levels of life satisfaction in various communities.

In terms of dimensions of LSITA, this study pertained highest and lowest mean scores on zest verses apathy (25.45±5.83) and the positive self-concept (14.68±3.49) subscales, in respective order. Similarly, study conducted at India also obtained highest mean score on domain of resolution and fortitude (6.1±2.5) and lowest score on positive self-concept (3.1±1.2).⁶ In the present study, family income, economical independency and sufficient money for expenditure are the determinant factors for life satisfaction which is consistent with the findings of the Loewe et al.^{7,13} This study also suggests higher level of education to be an influential factor for determining the life satisfaction because higher level of education develop a feeling of efficiency, economic independence and more realistic outlook on life processes among senior citizens. Like the current findings, Ghimire et al.⁷ revealed that the married participants were significantly more satisfied with their life than those who were living alone. Conversely, participants living in a nuclear family are significantly more satisfied than those living in a joint family.

Aging is accompanied by different changes in the body systems, reduced levels of activity and performance as

well as the emergence of diseases, which can influence the overall satisfaction with life for the elderly. This study also shows that people who are suffering from diseases are less likely satisfied than people who do not have disease. In United States 5.6% adults were dissatisfied with their life. As the level of life satisfaction decreased, the prevalence of getting poor health increases. The prevalence of smoking, obesity, physical inactivity, and heavy alcohol consumption have also decreased life satisfaction.¹⁴ Therefore, the Nepal government needs to address the issues of aging through advocacy and sensitization at local and national levels by launching a national public information campaign. As well as, authority body need to strengthen the existing program by finding a probable solution to the problems faced by seniors. This study is a cross sectional study, therefore results may change over time.

CONCLUSIONS

The life satisfaction among senior citizens in Pokhara metropolitan city was low. Financial state, state of health and role in family decision making are the main determinant factors of life satisfaction. Therefore, the authority body needs to develop proper old age policies to resolute the socio-economic problems of the senior citizens to make them feel part of society and improve their life satisfaction. To address effectively to the problem faced by senior citizens more scientific studies are required.

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REFERENCES

1. Acharya P. Senior Citizens and the Elderly Homes: A Survey from Kathmandu. Dhaulagiri. Journal of Sociology and Anthropology. 2008;2:211-226. DOI: 10.3126/dsaj.v2i0.1365

2. Nepal Law Commission. Senior citizens act, 2063. www.lawcommission.gov.np
3. Enkvist Å, Ekström H, Elmståhl S. What factors affect life satisfaction (LS) among the oldest-old?. *Arch Gerontol Geriatr.* 2012;54(1):140–5. DOI: 10.1016/j.archger.2011.03.013 PMID: 21555158.
4. Papi S, Cheraghi M. Multiple factors associated with life satisfaction in older adults. *PrzMenopauzalny.* 2021;20(2):65–71. DOI:10.5114/pm.2021.107025 PMID: 34321983.
5. Shrestha Mk, Adhikari RD, Ranjitkar UD, Chand A. Life satisfaction among senior citizens in a community of Kathmandu, Nepal. *J Gerontol Geriatr Res.* 2019;8(2):2–5. DOI:10.4172/2167-7182.1000500
6. Chehregosha M, Bastaminia A, Vahidian F, Mohammadi A, Aghaeinejad A, Jamshidi E, et al. Life Satisfaction Index among elderly people residing in Gorgan and its correlation with certain demographic factors in 2013. *Glob J Health Sci.* 2015;8(8):41. DOI:10.5539/gjhs.v8n8p41 PMID: 27045397.
7. Ghimire S, Baral BK, Karmacharya I, Callahan K, Mishra SR. Life satisfaction among elderly patients in Nepal: Associations with nutritional and mental well-being. *Health Qual Life Outcomes.* 2018;16(1):118. DOI: 10.1186/s12955-018-0947-2 PMID: 29880002.
8. Krug EG, Mercy JA, Dahlberg LL, Zwi AB. The world report on violence and health. *Lancet.* 2022;360(9339):1083–8. DOI: 10.1016/S0140-6736(02)11133-0 PMID: 12384003.
9. Israel GD. Determining sample size. 1992:1–5. Available from: <https://www.tarleton.edu/academicassessment/documents/samplesize.pdf>
10. Nations U. Designing household survey samples: Practical guidelines. *Studies in Methods Series F.* 2005;98.
11. Barrett AJ, Dudka MG. Life Satisfaction Index for the Third Age (LSITA)-Short Form: An improved and Briefer Measures of Successful Aging. 2009. DOI: 10.13140/2.1.1937.4085
12. Ng ST, Tey NP, Asadullah MN. What matters for life satisfaction among the oldest-old? Evidence from China. *PloSOne.* 2017;12(2):e0171799. DOI: 10.1371/journal.pone.0171799 PMID: 28187153.
13. Loewe N, Bagherzadeh M, Araya-Castillo L, Thieme C, Batista-Foguet JM. Life domain satisfactions as predictors of overall life satisfaction among workers: Evidence from Chile. *Soc Indic Res.* 2014;118(1):71–86. DOI: 10.1007/s11205-013-0408-6 PMID: 25018580.
14. Strine TW, Chapman DP, Balluz LS, Moriarty DG, Mokdad AH. The associations between life satisfaction and health-related quality of life, chronic illness, and health behaviors among U.S. community-dwelling adults. *J Community Health.* 2008;33(1):40–50. DOI: 10.1007/s10900-007-9066-4 PMID: 18080207.

Knowledge, attitude and practice towards COVID-19 among pregnant women in a tertiary hospital in Pokhara, Nepal

Benju Nepal*¹, Bibekti Nepal², Bandana Gurung Sharma¹,
Chandika Pandit¹, Rajju Hachhethu¹

¹Department of Obstetrics and Gynecology, Gandaki Medical College, Pokhara, ²Department of Public Health, Central Institute of Science and Technology, Pokhara University, Nepal

ABSTRACT

Introduction: The study was done to find out the knowledge, attitude, and practice of pregnant women towards COVID-19 in tertiary hospital of Pokhara, Nepal. **Methods:** A descriptive cross-sectional study was carried out among 385 pregnant women attending antenatal clinics of Gandaki Medical College starting from May 2021 to July 2021, by using self-administered questionnaire. The data was analyzed using statistical package for the social sciences version 21.0 and descriptive statistics were computed. **Results:** More than four-fifths respondents were aware about COVID-19. Half of them thought it transmits via human touch. One-fourth of them mentioned that delivery at the hospital during COVID-19 pandemic was unsafe. Almost half of them regretted conceiving, among which one quarter thought of aborting their fetus, half of them were against breastfeeding, and three-fourth had regular antenatal care checkups. Majority of them took precautions to stay safe, where half of them responded that they would not breast feed baby if they got infected. **Conclusions:** Majority of the study population have good knowledge, attitude, and practice of COVID-19 disease. However, it is worrisome that some respondents thought of terminating her pregnancy, and some were unable to visit the hospital for routine antenatal care checkups and didn't have proper knowledge about breastfeeding their child. Proper education must be given to the population to avert these negative attitudes while promoting a positive preventive attitude.

Keywords: Attitude, COVID-19, knowledge, practice.

*Correspondence:

Dr. Benju Nepal
Department of Obstetrics and Gynecology
Gandaki Medical College Teaching Hospital
and Research Center, Pokhara
Email: benzunepal@gmail.com
ORCID iD: <https://orcid.org/0000-0001-5722-4222>account_circle

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INTRODUCTION

The coronavirus (COVID-19) infection is a unique, infectious disease caused by novel coronavirus-2 (SARS-CoV-2). The outbreak first occurred in Wuhan, China in December 2019.¹ COVID-19 is still a public health problem of global concern.² The number is expected to increase with lots of consequences if immediate action is not taken. Accordingly, patients infected with COVID-19 would experience conditions ranging from a common cold to severe acute respiratory failure.³ The cure for COVID-19 remains elusive, but tremendous efforts have been made by scientists towards the development of drugs or vaccines for its curtailment.⁴ Currently, therapeutic management is mainly supportive with great emphasis being placed on the prevention of transmission of the virus.² Everybody is at risk of becoming infected; however, an immunocompromised state, as seen in pregnancy with its physiological changes, could predispose a pregnant woman to increased risk of SARS-COV-2 infection.⁵ The cytokine storm that occurs in COVID-19 infection is likely to predispose a pregnant woman with COVID-19 to increased morbidity and even mortality. Vertical transmission of the virus is yet to be confirmed.⁶ Till date, there is no evidence of fetomaternal transmission of the disease.⁷

During pregnancy, women are extremely apprehensive and anxious about their progress.⁸ Fear and anxiety associated with infection could lead to increased demand for abortion and operative deliveries.⁶ With the above background, it becomes imperative that great efforts should be made to prevent pregnant women and their fetuses from the scourge of COVID-19. WHO has recommended a series of preventive measures to halt the spread of the disease which to some extent has been adopted by the government. These measures' success is mainly dependent on the population having a good knowledge of them.⁶

Adherence to preventive measures by the people is crucial for the control of spread, which is mainly affected by their knowledge, attitudes, and practices (KAP) toward COVID-19.⁹ Moreover, knowledge and attitude can play critical roles in the prevention of infectious diseases.¹⁰ This can only be achieved if a woman is knowledgeable about how to prevent contracting the virus and its transmission to her family and others.² The objective of the study was to find the knowledge, attitude and practice towards COVID-19 among pregnant women in Gandaki Medical College, Pokhara.

METHODS

A descriptive cross-sectional study was conducted in the Department of Obstetrics and Gynecology, Gandaki Medical College and Teaching Hospital, Pokhara, Nepal. The research was conducted at Department of Obstetrics and Gynecology, Gandaki Medical College and Teaching Hospital, Pokhara, Nepal. The duration of data collection was three months. This hospital has maximum number of the tertiary health care services. The department has the facilities and provided the support needed for this research. The principal investigator conducted the study while pursuing her residency in Gandaki Medical College and was involved in all steps from the start till the end. The total numbers of sample size was 385. The sampling method used was convenience sampling. It nearly took three months of time period to complete the data collection procedure. The ethical clearance letter was obtained from GMC Institutional Review Committee (Reference number 93/77/78). Informed consent was obtained from each respondents before data collection. All pregnant women' visiting the outpatient department, giving the consent was taken for the study. Pregnant women who were in labor and those who refused to give consent were excluded. Self-administered questionnaire was prepared. They were interviewed by resident doctors in the Department of Obstetrics and Gynecology who were trained to administer the questionnaires. The answers were filled up in the self-

administered questionnaire form.

The procedure of pretesting was conducted in OPD ward of Obstetrics and gynecology department at Western Regional hospital among 10 respondents which is almost 2%. After pretesting, the necessary modifications were done in the tool. Validity: a) Questionnaire translation into nepali was made to avoid wrong interpretation. b) Same day verification of questionnaire was done for completeness and consistency.

Reliability: Participants were clearly informed about the purpose of the study to minimize information bias.

Dependent variables included age, occupation, religion, gestational age, number of children, trimester. Independent variables included modes of transmission, clinical symptoms, treatment, risk groups, isolation, prevention and control. Variables were age, occupation, religion, and gestational age, number of children, modes of transmission, clinical symptoms, treatment, risk groups, isolation, prevention, and control. Face masks were provided to the study population during the process of data collection, and each of the researchers wore a face mask. Total 30 questions were provided with multiple options. Participants were allowed to choose multiple options and if they chose multiple options analysis of data was done with consideration of response frequency. Microsoft excel was used to enter data and statistical package for the social sciences (SPSS) version 21.0 was used for analysis. Descriptive statistics, especially frequency and percentage were used to find the status of the knowledge, attitude and practices.

RESULTS

Total 385 participants were enrolled in the study. The distribution of age group comprised reproductive aged women ranging between 16 to 40 years. Maximum respondents were between the age group of 30 to 35 years. Total of 328(85%) participants studied higher secondary and above higher secondary. The occupation of mothers comprised 271(70%) housewife. Total of 303(79%) follow hinduism. Almost 40% were on their first trimester, like the same percentage on the second trimester and the remaining 20% on the third trimester (Table 1).

Table 1: Socio-demographic characteristics of the study population

Variables	Frequency(N=385)	Percentage (%)
Level of Education		
Literate	21	5.5
Lower Secondary	36	9.4
Higher Secondary	170	44.2

Above Higher Secondary	158	41.0
Religion		
Hinduism	303	78.7
Buddhism	45	11.7
Christianity	28	11.9
Others	10	2.6
Occupation		
Housewife	271	70.4
Civil Servant	34	8.8
Public Servant	31	8.1
Businesswoman	49	12.7

Total of 313(81.3%) were aware of what COVID-19 was, 10.6 are somewhat familiar, and the rest 8.1% were still unaware of what COVID-19 was. Around 65% heard from television (TV), radio, 35.3% heard from newspaper, internet, 13% heard via friends and 11.4% heard from health personnel. Almost 72.5% thought it transmits via human touch, 4.7% thought it transmits via animals, 32.5% thought it transmits via air, and only 2.6% thought it transmits via water. Almost 78.4% thought that symptoms can be common cold and fever, while 9.9% and 33% think that symptoms can be diarrhea and headache respectively. Likewise, 72.2% were somewhat aware of the treatment of COVID-19, 16.1% were clear on the treatment, and 11.7% were still unaware of how it's treated (Table 2).

Table 2: Knowledge of pregnant women regarding COVID-19

Variables	Frequency(N=385)	Percentage (%)
Heard about COVID-19		
Yes	313	81.3
Somewhat	41	10.6
No	31	8.1
Sources of Information		
TV, radio	251	65.2
Newspaper, internet	136	35.3
Friends	50	13
Health personnels	44	11.4
Mode of transmission		
Air	125	32.5
Water	10	2.6
Human touch	279	72.5
Animals	18	4.7
Symptoms of COVID-19		
Common Cold/Flu	302	78.4
Cough/fever	244	63.4
Headache	127	33.0
Diarrhoea	38	9.9
Treatment of COVID-19		
Somewhat	278	72.2
Clear	62	16.1
No idea	45	11.7

About 43% had no idea that COVID-19 can transmit from mother to fetus while 31% thought that it could transmit to fetus also and 24% said that there was no transmission to the fetus. About 57.9% participants did not regret at all,

32.2% were the participants who somehow regretted, and 9.9% extremely regretted to have conceived at this period of the pandemic. 17.4% thought about aborting during this pandemic. Almost 82.6% never had a thought about it. 86.8% expressed they wouldn't be safe if exposed in the crowd, 9.4% still thought it was safer to be in the crowd and remaining 3.9% didn't know if it was safe or not. In total, 62.6% didn't think it was safer for pregnant women to be treated at home, 20.6% thought it was safer for them to be treated at home, and 17.1% were still unaware. Almost 46.5% participants are somewhat satisfied, 45.5% were satisfied, 4.9% were not satisfied and 3.1% were not at all satisfied. About 88.8% said it was necessary to provide health education to mothers, 8.8% did not think it was necessary and 2.3% didn't know what to do. Likewise, 40% participants thought delivery in the hospital was safer, whereas 26.5% didn't think it was safe and rest 33.5% didn't know if it was safer or not (Table 3).

Table 3: Attitude of pregnant women regarding COVID-19

Variables	Frequency (N=385)	Percentage (%)
Regret of Conceiving during Pandemic		
Somewhat	124	32.2
More	38	9.9
No	223	57.9
Intuition of abortion during pandemic		
Yes	67	17.4
No	318	82.6
Pregnant women safer when exposed to crowd		
Yes	36	9.4
No	334	86.8
Don't Know	15	15
Treating pregnant women at home		
Yes	78	20.3
No	241	62.6
Don't Know	66	17.1
Necessity of Health education to women		
Yes	342	88.8
No	34	8.8
Don't Know	9	2.3
Satisfied with the precautions taken		
Somewhat	179	46.5
Satisfied	175	45.5
No	19	4.9
Not at all	12	3.1
Is Delivery in the hospital safe		
Yes	154	40.0
No	102	26.5
Don't Know	129	33.5

Around 47.5% said she won't breastfeed if she got infected, 20% said she would and 31.9% were still unaware of it. Almost 86.5% washed their hands regularly, 8.3% washed their hands sometimes, and 5.2% didn't wash hand frequently. In total, 38.7% did not have to go to crowd. Around 51.9% had to be in the crowd sometimes. 9.4%

had been regularly exposed to crowd.

Around 72.7% said their different behavior in people for conceiving during the COVID-19 pandemic, while 18.7% said there was somewhat difference in people’s behavior and 8.6% said there was totally different behavior after she conceived. About 53.2% always maintained the social distance during corona pandemic, 41.8% couldn’t maintain social distance and 4.9% did not maintain at all. Altogether, 81.6% regularly visited whereas 18.4% weren’t regular for the antenatal visit. 89.9% were consuming additional balanced diet where as 10.1% didn’t (Table 4).

Table 4: Practice of pregnant women regarding COVID-19

Variables	Frequency (N=385)	Percentage (%)
Precautions taken to stay safe		
Wearing mask	102	26.5
Wash hand frequently by soap	130	33.8
Maintaining social distance	116	30.1
Don't go to crowd	151	39.2
Breastfeed child after being infected with COVID-19		
Yes	79	20.5
No	183	47.5
Don't Know	123	32
Use of masks		
No	20	5.2
Sometimes	32	8.3
Regularly	333	86.5
Maintenance of social distance		
Yes, Always	205	53.2
Sometimes	161	41.8
No	19	4.9
Frequent handwashing		
No	20	5.2
Sometimes	32	8.3
Regularly	333	86.5
Exposed in crowd		
No	149	38.7
Sometimes	200	51.9
Regularly	36	9.4
Regular Antenatal Check up		
Yes	314	81.6
No	71	18.4
Additional balanced diet to fight COVID-19		
Yes	346	89.9
No	39	10.1

DISCUSSION

COVID-19 infection is still a public health problem in Nepal, adequate knowledge among the population is essential for its effective management. It has been demonstrated that adequate knowledge is a prerequisite for the establishment of preventive belief, forming a positive attitude, and promoting of positive practice to disease.¹¹ Although the influence of COVID-19 infection in pregnancy is yet to be fully established, the distinctive immunological

suppression during pregnancy may cause a detrimental effect on maternal and perinatal outcomes. Little is known regarding the current awareness for COVID-19 among pregnant women.¹² Like few KAP surveys conducted in India and other parts of the globe, our survey also revealed adequate levels of KAP, and good practices to prevent the spread of COVID-19 infection,¹³ except few concepts where awareness is required.

In two studies done in China and Europe, participants were more apprehensive regarding the transmission of the infection to the fetus (feto–maternal transmission) and its effect on the newborn, the safety of breastfeeding practices if infected with COVID-19, and the increased risk of abortion during this COVID-19 pandemic^{14 15} which is similar in this study. In this study, 41% of participants were qualified above the higher secondary level which is satisfactory for better maternal and child health. Most of the participants are housewives; very few are engaged in civil, public jobs, and business. About 18% of participants were still unaware of COVID-19 which requires immediate concern for the reason lagging behind. Almost 65% were aware about COVID-19 via television and radio. Likewise, the health personnel and friends also played a vital role in awareness of two-third participants which is acknowledgeable.

From this study, it showed that the participants were clear of how corona virus transmits. Most of the participants thought coronavirus transmits via air and human touch. However some of them still thought transmits via water and animals along with the minority being unaware of any of the symptoms.¹⁶ According to some studies, virus could be transmitted from human to human by droplets and contact.¹⁷ Several reports have suggested that symptomatic people are the most frequent source of COVID-19 spread. It primarily spreads between people through respiratory droplets by coughing or sneezing from an infected individual.⁷ Moreover, there are suggestions that individuals who remain asymptomatic could transmit the virus.⁵ The concerned authority should be focused on giving adequate knowledge about transmission so that people can take proper of participants were still unaware that COVID-19 can be asymptomatic, which prioritizes the need for the lacking awareness. But participants were aware of the symptoms of COVID-19. Around 78% of them said common cold and fever as main symptoms. In this study, 32% participants somewhat regretted to have conceived at this period of the pandemic, 9.9% completely regretted conceiving. About 17% of the participants had their intuition about abortion. There are findings that mothers are worried about catching the virus, transmitting it to their newborn and keeping

their child safe during infancy. It seems unlikely, however, that a developing fetus can get COVID-19 from its infected mother.¹⁸ COVID-19 needs a receptor molecule to cause infection. A recent study suggests the placenta contains very low levels of the molecules needed to create the receptor. This finding may explain why the virus is rarely found in newborns with COVID-19-positive mothers.¹⁸ To make stress tolerable, adequate social support, access to supportive resources and economic stability and knowledge about feto-maternal transmission are necessary. The level of awareness and health services delivered. Health propaganda equally plays a role in misconception and the way participants were feeling regarding conceiving and aborting.

Few participants were unaware if it's okay to be in a crowd likewise 9.4% were completely okay being in the crowd, 86% were clear on social distancing. Guidelines recommend at least six feet away from others outside your household.¹⁹ Half of the participants were socially distancing strictly and the remaining were not. They should have been educated about social distancing also. One-fourth wanted their services to be delivered at home whereas more than half wanted to visit on their own for services, few were still unaware. Around 40% of participants were okay delivering at a hospital, 26% wanted to deliver at home if the provision provided. Delivering a baby is always safest under the care of trained healthcare professionals.¹⁹ Therefore, local authorities should take responsibility to promote about the safety of both mother and child and provide the access towards safe Delivery under the supervision of healthcare professionals during their antenatal care (ANC) checkup on advance. About one-tenth of the population still think health education is not important for women. Almost 45.5% of the participants were satisfied with the precautions taken by them, whereas half of them were somewhat satisfied except a few who were not satisfied at all.

Around one-fourth (26%) of participants were treated with different behavior after conceiving during the COVID-19 pandemic. Prenatal anxiety, which may affect pregnancy outcomes, should be considered carefully.²⁰ Social stigma also should be reduced at the community level for the betterment of both maternal and fetal health.

Total of 47.5% said they won't breastfed their child if she gets infected with COVID-19, 31.9% were not aware of the role of breast milk in the transmission of COVID-19. Probably, this might be due to inadequate information circulated through various sources as seen in similar study.²¹ Current evidence suggests that breast milk is not likely to spread the virus to babies.¹⁹ They should be made

aware that Breast milk provides protection against many illnesses and is the best source of nutrition for most babies. Although four-fifth were aware of COVID-19, only one-third were taking precautions to stay safe, and one-seventh still don't use any precaution on a regular basis. This also highlights carelessness from the participants. Besides the hand washing, wearing a mask is practiced regularly by almost six-seventh participants like similar study.²² They should be taught to wash their hands with soap and water for at least 20 seconds. If soap and water are not available, use a hand sanitizer with at least 60% alcohol.¹⁹ Total of 18.5% participants were not able to visit for regular ANC checkups. Almost nine-tenth of the participants was able to afford additional diets whereas one-tenth was not able to afford additional diets during this period of the pandemic.

CONCLUSIONS

Majority of the study population has good knowledge, attitude, and practice of COVID-19 disease. However, it is worrisome that some respondents thought of terminating her pregnancy, and some were unable to visit the hospital for routine ANC checkup and didn't have knowledge about breastfeeding their child. Proper education must be given to the population to avert these negative attitudes while promoting a positive preventive attitude.

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CONFLICTS OF INTEREST: None

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REFERENCES

1. Wu F, Zhao S, Yu B, Chen YM, Wang W, Song ZG, et al. A new coronavirus associated with human respiratory disease in China. *Nature*. 2020;579(7798):265-9. DOI: 10.1038/s41586-020-2008-3 PMID: 32015508.
2. Anikwe CC, Ogah CO, Anikwe IH, Okorochukwu BC, Ikeoha CC. Coronavirus disease 2019: Knowledge, attitude, and practice of pregnant women in a tertiary hospital in Abakaliki, southeast Nigeria. *Int J Gynaecol Obstet*. 2020;151(2):197-202. DOI: 10.1002/ijgo.13293 PMID: 32608513.
3. Rasmussen SA, Kelley CF, Horton JP, Jamieson DJ. Coronavirus Disease 2019 (COVID-19) Vaccines and Pregnancy: What Obstetricians Need to Know. *Obstet Gynecol*. 2021;137(3):408-14. DOI:10.1097/

- AOG.0000000000004290 PMID:33370015.
4. Mullard A. COVID-19 vaccine development pipeline gears up. *Lancet*. 2020;395(10239):1751-2. DOI: 10.1016/S0140-6736(20)3252-6 PMID: 32505245.
 5. Zhao X, Jiang Y, Zhao Y, Xi H, Liu C, Qu F, et al. Analysis of the susceptibility to COVID-19 in pregnancy and recommendations on potential drug screening. *Eur J Clin Microbiol Infect Dis*. 2020;39(7):1209-20. DOI: 10.1007/s10096-020-03897-6 PMID: 32328850.
 6. Luo Y, Yin K. Management of pregnant women infected with COVID-19. *The Lancet Infect Dis*. 2020;20(5):513-4. DOI: 10.1016/S1473-3099(20)30191-2 PMID: 32220285.
 7. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *J Autoimmun*. 2020; 109:102433. DOI: 10.1016/j.jaut.2020.102433 PMID: 32113704.
 8. Liu X, Chen M, Wang Y, Sun L, Zhang J, Shi Y, et al. Prenatal anxiety and obstetric decisions among pregnant women in Wuhan and Chongqing during the COVID-19 outbreak: a cross-sectional study. *BJOG*. 2020;127(10):1229–1240. DOI: 10.1016/j.jaut.2020.102433 PMID: 32113704.
 9. Ajilore K, Atakiti I, Onyenankeya K. College students' knowledge, attitudes and adherence to public service announcements on Ebola in Nigeria: Suggestions for improving future Ebola prevention education programmes. *Health Education Journal*. 2017;76(6):648-60. DOI: 10.1177/0017896917710969
 10. Swaddiwudhipong W, Lerdlukanavong P, Khumklam P, Koonchote S, Nguntra P, Chaovakiratipong C. A survey of knowledge, attitude and practice of the prevention of dengue hemorrhagic fever in an urban community of Thailand. *Southeast Asian journal of tropical medicine and public health*. 1992;23(2):207-11. PMID: 1439972.
 11. Gao J, Tian Z, Yang X. Breakthrough: Chloroquine phosphate has shown apparent efficacy in treatment of COVID-19 associated pneumonia in clinical studies. *Bioscience trends*. 2020;14(1):72-3. DOI: 10.5582/bst.2020.01047 PMID: 32074550.
 12. Nwafor JI, Aniuoku JK, Anozie BO, Ikeotuonye AC, Okedo-Alex IN. Pregnant women's knowledge and practice of preventive measures against COVID-19 in a low-resource African setting. *Int J Gynaecol Obstet*. 2020;150(1):121-3. DOI: 10.1002/ijgo.13186 PMID: 32342500.
 13. Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT, et al. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. *Int J Biol Sci*. 2020;16(10):1745-52. DOI: 10.7150/ijbs.45221 PMID: 32226294.
 14. Huang Y, Zhao N. Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 outbreak in China: a web-based cross-sectional survey. *Psychiatry Res*. 2020;288:112954. DOI: 10.1016/j.psychres.2020.112954 PMID: 32325383.
 15. Durankus F, Aksu E. Effects of the COVID-19 pandemic on anxiety and depressive symptoms in pregnant women: a preliminary study. *J Matern Fetal Neonatal Med*. 2022;35(2):205-211. DOI: 10.1080/14767058.2020.1763946 PMID: 32419558.
 16. Janjua NZ, Razaq M, Chandir S, Rozi S, Mahmood B. Poor knowledge-Predictor of non-adherence to universal precautions for blood borne pathogens at first level care facilities in Pakistan. *BMC Infect Dis*. 2007;7:81. DOI: 10.1186/1471-2334-7-81. PMID: 17650331.
 17. Han Y, Yang H. The transmission and diagnosis of 2019 novel coronavirus infection disease (COVID-19): A Chinese perspective. *J Med Virol*. 2020;92(6):639-44. DOI: 10.1002/jmv.25749 PMID: 3214161.
 18. Pique-Regi R, Romero R, Tarca AL, Luca F, Xu Y, Alazizi A, et al. Does the human placenta express the canonical cell entry mediators for SARS-CoV-2? *Elife*. 2020;9:e58716. DOI: 10.7554/eLife.58716 PMID: 32662421.
 19. CDC. Centers for Disease Control and Prevention. Pregnancy and Breastfeeding: Information about Coronavirus Disease.
 20. Dunkel Schetter C, Tanner L. Anxiety, depression and stress in pregnancy: implications for mothers, children, research, and practice. *Curr Opin Psychiatry*. 2012;25(2):141-8. DOI: 10.1097/YCO.0b013e3283503680 PMID: 22262028.
 21. Kamal D, Thakur VD, Swain SK, Vikneshram CR. Knowledge, attitude, and practice toward COVID-19 among pregnant women in a tertiary care hospital during the COVID-19 outbreak. *J Mar Med Soc*. 2020;22(3):66-71. DOI: 10.4103/jmms.jmms_81_20

22. Srichan P, Apidechkul T, Tamornpark R, Yeemard F, Khunthason S, Kitchanapaiboon S, et al. Knowledge, attitudes and preparedness to respond to COVID-19 among the border population of northern Thailand in the early period of the pandemic: A cross-sectional study. *WHO South East Asia J Public Health*. 2020;9(2):118-25. DOI: 10.4103/2224-3151.294305 PMID: 32978344.

Assessment of root and root canal morphology of mandibular premolars using cone beam computed tomography in a tertiary center of Nepal

Shikha Bantawa*¹, Deepa Niroula², Sirjana Dahal³, Reema Joshi Pradhan¹, Asha Thapa¹,
Reetu Shrestha¹, Santosh Kumari Agrawal⁴

¹Department of Conservative Dentistry and Endodontics, National Academy of Medical Sciences, Bir Hospital, Kathmandu, Nepal,

²Department of Oral Medicine and Radiology Institute of Medicine, Maharajgunj, Nepal, ³Department of Public Health Dentistry, Institute of Medicine, Maharajgunj, Nepal, ⁴Department of Public Health Dentistry, B.P. Koirala Institute of Health Sciences, Dharan, Nepal

ABSTRACT

Introduction: Mandibular premolars are considered an enigma in dentistry because of their variability in anatomical and morphological features making it difficult to treat endodontically. This study was conducted to determine the root and canal morphology of mandibular premolars in the Nepalese population by using cone beam computed tomography imaging. **Methods:** One hundred and thirty-four cone beam computed tomography images of the Nepalese population were collected by convenience sampling method from April 1 to August 31, 2022 in Bir Hospital, Kathmandu, Nepal. A total of 536 premolars (268 mandibular first premolars and 268 mandibular second premolars) were evaluated by two examiners (one endodontist and one oral radiologist). Canal configuration was classified according to Vertucci's classification. **Results:** In mandibular premolar teeth, the majority had one root followed by two roots and fused roots. The most common configuration in mandibular premolars was Vertucci's type I (83.88% and 96.65% in the first and second premolar respectively) followed by type V (9.89%) in the first premolar and type III (1.86%) in the second premolar. Vertucci's type VII (0.37%), C-shaped configuration (1.46%), and an unusual configuration (0.37%) were observed in the first premolar. In mandibular first premolars, males showed more variation than females; while in second premolars, females showed more variation than males. **Conclusions:** Mandibular premolar teeth showed variation in root and canal morphology with one root and Vertucci's type I in the majority of the cases.

Keywords: Cone beam computed tomography, mandibular premolars, Nepalese population, root canal morphology, Vertucci's root canal configuration.

*Correspondence:

Dr. Shikha Bantawa
Department of Conservative Dentistry and Endodontics
National Academy of Medical Sciences
Bir Hospital, Kathmandu, Nepal
Email: candleshikha@gmail.com
ORCID iD: <https://orcid.org/0000-0001-6633-5346>

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INTRODUCTION

For the success of endodontic treatment, the knowledge of common root canal morphology and its anatomic variations is a basic requirement.¹ Thorough debridement, proper cleaning, shaping, and obturation of the root canals achieving a three-dimensional seal is the ultimate goal of endodontic treatment. Missed root canals may leave areas of infection untouched leading to failure of endodontic treatment. Therefore it is of utmost importance to know the common root canal morphology as well as the anticipation of its possible variations.²

Mandibular premolars are considered an enigma of endodontics due to their variation in the number of canals and roots.³ Thus, these teeth have a high rate of failure after root canal treatment.⁴ To study the canal morphology, different study designs (in vivo and ex vivo) and different techniques (staining and clearing,⁵ transverse cross-sectioning,⁶ conventional periapical radiography,⁷ and micro-computed tomographic imaging,⁸ a contrast medium-

enhanced digital radiography,⁹ and cone-beam computed tomographic (CBCT) imaging¹⁰ have been used. In a clinical setting, the most commonly used method for evaluating root canal morphology is periapical radiography taken at different angulations. However, it provides only two-dimensional images and may lead to the superimposition of structures and image distortion. CBCT scanning producing 3D scan is more accurate than conventional radiographs in determining root canal system.¹⁰

We can find several studies conducted in different populations including Egyptian,⁶ Iranian,¹¹ South Indian,¹² Saudi,¹³ Bangladeshi,¹⁴ Taiwanese,¹⁵ Kuwaiti,¹⁶ and Chinese.¹⁷ However, we found very few studies on the root and canal morphology of mandibular premolars in the Nepalese population.⁵ Hence, the purpose of this study is to use CBCT scanning to investigate the root and canal morphology of mandibular premolars in selected Nepalese population.

METHODS

A descriptive, cross-sectional study was conducted in the Department of Dental Surgery, NAMS, Bir Hospital, Kathmandu, Nepal. The CBCT image of first and second premolars from a patient requiring CBCT, attending the Oral Radiology unit at the Department of Dental Surgery, Bir Hospital was collected with convenience sampling method in April 1 to August 31, 2022 after receiving the ethical clearance from the Institutional Review Board of National Academy of Medical Sciences, Bir Hospital (Ref no. 1328/2078/79). Written informed consent was received from the study participants before data collection. The sample size was calculated using a formula $n = Z^2pq/e^2$ where, n = sample size, z =standard deviation set at 1.96 (95% confidence level), p =prevalence of condition (according to Hajihassiani et al.¹¹ prevalence of type I canal of second premolar=78%), q =100- p , e =permissible error=5%. Placing these values, we get a sample size of 264. For the assessment of 264 second premolars, 132 CBCT were taken.

This study included permanent mandibular first and second premolars with well-defined root and crown morphology and excluded root caries, fracture, resorption, large restoration, calcification, root canal treated, and distorted CBCT images. The CBCT machine used in this study was Sirona Orthophos SL-3D with exposure parameters; FOV 11 x 11 cm,² 85 kV, 7mA, 14.4 seconds exposure time, and 160 x 160 x 160 μ m,³ isotropic voxel size.

The CBCT volumes were processed and reconstructed using Galaxy Gallileo Implant software. Axial, coronal, and sagittal

sections, as well as multiplanar reconstructed (MPR) sections of the mandibular premolars, were displayed on a 21-inch Dell LCD monitor at a resolution of 1280 x 1024 pixels. The reading of the CBCT images was performed in a dark room. The image magnification, display contrast, and window size was adjusted to ensure optimal visualization. Canals in each root were visualized from the orifice to the apex in all planes by gradually progressing from the pulpal floor to the root tip and simultaneously changing the position and axis of the coronal and sagittal plane to orient it along the curvature of the root and canals. A series of screenshots were taken to visualize the root canal in each root. The following features were analyzed by two examiners (one endodontist and one oral radiologist) as per the above set guideline:

- 1) Number of roots and number of root canals per root
- 2) Root canal configuration based on Vertucci's classification¹⁸
- 3) Any other variants of root canal morphology

The recording criteria for canal identification were as follows:

- (1) The pulp floor was determined at the level when separate orifices were visible and connected by a faint radiolucent line.
- (2) The main canal was recorded as a long radiolucent connecting line that started from the orifice and ended in the apical foramen.
- (3) The root tip was represented by the final radiopaque appearance of the root structure.
- (4) A secondary canal was confirmed as a second radiolucent spot located off-center from the main canal.

Data were entered in microsoft excel sheet and analyzed in statistical package for the social sciences (SPSS) version 20.0. For descriptive statistics, mean, frequency, and percentage were calculated. Cohen's Kappa test was calculated for inter-evaluator reliability. An endodontist and radiologist evaluated 14 CBCT images (which represent 10% of the total sample) separately. The Kappa coefficient of agreement between both evaluators was 0.67 with substantial agreement.

RESULTS

CBCT radiographs of 134 subjects including 56 males and 78 females with the age ranging from 15 to 70 years (mean age 33.69) were collected. Number of roots and canal configuration of 536 mandibular premolars (268

mandibular first premolars and 268 mandibular second premolars) were evaluated.

Mandibular premolars showed variation in the morphology of root with the majority having one root (94.03% in mandibular first premolars and 99.26% in mandibular second premolars) (Table 1).

Table 1: Frequency of number of roots and canal configuration in mandibular first and second premolars

		Mandibular first premolar n= 268 (100.0%)			Mandibular second premolar n= 268 (100.0%)		
		Total	Male	Female	Total	Male	Female
Number of roots	One root	252 (94.03)	106 (94.64)	146 (93.59)	266 (99.26)	111 (99.11)	155 (99.36)
	Two roots	5 (1.87)	2 (1.78)	3 (1.92)	1 (0.37)	1 (0.89)	0 (0)
	Fused	11 (4.10)	4 (3.58)	7 (4.49)	1 (0.37)	0 (0)	1 (0.64)
Vertucci type	Type I	229 (83.88)	90 (78.95)	139 (87.42)	260 (96.65)	112 (99.12)	148 (94.87)
	Type III	11 (4.03)	6 (5.26)	5 (3.14)	5 (1.86)	0 (0)	5 (3.21)
	Type V	27 (9.89)	13 (11.40)	14 (8.81)	4 (1.49)	1 (0.88)	3 (1.92)
	Type VII	1 (0.37)	1 (0.88)	0	0 (0.0)	0	0
	C-shaped configuration	4 (1.46)	4 (3.51)	0	0 (0.0)	0	0
Unknown configuration	1 (0.37)	0 (0)	1 (0.63)	0 (0.0)	0	0	

Note: Each root present in a tooth has been considered for canal configuration

Regarding the canal configuration, 229 mandibular first premolar teeth and 260 mandibular second premolar teeth had Vertucci's type I configuration which also includes the two rooted teeth having type I configuration. Fused teeth having furcation at and below the middle third of the root were also considered as one root in this study. In mandibular premolars, type I configuration were the most prevalent (83.88% in the first premolar and 96.65% in the second premolars) (Table 1). In mandibular first premolar one tooth had type VII configuration. One tooth was found to have an unusual configuration not explained in Vertucci's classification where single canal leaves the pulp chamber and divides into two, out of which one further divides into two and ends with three foramina (Figure 1). Type II, IV, VI and VIII were not found in mandibular first premolar and Type II, IV, VI, VII, VIII and c-shaped configuration were not found in mandibular second premolar in our study (Table 1).

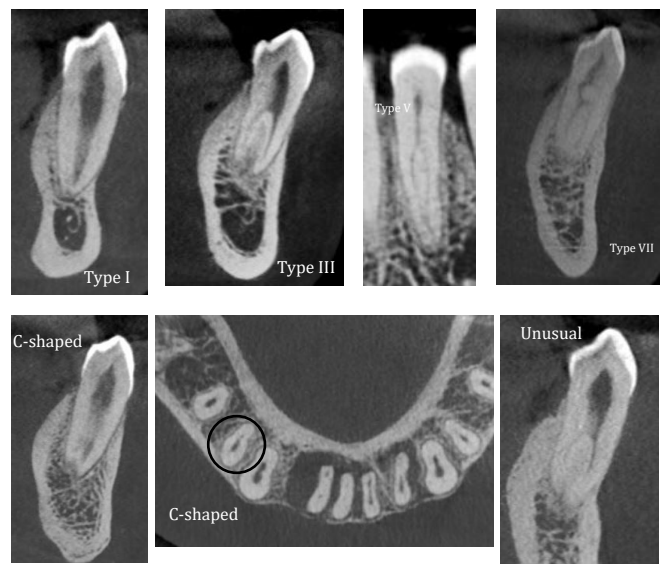


Figure 1. Root of mandibular premolars showing Vertucci's canal configuration type I, III, V, VII, c-shaped configuration (both in cross-section and axial view) and unusual configuration

Among the 112 mandibular premolars in males and 156 mandibular premolars in females, majority had one root (94.64% in males and 93.59% in females in first premolars and 99.11% in males and 99.36% in females in second premolars) (Table 1). Regarding canal configuration, among the mandibular first premolars in males and females, majority had type I followed by type V configuration. Similarly, among mandibular second premolars in males majority had type I followed by type V configuration, while in females majority had type I followed by type III configuration (Table 1).

Table 2: Bilateral symmetry of number of roots in mandibular first and second premolars

		Number (%) of root in left mandibular first premolars		
		Fused	One root	Two roots
Number (%) of root in right mandibular first premolars	Fused	4 (2.98)	1 (0.75)	0
	One root	2 (1.49)	124 (92.54)	0
	Two roots	0	1 (0.75)	2 (1.49)
		Number(%) of root in left mandibular second premolars		
		Fused	One root	Two roots
Number (%) of root in right mandibular second premolars	Fused	0	0	0
	One root	1 (0.75)	132 (98.50)	0
	Two roots	0	1 (0.75)	0

Regarding the bilateral symmetry, in mandibular first premolars, majority (92.54%) had one root on both sides, 2.98% had fused roots on both sides and only 1.49% had two roots on both sides. Similarly in mandibular second premolars, 98.50% had one root on both side (Table 2).

Table 3: Bilateral symmetry of canal configuration in mandibular first and second premolars

		Vertucci canal configuration in left mandibular first premolars n(%)		
		I	III	V
Vertucci canal configuration in right mandibular first premolars n(%)	I	92 (71.32)	7 (5.43)	14 (10.85)
	III	4 (3.10)	0	0
	V	9 (6.97)	0	3 (2.33)
		Vertucci canal configuration in left mandibular second premolars n(%)		
		I	III	V
Vertucci canal configuration in right mandibular second premolars n(%)	I	117 (93.60)	3 (2.40)	3 (2.40)
	III	1 (0.80)	0	0
	V	1 (0.80)	0	0

Regarding the bilateral symmetry of canal configuration of mandibular first premolars, 71.32% teeth had Vertucci's type I on both sides and 2.33% teeth had type V configuration on both side while, in mandibular second premolars, 93.60% teeth had type I on both side (Table 3).

DISCUSSION

Mandibular premolars are typically single rooted teeth, but different variations like two rooted, three rooted and four rooted mandibular premolars have also been reported.¹⁵ In the current study, one root was the most prevalent in both mandibular first premolar 252(94.03%) and second premolar 266(99.26%). This is similar findings in other literature too, only the prevalence percentage differs.^{6,16,19} In mandibular first premolar the prevalence of two rooted was 5(1.87%) and in second premolar only one tooth out of 268 had two root which was much low as compared to Alenezi et al.¹⁶ The prevalence of fused teeth in this study in mandibular first premolar was 11(4.10%) and in second premolar was 1(0.37%).

Vertucci's classification system has been used in this study to classify the canal configuration as it is the most commonly used system by authors in text books and literatures.⁵ Vertucci type I is the most common finding of all types with variable percentage in variable population. In the current study 83.88% and 96.65% of mandibular first and second premolars respectively exhibit type I canal morphology, which was similar to the CBCT study done in South Indian population¹² (83.91% and 93.48% in mandibular first and second premolars respectively) and slightly higher than the study done in Iranian population¹¹ (62.2% and 78% in mandibular first and second premolar respectively). In this study mandibular first premolar exhibit type V configuration as the second most common configuration with the prevalence of 9.89% followed by type III configuration (4.03%) whereas in mandibular second premolar both type III and type V are almost equally prevalent (1.86% and 1.49% respectively). One study done

in Nepalese population in mandibular first premolar using clearing technique has also shown type V as a second most common configuration (18.6%). Iranian population¹¹ has also shown type V as the second most prevalent configuration with higher percentage as compared to our study (28.8% and 22% in mandibular first and second premolars respectively). In contrast to our result, some in vitro study conducted in USA,²⁰ India²¹ has shown type IV as the second most common canal configuration. These variations can be attributed by the difference in racial factor, methods of study and sample size.

Type VII being a rare canal configuration, our study found one mandibular first premolar tooth with this configuration. The clinical significance of the knowledge of canal configuration is mainly to predict the course of root canal treatment. In Vertucci's configuration, type I and type IV are relatively simple with separate and distinct orifice and apex, whereas type II, III, V, VI, VII and VIII configuration are difficult to appreciate and treat due to the complexity leading to the high prevalence of failure. Thus clinician should be aware of the prevalence of these complex anatomy and should be skilled to obtain desirable outcome. Besides the canal configuration classified in Vertucci's, unusual configuration has been reported in many literatures.^{5,15} Current study has observed one mandibular first premolar having unusual configuration. Thus, the clinician performing the routine root canal treatment in mandibular premolars should be cautious about the possibilities of the unusual configurations.

Current study has observed bifurcations in mandibular premolar roots tend to occur in middle and apical third, which is consistent with other literatures too.^{19,20} This indicates the high probability of canal variation in middle and apical third. While classifying the canal configuration: when there were two roots, each roots were classified accordingly but when there was bifurcation of root in middle and apical third, in current study author has considered a single root and classified accordingly. While doing the root canal treatment number of canal or the canal configuration is more relevant than the number of root, thus bifurcation of root in middle and apical third were considered as a single root. C-shaped canal is mainly common in mandibular second molar; however, it is also prevalent in mandibular premolars. In Chinese population¹⁹, C-shaped configuration was found 18% (first premolar) and 1.1% (second premolar) much higher than this study: 1.46% (first premolar) and 0% (second premolar). C-shaped configuration is more prevalent in Mongolian tribe thus more study is recommended in this tribe of Nepalese population.

In current study, regarding the number of roots in mandibular first and second premolars, both males and females have similar distribution. Regarding the canal configuration, in mandibular first premolars, male showed more variation than female; while in mandibular second premolars, female showed more variation than male which is consistent with the study done in German selective population.²² The first mandibular premolars showed higher canal configuration variability in current study than the second mandibular premolars, while Alenezi et al.¹⁶ observed more variability in mandibular second premolars in Kuwaiti subpopulation.

The study has some limitations. Sample was collected from the single tertiary center. It can be considered as the limitation to generalize the outcome in Nepalese population. Thus, we would like to recommend similar studies in multiple centers.

CONCLUSIONS

Mandibular premolar teeth showed variation in root and canal morphology with one root and Vertucci's type I canal configuration in majority of the cases followed by type V in mandibular first premolar teeth and type III in mandibular second premolar teeth. Thus clinician should be aware of these possible anatomical variations, while doing the root canal treatment.

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REFERENCES

1. Gutmann JL, Fan B. Tooth Morphology, Isolation, and Access. Cohen's pathways of the pulp. Mosby Elsevier, 2011, p. 130-208.
2. Vertucci FJ. Root canal morphology and its relationship to endodontic procedures. *Endodontic topics*. 2005;10(1):3-29. DOI: 10.1111/j.1601-1546.2005.00129.x
3. Kararia N, Chaudhary A, Kararia V. Mandibular left

- first premolar with two roots: A morphological oddity. *Contemporary Clinical Dentistry*. 2012;3(2):234. DOI: 10.4103/0976-237X.96840 PMID: 22919233.
4. Jha P, Nikhil V, Arora V, Jha M. The root and root canal morphology of the human mandibular premolars: A literature review. *J Res Dent*. 2013;1(1):3-10.
5. Shrestha R, Srii R, Shrestha D. Diversity of Root Canal Morphology in Mandibular First Premolar. *Kathmandu Univ Med J*. 2019;67(3):223-8. PMID: 33305752.
6. Alhadainy HA. Canal configuration of mandibular first premolars in an Egyptian population. *J Adv Res*. 2013;4(2):123-8. DOI: 10.1016/j.jare.2012.03.002 PMID: 25685409.
7. Walker RT. Root canal anatomy of mandibular first premolars in a southern Chinese population. *Endod Dent Traumat*. 1988;4(5):226-8. DOI: 10.1111/j.1600-9657.1988.tb00326.x PMID: 3248581.
8. Alkaabi W, AlShwaimi E, Farooq I, Goodis HE, Chogle SM. A micro-computed tomography study of the root canal morphology of mandibular first premolars in an Emirati population. *Med Princ Pract*. 2017;26(2):118-24. DOI: 10.1159/000453039 PMID: 27816983.
9. Neelakantan P, Subbarao C, Subbarao CV. Comparative evaluation of modified canal staining and clearing technique, cone-beam computed tomography, peripheral quantitative computed tomography, spiral computed tomography, and plain and contrast medium-enhanced digital radiography in studying root canal morphology. *J Endod*. 2010;36(9):1547-51. DOI: 10.1016/j.joen.2010.05.008 PMID: 20728725.
10. da Silva Ramos LMP, Rice D, Ordinola-Zapata R, Capelozza ALA, Bramante CM, Jaramillo D, et al. Detection of Various Anatomic Patterns of Root Canals in Mandibular Incisors Using Digital Periapical Radiography, 3 Cone-beam Computed Tomographic Scanners, and Micro-Computed Tomographic Imaging. *J Endod*. 2014;40(1):42-5. DOI: 10.1016/j.joen.2013.09.039 PMID: 24331989.
11. Hajihassani N, Roohi N, Madadi K, Bakhshi M, Tofangchiha M. Evaluation of root canal morphology of mandibular first and second premolars using cone beam computed tomography in a defined group of dental patients in Iran. *Scientifica*. 2017; 2017;1504341. DOI: 10.1155/2017/1504341 PMID: 29348968.
12. Shetty A, Hegde MN, Tahiliani D, Shetty H, Bhat GT and Shetty S. A three-dimensional study of variations

- in root canal morphology using cone-beam computed tomography of mandibular premolars in a South Indian population. *J Clin Diagn Res.* 2014;8(8):ZC22-4. DOI: 10.1155/2017/1504341 PMID: 25302261.
13. Alfawaz H, Alqedairi A, Al-Dahman YH, Al-Jebly AS, Alnassar FA, Alsubait S, et al. Evaluation of root canal morphology of mandibular premolars in a Saudi population using cone-beam computed tomography: A retrospective study. *Saudi Dent J.* 2019;31(1):137-42. DOI: 10.1016/j.sdentj.2018.10.005 PMID: 30723367.
 14. Islam MA, Wakia T, Alam MS. Root canal morphology of mandibular first premolars of Bangladeshi population. *Update Dental College Journal.* 2012;2(2):3-7. DOI: 10.3329/updcj.v2i2.15481
 15. Huang Y-D, Wu J, Sheu R-J, Chen M-H, Chien D-L, Huang Y-T, et al. Evaluation of the root and root canal systems of mandibular first premolars in northern Taiwanese patients using cone-beam computed tomography. *J Formos Med Assoc.* 2015;114(11):1129-34. DOI: 10.1016/j.jfma.2014.05.008 PMID: 25174647.
 16. Alenezi DJ, Al Nazhan SA, Al Maflehi N, Soman C. Root and canal morphology of mandibular premolar teeth in a Kuwaiti subpopulation: A CBCT clinical study. *Eur Endod J.* 2020;5(3):248-56. DOI: 10.14744/eej.2020.40085 PMID: 33353914.
 17. Dou L, Li D, Xu T, Tang Y, Yang D. Root anatomy and canal morphology of mandibular first premolars in a Chinese population. *Sci Rep.* 2017;7(1):1-7. DOI: 10.1038/s41598-017-00871-9 PMID: 28389648.
 18. Karobari MI, Parveen A, Mirza MB, Makandar SD, Ghani NRNA, Noorani TY, et al. Root and root canal morphology classification systems. *Int J Dent.* 2021;2021:6682189. DOI: 10.1155/2021/6682189 PMID: 33679981.
 19. Yu X, Guo B, Li K-Z, Zhang R, Yu X, Tian Y-Y, et al. Cone-beam computed tomography study of root and canal morphology of mandibular premolars in a western Chinese population. *BMC Medical Imaging.* 2012;12(1):1-5. DOI: 10.1186/1471-2342-12-18 PMID: 22817397.
 20. Baisden MK, Kulild JC, Weller RN. Root canal configuration of the mandibular first premolar. *J Endod.* 1992;18(10):505-8. DOI: 10.1016/S0099-2399(06)81352-X PMID: 1289476.
 21. Parekh V, Shah N, Joshi H. Root canal morphology and variations of mandibular premolars by clearing technique: An in-vitro study. *J Contemp Dent Pract.* 2011;12(4):318-21. DOI: 10.5005/jp-journals-10024-105 PMID: 22186868.
 22. Bürklein S, Heck R, Schäfer E. Evaluation of the root canal anatomy of maxillary and mandibular premolars in a selected German population using cone-beam computed tomographic data. *J Endod.* 2017;43(9):1448-52. DOI: 10.5005/jp-journals-10024-1052 PMID: 28743430.

Clinico-epidemiological presentation of acute encephalitis syndrome in patients visiting a tertiary hospital in Kathmandu, Nepal: A descriptive cross-sectional study

Bidhi Dhital¹, Neeti Bhat*²

¹Charak Memorial Hospital, Pokhara, Nepal, ²Department of Clinical Physiology, Madan Bhandari Academy of Health Sciences, Makawanpur, Hetauda, Nepal

ABSTRACT

Introduction: Acute encephalitis syndrome is diagnosed when a person of any age, and at any time of the year, presents with the acute onset of fever and a change in mental status and/or new onset of seizures. It has an ill-defined clinico-epidemiological presentation in Nepal, making it a challenging medical condition. The objective of this study was to study the clinical profile of acute encephalitis syndrome. **Methods:** All consecutive admissions at Tribhuvan University Teaching Hospital between April 2017 and December 2018 were screened for acute encephalitis syndrome. The diagnosis was confirmed by history, examination, laboratory findings, brain imaging, and electroencephalography. All patients who met the inclusion criteria were enrolled. For data entry and analysis, statistical package for the social sciences software version 16.0 was used. Descriptive statistics as frequencies and mean \pm standard deviations were computed. **Results:** The mean age of the study population was 49.56 ± 22.28 years with male predominance 42 (58.3%). Among the diagnosed etiologies, 1.38% had Japanese encephalitis, 4.12% had herpes encephalitis, and 4.12% had autoimmune encephalitis. Out of the 72 patients, 52 patients (72.22%) had Glasgow coma scale >12 , 15 patients (20.83%) had 8 to 12, and five patients (6.94%) had coma (Glasgow coma scale <8). Among the clinical findings, altered mental status (91.66%) was the most commonly noticed manifestation followed by fever. **Conclusions:** Most patients had altered sensorium with less severe brain injury based on the Glasgow coma scale score during the presentation. Its low diagnostic yield, however, often leads to an increase in unknown etiologies. The syndrome was more prevalent in hilly regions.

Keywords: Acute encephalitis syndrome, altered sensorium, Japanese encephalitis.

*Correspondence:

Dr. Neeti Bhat
Department of Clinical Physiology
Madan Bhandari Academy of Health Sciences,
Hetauda, Nepal
Email: neeti.bhat@mbahs.edu.np
ORCID iD: <https://orcid.org/0000-0003-4946-2428>

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INTRODUCTION

Acute encephalitis syndrome (AES) has been a major health concern around the globe because the disease is associated with high morbidity and mortality rates. AES (simply known as brain fever) is a constellation of symptoms and signs, characterized by acute onset of fever and a change in mental status, such as disorientation, confusion, coma, or inability to speak, as well as onset of new seizures (except febrile seizures) due to inflammation of brain.¹ Because AES caused by different etiological agents show similar clinical characteristics, this broad syndromic definition is primarily used for disease surveillance. AES can occur as a sporadic or explosive outbreak. Many neurotropic viruses and non-viral etiologies can cause AES, making diagnosis challenging.² There have been outbreaks of Japanese encephalitis virus (JEV) in Nepal.³ According to current estimates, 12.5 million people in Nepal are at high risk for JE. Over the past several decades, the JE-endemic region has spread from 24 districts in the southern plains to districts in the

neighboring hills and mountains in the north, including the densely populated Kathmandu Valley.⁴ No specific research has been conducted on the incidence of AES. Nevertheless, there were studies from various countries that examined the incidence of encephalitis in different settings. During an epidemic in Nepal in 1997, an incidence rate of 145 to 185 was recorded.⁵ In Nepal, cases of acute encephalitis syndrome (5.23/100,000) are estimated to be more than 12 times higher than in India (0.42/100,000).⁶ In our scenario, knowledge of this disease is limited, limitations in investigations and diagnostics, and challenges in the management of critically ill patients.³ Therefore, this study was conducted to assess the clinical spectrum of AES in patients visiting the Institute of Medicine, Nepal.

METHODS

All the patients aged 16 years and older admitted to the inpatient wards and critical care units of the Department of Neurology, Institute of Medicine with acute encephalitis syndrome between April 2017 and December 2018 were included. The cases of encephalitis were limited to those patients who met the following criteria: patients with fever or history of fever with change in mental status (including confusion, disorientation, coma, or inability to talk) and or new onset of seizures at any time of year, all subjects with a diagnosis of encephalitis. Cases with a diagnosis of delirium or encephalopathy secondary to sepsis, toxins, metabolic causes (hypoglycemia, electrolyte disturbances, Wernicke's encephalopathy), patients having cerebrovascular disease followed by fever; traumatic brain injury, malignant hypertension, neuroleptic malignant syndrome, epilepsy, systemic organ dysfunction, systemic infection that spreads to brain (e.g. Malaria), tubercular meningoencephalitis, bacterial meningoencephalitis, patients diagnosed with Acute disseminated encephalomyelitis (ADEM) were excluded.

A detailed history was obtained and general and systemic examination was performed meticulously. Then, all required investigations: complete blood count (CBC), erythrocyte sedimentation rate, renal function test (serum urea, serum creatinine, Na⁺, K⁺), random blood sugar, serology (ELISA for HIV I and II, HBsAg IgG, Anti-HCV Antibody), urine routine examination, cerebrospinal fluid (CSF) analysis-CSF pressure, total leukocyte count, differential leukocyte count, sugar, protein, gram stain and C/S, HSV I & II polymerase chain reaction (PCR), varicella zoster PCR, Anti-JE IgM and tropical fever panel (Dengue virus, Rickettsia species, Salmonella species, West Nile virus, Plasmodium species, Chikungunya virus, and Leptospira species) and anti-NMDA receptor antibody,

acid-fast bacilli and blood C/S were sent. Magnetic Resonance Analysis (MRI)-Brain, electroencephalography, and chest x-ray were done and medical management was started. Once the culture and sensitivity report arrived, anti-microbial was changed accordingly. Autoimmune encephalitis was confirmed by the presence of anti-NMDA-R antibodies. Blood pressure (BP), pulse rate (PR), Glasgow coma scale (GCS), respiratory rate, temperature, and oxygen saturation (SpO₂) were monitored regularly and strict input and output chart was maintained. Ethical clearance was obtained from the Institutional review board, institute of Medicine, Tribhuvan University [Ref: 80 (6-11-E)²/074/075]. Written informed consent was obtained from the patients, or their legal surrogates for children below 18 years) before enrolment. Statistical package for social sciences (SPSS) software version 16.0 was used for data entry and analysis. Descriptive statistics were used for analysis. Descriptive statistics were expressed as frequencies, mean \pm SD and range.

RESULTS

After the exclusion of other causes of altered sensorium, 72 patients who met the inclusion criteria were included in the study. The mean age of the study population was 49.56 \pm 22.28 years ranging from 16 years to 94 years. Most patients presenting with acute encephalitis syndrome were 16- 30 years and 46-60 years of age group. There was notable male preponderance 42(58.33%). No cases were reported from the mountain region during the course of the present study (Table 1).

Table 1: Clinico-epidemiological patterns among the study participants (n=72)

Variables	n(%)
Age group (years)	
16-30	18(25%)
31-45	13(18.05%)
46-60	18(25%)
61-75	14(19.44%)
76-90	7(9.72%)
>90	2(2.77%)
Geographic location	
Hills	47(65.27%)
Terai	25(34.72%)
Clinical features	
Altered Sensorium	66(91.66%)
Fever	52(72.22%)
Headache	52(72.22%)
Focal Neurological Deficit	26(36.11%)
Seizure	25(34.72%)
Loss of Consciousness	18(25%)
Meningeal Signs	13(18.05%)

The most common comorbidity was hypertension which was present in 21(29.16%) of the study population,

followed by diabetes mellitus in 15(20.83%), chronic kidney disease 7(9.72%), coronary artery disease 7(9.72%) and chronic liver disease in 7(9.72%), and HIV in 5(6.94%) cases.

Most of the patients 52(72.22%) had GCS>12 (Table 2).

Table 2: Glasgow coma scale group among the study population (n=72)

GCS	Number (n)	Percentage (%)
<8	5	6.94
8-12	15	20.83
>12	52	72.22

Among the study population, 16 patients (22.22%) had BP more than 130/80 mmHg and 56 patients (77.77%) had BP less than 130/80 mmHg. Regarding pulse rate, 64 patients (88.88%) had PR of fewer than 100 beats/min and eight patients (11.11%) had PR of more than 100 beats/min.

Most of the cases 65(90.27%) had unknown etiology. (Table 3)

Table 3: Etiological characteristics among the study population (n=72)

Characteristics	Variables	Value
Etiology	JE	1(1.38%)
	HSV	3(4.16%)
	Autoimmune	3(4.16%)
	Unknown	65(90.27%)

Table 4: Summary of CSF analysis characteristics among the study population (n=72)

Characteristic	Variable	Value n (%) or mean \pm SD (Range)
Total Count ($\times 10^3/\text{mm}^3$)		88.51 \pm 137.06 (5 to 800)
Differential Count	Polymorphs ($\times 10^3/\text{mm}^3$)	34.20 \pm 80.91 (1 to 480)
	Monomorphs	54.23 \pm 98.84 (1 to 760)
	Polymorph predominant	12 (16.66%)
	Monomorph predominant	60 (83.33%)
CSF Biochemistry	Glucose	3.33 \pm 1.84 (1.00 to 8.00)
	Normal	34 (47.22%)
	Low	38 (52.77%)
	Protein	55.74 \pm 20.36 (17.00 to 110.00)
	Normal	15(20.83%)
	Low	1(1.38%)
	High	56(77.77%)
CSF Serology	No growth	68(94.44%)
	HSV PCR positive	3(4.16%)
	Anti JE Antibody positive	1(1.38%)

More than half of the patients had low CSF glucose and high CSF protein. Only four cases had a viral cause of the disease (Table 4).

DISCUSSION

As the primary presenting feature, altered sensorium was most frequently encountered in our study followed by fever and headache, which contrasts with Dongol et al.⁷, who reported fever as the most common finding among 100% of their study participants. In their study, altered sensorium was found in only 18.75% of participants. Tripathy et al.¹ also found that 100% of their participants had a fever. Their study, however, involved only pediatric participants under 15 years old. The observation of our study was similar to the study conducted by Jameel et al.⁸ where 80.48% of patients had mental status changes followed by fever (79.26%). A study conducted by Rayamajhi et al.⁹ had, however, all of their 36 patients presenting with fever and headache. The seizure was found in 25(34.72%) participants in our study. The study conducted by Jameel et al.⁸ reported seizures in 97(59.14%) patients whereas 44.64% of pediatric patients had seizures in a study by Dongol et al.⁷ Tripathi et al.¹ found that 53.23% of pediatric participants had seizure symptoms. There was a 1.12 odds ratio associated with seizure-related mortality, but it was not statistically significant. The risk of mortality was significantly increased when intracranial pressure was raised, assisted ventilation was required, and hypotension was present.

Additionally, when we evaluated the mean age of study participants, the results showed significant differences compared to the previous study conducted between March 2009 and March 2010 in the same setting to study predictors of outcome in acute encephalitis. The participants in their study were younger with a mean age of 34.83 \pm 14.34.⁹ The mean age was comparable to a study by Rayamajhi et al.⁹ conducted in the same setting who reported mean age of 43 \pm 18 years.

Our study showed male preponderance which is in line with previous studies.⁷⁻⁹ A possible explanation for this variation could be increased outside activities, exposure, or stress. In addition, women may feel stigmatized or seek health services less often as a result of low health-seeking behaviors, resulting in an inflated presentation rate of males.

The present study is focused on cases from Kathmandu, the capital city that drains cases from all over Nepal. In our study, no cases were reported from the mountain region, which may be attributed to the mountain region being sparsely populated or due to exodus for employment and education. Highest reported cases were from the hilly region followed by the terai region, which contested the findings of Thapa et al. where a larger proportion was

from the terai region. The geographical variation in the study might be due to differences in the place of study, the differences in the catchment area of the hospital, and referral bias.¹⁰

Although encephalitis covers a wide variety of known pathologies, diagnostic tests for AES usually produce very low diagnostic yields. The etiology of more than 90% of cases remains unknown in the current study. In previous studies, at least a third of all cases remained undiagnosed. Among the total, 1571 encephalitis patients evaluated over a seven-year period, only 15% had an infectious etiology, as seen in the California Encephalitis Project.¹¹ The most common etiology in the current study was herpes encephalitis (n=3) and autoimmune encephalitis confirmed by the presence of NMDA antibody (n=3). Only one case of JE was observed. Earlier studies reported enteroviruses as one of the predominant causative agents of encephalitis.^{2,11,12} A north Indian hospital-based surveillance study reported that 20(13%) of all 151 AES cases had evidence of an enteroviral infection.¹³ Normally, enteroviruses only reside in the CSF for a short time before translocating to the brain parenchyma. Consequently, some patients with encephalitis of unknown cause may have had enteroviral encephalitis, which is only detectable by tissue PCR.²

A resounding success has been achieved in the prevention and control of JE in Nepal, especially after it incorporated CD-JEV into its Expanded Program on Immunization (EPI) for children in high-risk districts. There may be herd immunity against JEV due to the widespread use of the JE vaccine. In a six-year surveillance period from 2004 to 2009, surveillance data showed that, after the campaigns, JE incidence was 72% lower than what might have occurred otherwise.⁴ AES patients have compromised respiratory drives and require assisted ventilation if they have brain-stem encephalitis or cerebral herniation. The high GCS at admission is protective as it implies less neurologic damage. The majority of our study participants had GCS>12(72.22%). There was an elevated white blood cell count with predominantly lymphocytic pleocytosis (83.33%). Low glucose (52.77%) and raised protein level (77.77%) was noted. Possible contributors to decreased CSF glucose could be increased metabolism in the brain.

Our study has several limitations. Considering that all of the AES cases included in this study came from one hospital, it is likely that we missed those individuals who never sought medical care or sought care in another institute. Since AES is more likely to affect lower socio-economic populations, we expect sampling bias to only moderately

underestimate the overall incidence. The nature of the study being hospital-based can lead to misrepresentation of AES since milder, non-hospitalized cases were not captured. Future efforts to estimate the community burden of AES are needed. A long-term follow-up of survivors, as well as neuropsychological evaluation, beyond the hospital stay, was not possible due to the design of the study. Future study recommendations could include participants from multiple centers throughout the country and analyze their clinical spectrum.

CONCLUSIONS

Clinically, altered sensorium was the most common clinical presentation, followed by fever, vomiting, and headaches. As observed in our study, AES often results in an increased number of cases with unknown etiology due to its poor diagnostic yield. We, thus, conclude that diagnostics for acute encephalitis syndrome require a significant amount of resources, however, standard protocols can be incorporated to identify AES.

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REFERENCES

1. Tripathy SK, Mishra P, Dwibedi B, Priyadarshini L, Das RR. Clinico-epidemiological study of viral acute encephalitis syndrome cases and comparison to nonviral cases in children from eastern India. *J Global Infect Dis.* 2019;11(1):7 DOI: 10.4103/jgid.jgid_26_18 PMID: 30814829.
2. Joshi R, Mishra PK, Joshi D, Shantosh S, Parida MM, Desiken P, et al. Clinical presentation, etiology, and survival in adult acute encephalitis syndrome in rural Central India. *Clin Neurol Neurosurg.* 2013;115(9):1753-61. DOI: 10.1016/j.clineuro.2013.04.008 PMID: 23643180.
3. Pant DK, Tenzin T, Chand R, Sharma BK, Bist PR. Spatio-temporal epidemiology of Japanese encephalitis in Nepal, 2007-2015. *PLoS One.* 2017;12(7):e0180591. DOI: 10.1371/journal.pone.0180591 PMID: 28746354.
4. Control of Japanese Encephalitis in Nepal (1978-2012). World Health Organization-Programme for Immunization Preventable Diseases (WHO-IPD), Nepal and Child Health Division, Department of Health Services, Nepal Ministry of Health. Available from:

https://media.path.org/documents/VAD_je_nepal_case_study_r1.pdf. [Accessed on 20th May]

5. Akiba T, Osaka K, Tang S, Nakayama M, Yamamoto A, Kurane I, et al. Analysis of Japanese encephalitis epidemic in Western Nepal in 1997. *Epidemiol Infect.* 2001;126(1):81–8. PMID: 11293685.
6. Potharaju NR. Incidence rate of acute encephalitis syndrome without specific treatment in India and Nepal. *Indian J Comm Med.* 2012;37(4):240–51. DOI: 10.4103/0970-0218.103473 PMID: 23293439.
7. Dongol S, Shrestha S, Shrestha N, Adhikari J. Clinical profile and outcome of acute encephalitis syndrome in Dhulikhel hospital of Nepal. *J Nepal Paediatr Soc.* 2013;32(3):201–5. DOI: 10.3126/jnps.v32i3.6683
8. Jameel M, Habib Z, Ali SA, Shafqat S. Acute Encephalitis in Karachi, Pakistan: Clinical spectrum and outcome predictors in a hospitalized population. *Pak J Neurological Sci.* 2006;1(1):1–6.
9. Rayamajhi P, Nepal G, Ojha R, Rajbhandari R, Gajurel BP, Karn R. Evaluating cognitive outcomes in adult patients with acute encephalitis syndrome: a prospective study from a tertiary care center in Nepal. *Encephalitis.* 2021;2(2):36–44. DOI:10.47936/encephalitis.2021.00157
10. Thapa LJ, Twayana R, Shilpakar R, Ghimire M, Shrestha A, Sapkota S, et al. Clinical profile and outcome of acute encephalitis syndrome (AES) patients treated in College of Medical Sciences Teaching Hospital. *JCMS-Nepal.* 2014;9(2):31–7. DOI: 10.3126/jcmsn.v9i2.9685
11. Fowlkes AL, Honarmand S, Glaser C, Yagi S, Schnurr D, Oberste MS, et al. Enterovirus-associated encephalitis in the California encephalitis project, 1998–2005. *J Infect Dis.* 2008;198(11):1685–91. DOI: 10.1086/592988 PMID: 18959496.
12. Giri A, Arjyal A, Koirala S, Karkey A, Dongol S, Thapa S, et al. Aetiologies of Central Nervous System infections in adults in Kathmandu, Nepal: A prospective hospital-based study. *Sci Rep.* 2013;3(1):1–7. DOI: 10.1038/srep02382 PMID: 23924886.
13. Karmarkar SA, Aneja S, Khare S, Saini A, Seth A, Chauhan BKY. A study of acute febrile encephalopathy with special reference to viral etiology. *Indian J Pediatr.* 2008;75(8):801–5. DOI: 10.1007/s12098-008-0150-2 PMID: 18769890.

The outcome of Transversus Abdominis Release for complex ventral hernia: A one-year of follow-up experience

Sagar Khatiwada*¹, Narayan Prasad Belbase¹, Suman Baral², Hari Prasad Upadhyay³,
Sushim Bhujel¹, Nishnata Koirala¹

¹Department of Gastrointestinal and General Surgery, College of Medical Sciences, Teaching Hospital, Bharatpur, Chitwan, Nepal, ²Department of Surgery, Dirghayu Pokhara Hospital Ltd, Pokhara, Nepal, ³Department of Statistics, Birendra Multiple Campus, Bharatpur, Chitwan, Nepal

ABSTRACT

Introduction: Transversus Abdominis Release is a noble technique for the repair of complex ventral hernia, where the posterior component separation allows a huge pre-peritoneal space advantageous for the placement of large-sized mesh. It has less wound morbidity as compared to anterior component separation due to the preservation of skin perforators. The main objective of this study was to evaluate one-year follow-up results in terms of recurrence, wound morbidity, and various techniques for managing complications of Transversus Abdominis Release. **Methods:** This is a descriptive cross-sectional study that was conducted at the department of surgery, College of Medical Sciences Teaching Hospital. Among 41 patients with complex ventral hernia, 34 patients met the inclusion criteria. Demographic data, intra-operative events like bleeding, operative duration, intraoperative complications, post-operative events like duration of hospital stay, wound morbidity, and follow-up data were analyzed. **Results:** Posterior rectus sheath closure at midline was possible in 30 (88.2%) patients. In patients, where posterior rectus sheath closure was not possible, the peritoneum of hernia sac was tailored to patch the defect or in some omentum was placed below the raw surface of mesh. The average operative duration and blood losses were 130±12 minutes and 301±133 ml respectively. The semilunar line injury occurred in one case that was diagnosed and repaired at the same time and the TAR plane was re-established. Wound morbidity occurred in three cases that were managed by dressing with commercially available collagen and mupirocin granule. No recurrence was observed in one-year follow-up. **Conclusions:** Transversus Abdominis Release has a better result with no recurrence in short term follow up and fewer complications which are easily manageable.

Keywords: Hernia, incisional hernia, transverse abdominis release, ventral hernia.

*Correspondence:

Dr. Sagar Khatiwada
College of Medical Sciences Teaching Hospital
Bharatpur, Chitwan, Nepal
Email: sagarkhatiwada2064@gmail.com

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INTRODUCTION

After midline laparotomy, ventral hernia occurs in 9 to 22% of patients while after surgical repair of ventral hernia the recurrence rate is as high as 37%.^{1,2} In 1970, Rives and Stoppa described the retro-rectus repair of ventral hernia. The fusion fibers at linea semilunaris prevented the space to be generated beyond this landmark.³ Hence, midline fascial closure in a wider ventral hernia was difficult. Ramirez and colleagues addressed this issue by introducing anterior component separation (ACS) by division of external oblique and separating it from internal oblique muscles which allows midline shift and closure of linea alba even in wider hernia. However, ACS required creation of large lipo-cutaneous flaps sacrificing skin perforators resulting into flap necrosis, increased risk of surgical site infection (SSI) and the recurrence rate remained as high as 30%.⁴

In 2012, Novitsky et al. described Transversus Abdominis Release

(TAR) technique that generates huge extra-peritoneal space without raising lipocutaneous flaps and thereby reducing wound morbidity.^{5,6} A durable technique with a low recurrence rate, less wound morbidity, low and manageable complications are necessary. Therefore, the main objective of this study was to evaluate intraoperative challenges and recurrences in one year.

METHODS

A descriptive cross-sectional study was carried out by the department of surgery of College of Medical Sciences-teaching hospital (COMS-TH) among the patient who underwent TAR from March 1, 2019 to February 28, 2021. Data were collected from May 6 to June 17, 2022 after getting ethical approval from Institutional review committee (COMSTH-IRC/2022-015). Before data collection, informed and written consent were taken from patients. All the collected data was entered and analyzed by using statistical package for social sciences version 20.0.

Preoperative protocol of TAR

All patients were advised to abstain from smoking one month prior to surgery. In diabetic patients, glycemic control with glycosylated hemoglobin (HbA1c) was achieved at less than 6%. Hypothyroid and hypertensive patients were medically optimized, and each patient was operated on after the cardiac risk assessment from the cardiology department. Pre-operative CT-Scan was performed to assess the hernia sac volume. Segmentation and abdominal volumetry were also performed. We considered loss of domain as the major indicator of TAR, and calculation was performed as per Sabbagh.⁷ If the ratio of hernia sac volume (HSV) to total peritoneal volume (TPV) was more than 20%, the primary closure of rectus sheath was not possible or if it was possible, the risk of intra-abdominal hypertension remained.

Figure 1 shows CT-Scan image of 66 years old lady with ventral hernia. Figure 1A shows 9.4 cm of defect. Figure 1B shows the segmentation of CT-image, here after volume rendering, the ratio of HSV to TPV was more than 20%, suggesting the loss of domain. Confirmation of volumetry was done with radiologist.

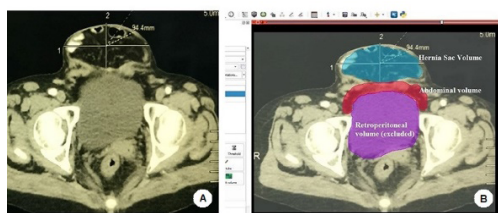


Figure 1: CT-Scan image of 66 years lady with a ventral hernia.

Surgical techniques

All patients were operated on under general anesthesia. After midline laparotomy and adhesiolysis, abdominal cavity was packed. We performed posterior approach where the intraperitoneal incision was given along the edge of posterior rectus sheath to create retro-rectus space.⁸ Retro-rectus dissection was carried out till the neurovascular bundle. An incision of Transverse abdominis muscle fibers known as Madrid modification along musculoaponeurotic transition (see figures 2d and 2e) was given.⁹ A wide pre-peritoneal space was created that connected space of Retzius and the space of Bogros caudally, laterally along the lateral border of the psoas muscle, and cranially at the edge of the diaphragm. Special care was taken to prevent injury of the neurovascular bundle, prevent the disruption of linea semilunaris, and inadvertent injury of diaphragmatic muscle fiber while entering the fibrofatty triangle. After creating pre-peritoneal space, the posterior rectus sheath at the midline was closed. In those cases whom posterior rectus sheath closure was not possible, PRS was bridged. To achieve this, either peritoneum from hernia sac was tailored to cover the defect or when sac can't be utilized due to Swiss cheese defect or recurrent hernia, omentum was laid just below the raw surface of mesh. After completion of this, a huge synthetic Polypropylene mesh was placed and fixation of mesh was done on both sides of the anterior superior iliac spine (ASIS), caudally floating ribs (coastal fixation), and midline respectively. After fixation of mesh, two negative pressure drain was placed and anterior rectus sheath was closed.

For giant lumbar hernias, after midline incision, on contralateral side of hernia, dissection was carried out till the edge of psoas muscle. But, on ipsilateral side, we started TAR from midline and stop the dissection when we reach the edge of hernia. Further dissection on the ipsilateral side of hernia was added only after changing patient in lateral decubitus position. After positioning patient in lateral decubitus a lumbar incision was added, the sac was dissected and finally, the retroperitoneal dissection was continued where it was left during supine position. Retroperitoneal space was extended till the lateral border of the psoas muscle. Synthetic polypropylene mesh was placed and fixed. The muscular defect of hernia just anterior to mesh was closed, and at the midline ARS was also approximated with suture. Finally wound was closed. Some of the cases required resection of the bowel and anastomosis, usually when the bowel was found trapped or sutured in the previous repair. We removed the previous mesh on all cases of recurrent hernias.

Assessment of recurrences

Hernia recurrences were evaluated through clinical examination and ventral hernia recurrence inventory (VHRI) questionnaires.¹⁰ All patients were asked about the bulge and physical symptoms/pain at the incision site.

Figure 2 shows surgical technique, figure 2a shows posterior approach where linea alba is held by forceps and retracted and a linear incision is given along the posterior rectus sheath, 2b shows posterior rectus sheath was held by artery forceps and pushed downward while the anterior rectus sheath was held by Allis forceps and retracted upward, 2c shows entry to the space between rectus abdominis muscle and posterior rectus sheath 2d shows a line of musculoaponeurotic transition (dashed line) that was incised releasing the transverse abdominis muscle fiber and entering the pre-peritoneal space, 2e clarifies the anatomy and 2f shows entry to the pre-peritoneal space with excellent medialization of posterior rectus sheath.

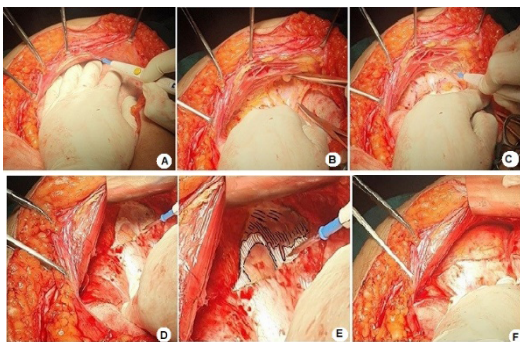


Figure 2: Surgical techniques

Two negative pressure drains were placed on either side which were placed for at least ten days and dressing was done on alternate days, and sutures were removed on the fourteenth post-operative day.

RESULTS

During the period of study, a total of 41 patients underwent an open abdominal wall reconstruction using the TAR technique. Among them, only 34(83%) were included in the study as seven patients failed to report on follow-up. All patients in this study presented with pain and an enlarging hernia interfering with daily activities. The average age of patients was 55 ± 3.85 years ranging from 48 to 61 years. Four patients had wounds at the hernia site, two of them were with mesh infection and sinus while two had pressure ulcers for primary ventral hernia. Demographics and other characteristics of the respondents are presented in table no 1. Table 2 shows the peri-operative details of patients who have undergone TAR.

Table 1: Demographics and other related characteristics of respondents (n=34)

Location of hernia	Midline	Above umbilicus	9
		Below Umbilicus	18
Hernia grade	Lateral		7
	Grade 1		6
	Grade 2		16
	Grade 3		8
	Grade 4		4
Wound	Clean wound		28
	Contaminated wound		6
Defect size diameter (cm)			11.64 \pm 1.2
Intraoperative duration (minutes)			130 \pm 11.9
Average blood loss (ml)			301 \pm 133
Button defect of pre-peritoneum			13
Neurovascular injury			1
Injury of linea semilunaris			1

Table 2: Peri-operative surgical details of patients who have undergone TAR

Sex	Male	8 (23.5%)
	Female	26 (76.47%)
BMI (kg/m²)	23 to 24.9	11
	25 to 29.9 (Pre-Obese)	6
	30 to 40 (Obese-I)	17
Comorbidities	Diabetes Mellitus type 2	5
	Hypothyroidism	6
	Hypertension	4
	Cholecystectomy-Surgical site infection (SSI)	2
Prior surgical history or trauma	Nephrectomy-SSI	2
	Gunshot injury (colostomy)	1
	Fall injury (trauma)	1
	Hysterectomy	2
	Exploratory laparotomy (various causes)	17
Primary ventral hernia (no previous surgical history)		9
Incisional Hernia (non-recurrent)		11
Recurrent ventral Hernia		14
Past Smoker		7
Wound on initial presentation	Ulcer of hernia (due to long-standing disease)	2
	Mesh infection or sinus tract formation	2

Complete posterior fascial closure was not achieved in four cases. Among which in one patient the peritoneum from hernia sac was tailored to patch fascial defect (figure 3a). In remaining three cases omentum was placed. Free edge of unclosed PRS was sutured to omentum to prevent bowel herniation (figure 3b).

We don't leave button defect unclosed because it risks bowel adhesion with mesh and bowel entrapment (figure 3c). One case had an inadvertent injury of linea semilunaris that was diagnosed at the same time and repaired by Polypropylene suture and finally, TAR plane was re-established (figure 3d). The repaired defect observed was with a mean diameter of 11.64 ± 1.2 cm. The average estimated blood loss was 301 ± 133 ml (minimum 100 ml, maximum 650 ml). The average

duration of surgery was 130 ± 12 minutes ranging from 110 to 150 minutes.

Figure 3 shows techniques to overcome various complications of TAR. 3a shows posterior bridging mesh managed by tailoring peritoneum of hernia sac, 3b shows omentum placement for bridging mesh, 3c shows closure of button defect and 3d shows inadvertent injury of linea semilunaris.

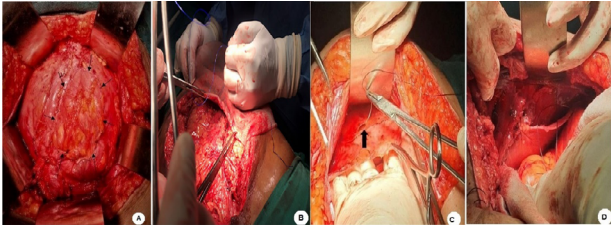


Figure 3: Techniques to overcome various intraoperative complications

Postoperative events

The mean duration of hospital stay within the study group was 11.7 ± 1.3 days ranging from 10 to 14 days. Two cases had surgical site infections during their hospital stay. For both cases twice daily dressing was done in the 1st week with antibiotics based upon culture and sensitivity of the swab from the wound site. Dressing was continued once daily and we used mupirocin and collagen granules for dressing, and as the wound narrowed, skin closure was done. None of the patients required procedural intervention but, it took nearly seven weeks for complete resolution of SSI. Seroma occurred in one of the cases. None of the patients showed clinical signs of symptoms of recurrence in our study after surgery during the follow-up for one year.

DISCUSSION

Complex ventral hernias present surgeons with various challenges for repair, as these hernias have high recurrence rates and wound morbidities. The posterior component separation with TAR as described by Novitsky et al. has recently been identified as the technique of choice for the repair of complex ventral hernias. The technique has been widely accepted for its comparable outcome regarding wound morbidity and recurrence rate.

Novitsky et al. showed a recurrence rate of only 4.7%. In our study out of 34 patients, no recurrences have been yet reported in a one year follow-up period. Punjani et al. published a retrospective review of 100 cases who underwent TAR for complex ventral hernias, they also had no recurrence in a follow-up time of 20.2 months.^{3,5} During the period of study, nearly two cases developed

superficial SSI, and one case presented with a seroma. For one who had recurrent seroma, studies suggest to use multiple aspirations, use of doxycycline, re-operation, and obliteration of pseudocapsule formation around seroma.¹⁴ In our patient, we aspirated multiple times by syringe under aseptic precaution and ultrasound guidance and seroma resolved in four weeks.

Injury of linea semilunaris is said to be the most devastating complication of TAR like permanent laxity of the abdomen due to denervation, spigelian hernia etc.¹¹ We also observed injury in a patient, soon intra operative diagnosis was made and was repaired by suture. The TAR plane was re-established. This patient was aggressively followed up and scrutinized to see any signs of abnormalities of abdominal domain, laxity, and spigelian hernia. But, no such problems were observed, questioning if the injury of linea semilunaris is over-emphasized, or at least if diagnosed and repaired at the time of surgery it may be harmless. As our study is of a short period of one-year follow-up and such intra-operative complication is observed in only one case, drawing a conclusion based on this study is yet difficult.

Vascular injury, one case of recurrent ventral hernia had profuse bleeding due to bleeding from the inferior epigastric vessel just 3 to 4 cm from its origin. The inferior epigastric vessel was isolated and ligated by suture. Postoperatively, there were no features of ischemia or wound complications, probably multiple collateral vessels helped. Though vascular injury is not being described in literature during TAR, but when there is an imbalance of traction and counter traction injury by retractor is possible. So we suggest a balanced retraction.

Fascial medialization or approximation of posterior rectus sheath was able in the majority of cases up to 31(89%). For those in whom fascial medialization was not possible, omentum was placed below the bridging mesh and suture secured to prevent bowel contact. These patients did not show delayed bowel movement suggesting omental placement may be feasible (See figure 3b). Similarly in one of the patients, the fascial gap was patched by peritoneum of hernia sac, tailored to close the defect (figure 3a). We realized this could be another option. A similar problem was encountered by Alkhatib et al. which they managed by placing bio-synthetic composite mesh.¹² Button defect due to peritoneal breach during dissection occurred in 38.2% (n=13), each button defect was closed by vicryl 3-0 and no defects were left without closure as described by Kushner et al.¹³

Two cases had gone resection and anastomosis. Among

them, one case was a recurrent hernia whose previous mesh was sutured with bowel where removal of mesh without resection of bowel was impossible. In the next case of a huge lumbar hernia, though medial fascial closure was possible, but due to suspicion of abdominal compartment syndrome, resection of the bowel was done. Both patients had no surgical site occurrence and they had dramatic outcomes, so remaining in a controlled environment and well handling bowel content, mesh placement is still feasible. During trauma surgery it have shown by many studies that mesh placed in even contaminated field yields a good result and if mesh is infected, it can be managed by local debridement above mesh. Removal of whole infected mesh is overstated.¹⁵

CONCLUSIONS

The use of TAR as a standard technique for repair of a complex ventral hernia could be beneficial to patients as the recurrence is minimum, wound morbidity is low with manageable complications, but, since this study is a single centered, follow-up time of only one year, done among small number of cases, further study using larger sample size and longer follow up are necessary to validate the efficacy in the management of complications of TAR.

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REFERENCES

1. Fink C, Baumann P, Wente MN, Knebel P, Bruckner T, Ulrich A, et al. Incisional hernia rate 3 years after midline laparotomy. *Br J Surg.* 2014;101(2):51-4. DOI: 10.1002/bjs.9560 PMID: 24915797.
2. Helgstrand F, Rosenberg J, Kehlet H, Strandfelt P, Bisgaard T. Reoperation versus clinical recurrence rate after ventral hernia repair. *Ann Surg.* 2012;256(6):955-8. DOI: 10.1097/SLA.0b013e318254f5b9 PMID: 22580941.
3. Punjani R, Arora E, Mankeshwar R, Gala J. An early experience with transversus abdominis release for complex ventral hernias: a retrospective review of 100 cases. *Hernia.* 2021;25(2):353-64. DOI:10.1007/s10029-020-02202-w PMID: 32377962.
4. Wegdam JA, Thoolen JMM, Nienhuijs SW, de Bouvy N, de Vries Reilingh TS. Systematic review of transversus abdominis release in complex abdominal wall reconstruction. *Hernia.* 2019;23(1):5-15. DOI: 10.1007/s10029-018-1870-5 PMID: 30539311.
5. Novitsky YW, Elliott HL, Orenstein SB, Rosen MJ. Transversus abdominis muscle release: a novel approach to posterior component separation during complex abdominal wall reconstruction. *Am J Surg.* 2012;204(5):709-16. DOI: 10.1016/j.amjsurg.2012.02.008 PMID: 22607741.
6. Haskins IN, Prabhu AS, Jensen KK, Tastaldi L, Krpata DM, Perez AJ, et al. Effect of transversus abdominis release on core stability: Short-term results from a single institution. *Surgery.* 2019;165(2):412-6. DOI: 10.1016/j.surg.2018.08.005
7. Sabbagh C, Dumont F, Robert B, Badaoui R, Verhaeghe P, Regimbeau JM. Peritoneal volume is predictive of tension-free fascia closure of large incisional hernias with loss of domain: a prospective study. *Hernia.* 2011;15(5):559-65. DOI: 10.1007/s10029-011-0832-y PMID: 21584816.
8. Gibreel W, Sarr MG, Rosen M, Novitsky Y. Technical considerations in performing posterior component separation with transverse abdominis muscle release. *Hernia.* 2016;20(3):449-59. DOI: 10.1007/s10029-016-1473-y PMID: 26898842.
9. Reinpold W. Transversus abdominis muscle release: Technique, indication, and results. *International Journal of Abdominal Wall and Hernia Surgery.* 2018;1(3):79-86. DOI: 10.4103/ijawhs.ijawhs_27_18
10. Baucom RB, Ousley J, Feurer ID, Beveridge GB, Pierce RA, Holzman MD, et al. Patient reported outcomes after incisional hernia repair establishing the ventral hernia recurrence inventory. *Am J Surg.* 2016;212(1):81-8. DOI: 10.1016/j.amjsurg.2015.06.007 PMID: 26319337.
11. Zolin SJ, Fafaj A, Krpata DM. Transversus abdominis release (TAR): What are the real indications and where is the limit? *Hernia.* 2020;24(2):333-40. DOI: 10.1007/s10029-020-02150-5
12. Alkhatib H, Tastaldi L, Krpata DM, Petro CC, Fafaj A, Rosenblatt S, et al. Outcomes of transversus abdominis release (TAR) with permanent synthetic retromuscular reinforcement for bridged repairs in massive ventral hernias: a retrospective review. *Hernia.* 2020;24(2):341-52. DOI: 10.1007/s10029-019-02046-z PMID: 31549325.
13. Kushner B, Holden S, Blatnik J. Surgical "error traps"

- of open posterior component separation-transversus abdominis release. *Hernia*. 2021;25(6):1703-14. DOI: 10.1007/s10029-020-02321-4 PMID: 33079331.
14. Damiani GR, Lombardi C, Pulerà E, Loizzi V, Villa M, Schonauer LM, et al. Management of abdominal wall recurrent subfascial seroma after pelvic surgery. *Acta Biomed*. 2020;91(4):e2020092. DOI: 10.23750/abm.v91i4.9024 PMID: 33525299.
15. Como J, Gunter O, Diaz J, Ho V, Miller P. Use of posterior component separation and transversus abdominis release in trauma and emergency general surgery patients: A case report and review of the literature. *Trauma Surgery & Acute Care Open*. 2019;4:e000268. DOI:10.1136/tsaco-2018-000268 PMID: 30793037.

Role of oral corticosteroids with adjunct to intravenous antibiotics in treatment of orbital cellulitis

Sangeeta Shah*¹, Poonam Lavaju¹, Mukesh Kumar Gupta², Shailesh Mani Pokharel¹, Sanjib Kumar Chaudhary³, Santosh Chaudhary¹

¹Department of Ophthalmology, BPKIHS, Dharan, Nepal, ²Department of Radiodiagnosis and Imaging, BPKIHS, Dharan, ³Consultant Ophthalmologist, Sagarmatha Choudhary Eye Hospital, Lahan, Nepal

ABSTRACT

Introduction: The standard treatment protocol of orbital cellulitis includes the use of broad-spectrum intravenous antibiotics. This study was done to evaluate the role of oral corticosteroids in the treatment of orbital cellulitis in order to address the inflammatory component. **Methods:** A prospective comparative interventional study was carried out on 17 cases of orbital cellulitis over 16 months. All the patients were treated with intravenous antibiotics and were allotted to Group A or B. The former consisted of eight cases (intravenous antibiotics) while group B consisted of nine cases (intravenous antibiotics and oral corticosteroids). The oral corticosteroids were started after 24 to 48 hours of initiation of antibiotics. The outcomes compared between the two groups were hospital stay, visual analogue score, temperature, peri-orbital edema, proptosis, visual acuity, extra-ocular movement and conjunctival chemosis. **Results:** The age of the participants ranged from 7 to 77 years with M:F = 6:11. The mean duration of hospital stay was 7.75±2.7 and 8.22±2.53 days in group A and B. The result showed that the changes in the other parameters were significant on the 3rd day after starting treatment in both groups but insignificant between the groups at the end of 7th and 14th day. **Conclusions:** In our study, addition of oral corticosteroids to intravenous antibiotics showed no added beneficial effect over the use of intravenous antibiotics alone in the treatment of orbital cellulitis. However, it was noted that there was no further deterioration of the disease with the use of steroids.

Keywords: Intravenous antibiotics, oral steroids, orbital cellulitis.

*Correspondence:

Dr. Sangeeta Shah
Department of Ophthalmology
BPKIHS, Dharan, Nepal
Email: drsangeetashah@hotmail.com
ORCID: <https://orcid.org/0000-0002-4140-0102>

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INTRODUCTION

Orbital cellulitis is one of the common diseases encountered by the ophthalmologist in day to day practice. It can occur after trauma, surgery, septicemia (hematogenous spread), extension of infection from adjacent ocular and adnexal structures such as dacryocystitis, endophthalmitis, preseptal cellulitis etc.^{1,2} Dental infections can also be a cause for this disease.³ The common causative organisms are Hemophilus influenza, Staphylococcus and Streptococcus.

This disease can occur in all the age group irrespective of gender, the children being more commonly affected. It can lead to visual threatening condition like optic neuropathy and life threatening conditions such as encephal meningitis, cavernous sinus thrombosis, sepsis and intracranial abscess formation.⁴⁻⁷ The primary management strategy is the use of broad spectrum intravenous antibiotics based on empiric coverage of most common causative organisms and surgical drainage in the non-resolving cases or wherever needed.

Use of steroids under coverage of antibiotics, still controversial, has shown faster recovery and decreased complications.⁷⁻⁹ Only few studies have been conducted worldwide and they have shown

that regardless the improvement, there has rarely been an adverse effect with its use. Vancomycin is the first line agent for treatment of the disease. To provide broader spectrum coverage, cefotaxime and metronidazole or clindamycin are typically administered. In case of penicillin allergic patients, vancomycin is given along with fluroquinolone. The introduction of intravenous corticosteroids in orbital cellulitis is still controversial as it may suppress the immune system and worsen the disease. One of the pathogenesis of orbital cellulitis is aggressive inflammation. Use of steroids in orbital cellulitis is to decrease the inflammatory component of the disease and prevent further deterioration from the disease process itself and to recover faster. Not much information has been published regarding this. Thus, the use of corticosteroids may prove to be of beneficial effect halting the inflammatory process and further deterioration of the disease.

Therefore the present study was undertaken to evaluate the effect of oral corticosteroids with adjunct to antibiotics in the treatment of orbital cellulitis. Early diagnosis and prompt treatment of orbital cellulitis are of utmost importance for early recovery and to prevent the dreadful complications.

METHODS

This was a prospective comparative interventional, single-masked study conducted on all the admitted patients in BPKIHS with diagnosis of orbital cellulitis over a 16 months period. The exclusion criteria included subjects not willing to participate in the study, suspected fungal or tubercular infections, cases not responding to standard treatment of intravenous antibiotics, pregnancy and lactating mothers. A total of 20 patients were admitted with diagnosis of orbital cellulitis but only 17 cases fitted with inclusion criteria were taken into the study. After taking informed consent, the detailed clinical history was taken and ocular examination was done as the structured proforma. History related to duration of disease, fever, upper respiratory tract infection, lacrimal outflow obstruction, sinusitis or trauma was queried. The symptoms included pain, redness and swelling of periorbital region. The signs included one or more of the following according to the severity of the disease: conjunctival chemosis, proptosis, ophthalmoplegia and/or loss of vision. Pupillary reactions in the all the patients were normally reactive. The absence of Relative afferent pupillary defect (RAPD) ruled out any involvement of the optic nerve. With an accurate history and clinical examination, ancillary investigations was done which included mainly complete blood count (CBC),

pus (conjunctival and follicles whenever present) and blood cultures and orbital ultrasonography. However, the initiation of treatment for suspected orbital cellulitis was not delayed awaiting for these reports.

The diagnosis of orbital cellulitis was done on the basis of the clinical features and the laboratory investigations. Computed tomography (CT) Scan/ Magnetic resonance imaging (MRI) was done to support the findings of orbital cellulitis, to see its type and to rule out other mimicking pathology like pseudotumors, intraocular/ intraorbital tumors, non-infectious conditions etc. and also to look for any complications due to orbital cellulitis. IRC was obtained from Institutional review board, BPKIHS, Dharan, Nepal (code no: IRC/501) and is in accordance to declaration of Helsinki.

Twenty patients diagnosed as orbital cellulitis were included in the study by purposive sampling method. Initially combination of vancomycin and ceftazidime were administered intravenously to all the selected cases. Injection of vancomycin was given at the dose of 40 mg/kg body weight twice daily in adults and 10 mg/kg body weight twice daily in patients ≤ 18 years of age. Injection of ceftazidime was given at the dose of 100 mg/kg body weight twice daily. All the patients were observed for 24 hours after administration of antibiotics. Among these 20 patients, three patients showed deterioration of symptoms at 48 hours and were excluded from the study. In those three patients, blood culture and sensitivity with other vital tests were repeated and either antibiotics were changed or added accordingly. They showed improvement approximately after a week and were discharged after complete resolution of the disease.

Remaining 17 patients showed improvement or remained static at 24 hours of administration of antibiotics. They were randomly allotted to group A or group B by simple randomization. Cases in group A (n=8) were continued with intravenous antibiotics and those falling in group B (n=9), oral prednisolone acetate of 1 mg/kg/day was added to their treatment along with the antibiotics till their hospital stay. The outcomes of both the groups were measured and recorded in the proforma on, 3rd, 7th and 14th day of admission.

Parameters / Variables studied at each follow up:

Pain: Improvement of the pain was evaluated by using visual analogue scale (VAS). A scale was made ranging from 0 to 10 and the patients were asked to point out the value according to the severity of their pain. It ranged from no symptoms (0) to most severe symptoms (10).

Body Temperature: Body temperature was measured with a thermometer.

Vision: Best corrected visual acuity was measured by using Snellen’s chart. It was graded into two: Grade 1: < 6/60 and Grade 2: > 6/60

Periorbital edema: It was graded at a scale of 0 to 4 according to Pushkar et al.¹⁰

Table 1: Grading of periorbital edema

Grade	Features
4	very severe swelling, very difficult to separate the eyelids
3	severe swelling, eyelids can be separated with some difficulty
2	moderate swelling, patient can separate eyelids by himself or herself
1	mild swelling, patient can easily open eyelids with no difficulty
0	no swelling

Proptosis: Proptosis was measured by Hertel’s exalophthometer. The difference of the values of both eyes were calculated and was graded into mild, moderate and severe and very severe.¹⁰ Grade 0: none, Grade 1: difference of 3 mm, Grade 2: 4-7 mm, grade 3: 8-10 mm, grade 4: difference of >10 mm. Improvement after treatment was noted down by the same procedure.

Conjunctival chemosis: It was graded at a scale of 0 to 3.¹⁰

Table 2: Grading of conjunctival chemosis

Grade	Features
3	conjunctival congestion with prolapsed
2	in between grade 3 and grade 1
1	minimal congestion with faintly detectable conjunctival edema
0	no chemosis

Extraocular movements: Extra ocular movement (EOM) were measured by Kestenbaum limbus test of motility.¹¹ Movement of the contralateral limbus was measured in superior, inferior, lateral and medial directions using a ruler and the measurement were recorded in millimeters. The values in all the directions were summed up and this was compared with the normal eye to get the percentage value of extraocular motility.

The recorded data of all the parameters of day 0, 3, 7 and 14 were analyzed using statistical package for social sciences (SPSS) 12.0. The Fischer Exact test and independent t test were applied to test the significance of variables. A p-value of <0.05 was considered significant.

RESULTS

A total of 17 patients were admitted with orbital cellulitis ranging in age from 7 to 77 years with the median age of 40 years. Male to female ratio was 6:11. All the cases had unilateral presentation of orbital cellulitis with right to left ratio of 7:10. The most common cause of orbital cellulitis

in our study was paranasal sinusitis followed by dental infection and facial folliculitis (nasal area, forehead).

The difference of age, hospital stay and proptosis in group A and B are shown in table 3.

Table 3: Comparison of mean age, duration of disease, hospital stay and proptosis in group A and B

Parameters	Group A	Group B	p-value
Mean age (years)	41.38 ± 22.62	32.89 ± 26.41	0.168
Duration of disease unit	6.75 ± 2.7	9.22 ± 5.19	0.210
Hospital stay (days)	7.75 ± 2.7	8.22 ± 2.53	0.789
Proptosis (mm)	4.38 ± 2.32	5.56 ± 2.40	0.749

The visual acuity in two groups was not significant on day 0 (p=0.08) and on day 14 (p=0.124). However, the cause of decreased vision in three patients was due to globe compression due to orbital cellulitis/abscess leading to refractive error which recovered by the end of 14 days.

The change in temperature in group A and B were insignificant on day 0 and 7 with p-value of 0.984 and 0.748 respectively. At follow up on day 14, all the patients in both the groups had normal body temperature.

The different parameters recorded on day 0, 7 and 14 are shown in table 4 and 5.

Table 4: Comparison of VAS, conjunctival chemosis and periorbital edema between group A and B

Day	VAS			Conjunctival chemosis			Periorbital edema					
	Grade	Group A (8)	Group B (9)	P-value	Grade	Group A (8)	Group B (9)	P-value	Grade	Group A (8)	Group B (9)	P-value
0	2	1	1	0.403	0	0	1	0.708	1	2	1	0.20
	3	3	1		1	5	4		2	3	3	
	4	4	7		2	2	2		3	3	2	
7	2	2	0	0.748	0	1	0	0.750	1	3		
	3	4	0		1	8	1		2	6		
	4	10	1		2	3	1		3	5		
					3	3	0		4	3		

It was also observed that pain, conjunctival chemosis and periorbital edema subsided by the end of one week in all the patients irrespective of the group.

Table 5: Comparison of visual acuity, extra ocular movement and proptosis between group A and B

Day	VAS			Conjunctival chemosis			Periorbital edema					
	Grade	Group A (8)	Group B (9)	P-value	Grade	Group A (8)	Group B (9)	P-value	Grade	Group A (8)	Group B (9)	P-value
0	1	1	5	0.088	2	3	1	0.429	0	1	2	0.345
	2	7	4		3	2	5		1	2	0	
					4	3	3		2	3	2	
7	1	0	4	0.205	0	3		0.279	0	5	2	0.466
	2	8	5		1	2	4		1	2	2	

				2	2	4		2	1	3	
				3	1	1		3	0	1	
								4	0	1	
14	1	0	4	1	7	9		0	8	6	0.529
	2	8	5	0.124	2	1	0	0.471	1	3	

DISCUSSION

The results of our study showed that there was no significant difference of patient recovery at discharge regardless to the treatment done in group A and B. Even though our study did not conclude any beneficial effect of oral prednisolone as an adjunct to intravenous antibiotics, it however showed that addition of steroids did not lead to any deterioration with regard to the disease pathogenesis. At the end of two weeks, almost complete resolution was seen on all the patients regardless of the group. CT scan was done in 12 patients. The rest were not able to undergo the scan due to financial problem. Therefore, outcome of treatment methodology with the disease (Chandler's classification) could not be evaluated. Among the 12 patients, 6 of them were in stage 2 (orbital cellulitis), 4 in stage 3 (subperiosteal abscess) and 2 in stage 4 (intraorbital abscess). Our study showed that female were more than male (M:F= 6:11) which was not consistent with the study done by Nageswaran et al. where male were more than female.¹²

In this study the patients were divided into two groups A(n=8) and B(n=9) by simple randomization. In a study¹⁰ done by Pushkar et al. patients were divided into 1:2 with 7 in group A and 14 in group B (cases treated with adjuvant oral steroids). In that study, antibiotics given were intravenous vancomycin and ceftriaxone and in suspected anaerobic cases, intravenous metronidazole was added. Patients in group two were then given oral steroids after observing improvement with intravenous antibiotics. But in our study, a combination of intravenous vancomycin and ceftazidime were given to all patients of both groups. In group B oral steroids were started after initial positive response to intravenous antibiotics which was after 24 to 48 hours. In two patients, steroids were started on day 3 and 4 respectively as there was a slow improvement in the signs and symptoms of the patients. Though the improvement in fever, pain, periorbital edema, conjunctival chemosis, proptosis, and extraocular motility was statistically not significant, no adverse effect or deterioration of any case with the use of steroids were seen.

None of the patients had recurrence or spread of infection. There was no difference in the final vision attained in both the groups. This finding was similar to other studies which have been done.^{10,13}

Literature on orbital cellulitis with abscess reports that

60% of the cases require surgical drainage.^{13,14} However, in our study, none of the patients required surgical drainage.

The length of the hospital stay was similar in both the groups. According to a study, the mean hospital stay for medically treated patient was six days and for surgically treated it was 11 days.¹⁴ A study by Nwaorgu et al. showed a median of six and half days versus ten days in patients treated with or without intravenous adjuvant steroids.¹⁴ These are dissimilar to our study in which the mean hospital stay in group A and B were 7.75 ± 2.27 and 8.22 ± 2.53 days respectively which was statistically insignificant ($p=0.789$). The study conducted by Yen et al. found that there was a shorter hospitalization and decreased need for surgical drainage and intravenous antibiotics in patients given steroids.¹³ It also concluded that the use of steroids does not adversely affect the final clinical outcomes and maybe beneficial in treatment of pediatric orbital cellulitis with subperiosteal abscess.

A study conducted by Pushkar et al. and Yen et al. showed significant faster recovery with no deterioration with the use of systemic corticosteroids.^{10,13} Though our study did not show statistically significant improvement when compared, but we did observe that clinically the patients of group B had faster recovery in terms of pain, chemosis, proptosis, periorbital edema.

A retrospective study conducted by Yen et al. reviewed the use of IV steroids in pediatric patients with orbital cellulitis and subperiosteal abscess.¹³ Twelve patients received IV corticosteroids and 11 did not. The group receiving steroids showed a trend toward shorter hospital stay but the results were statistically insignificant. This study strengthens the fact that the steroids did not adversely affect the clinical outcomes which is similar to our study. A prospective, comparative interventional study was done in pediatrics groups of orbital cellulitis where C-Reactive Protein was measured daily as a biomarker of inflammation and when below 4 mg/dl the patients were started on oral prednisolone 1 mg/kg per day for seven days.¹⁵ Out of 31 children, 24 received oral steroids while seven did not. Males were more than female. Thirteen children from the group receiving steroids and two from the group not receiving steroids underwent surgical drainage. There was one case in each group of recurrence of symptoms after discharge from the hospital. At the last visit, all patients returned to their baseline ophthalmic examination.

Literatures have shown that steroids has beneficial effect in acute bacterial meningitis by reducing cerebrospinal fluid, meningeal inflammation, brainstem encephalopathy and other neurologic sequelae with no adverse effects.¹⁶⁻¹⁸ It has

been given in brain abscess with positive response.¹⁹ It has also been used in chronic sinusitis,²⁰ in cases of tubercular meningitis²¹ and septicemia^{22,23} without any adverse effect. Some studies prove that timely use of steroids probably helps in controlling the inflammation therefore reducing related morbidity.^{24,25} However, the use of corticosteroids in orbital cellulitis still remains controversial. From different studies, it has been found that the timing and duration of corticosteroids should be monitored cautiously.¹⁰

CONCLUSIONS

The study showed additional therapy with corticosteroid did not have any effect with regard to the recovery of orbital cellulitis. However, it adds to the fact that there is no deterioration of the disease with the use of oral corticosteroids and there are no side effects of steroids during the treatment course. The limitation of the study was less sample size and outcome measurement according to grading of orbital cellulitis. More case control studies should be carried out for better results.

CONFLICTS OF INTEREST: None declared

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REFERENCES

- Harris GJ. Subperiosteal abscess of the orbit. *Arch Ophthalmol.* 1983;101(5):751-7. DOI:10.1001/archophth.1983.01040010751010 PMID: 6847463.
- Chandler JR, Langenbrunner DJ, Stevens ER: The pathogenesis of orbital complications in acute sinusitis. *Laryngoscope.* 1970;80:1414-23. DOI: 10.1288/00005537-197009000-00007 PMID: 5470225.
- Howe L, Jones NS. Guidelines for the management of periorbital cellulitis/abscess. *Clin Otolaryngol.* 2004;29:725-8. DOI: 10.1111/j.1365-2273.2004.00889.x PMID: 15533168.
- Gracia GH, Harris GJ. Criteria for nonsurgical management of subperiosteal abscess of the orbit: analysis of outcomes 1988-1998. *Ophthalmology.* 2000;107:1454-6. DOI: 10.1016/s0161-6420(00)00242-6 PMID: 10919887.
- Greenberg MF, Pollard ZF. Medical treatment of pediatric subperiosteal orbital abscess secondary to sinusitis. *J AAPOS.* 1998;2:351-5. DOI: 10.1016/s1091-8531(98)90033-7 PMID: 10532723.
- Sajjadian A, Chundru U, Issacson G. Prospective application of a protocol for selective non-surgical management of suspected orbital subperiosteal abscesses in children. *Ann Otol Rhinol Laryngol.* 1999;108:459-62. DOI: 10.1177/000348949910800507 PMID: 10335706.
- Rubin SE, Slavin ML, Rubin LG: Eyelid swelling and erythema as the only signs of subperiosteal abscess. *Br J Ophthalmol.* 1989;73:576-8. DOI: 10.1136/bjo.73.7.576 PMID: 2758001.
- Cable BB, Wassmuth Z, Mann EA et al. The effect of corticosteroids in the treatment of experimental sinusitis. *Am J Rhinol.* 2000;14:217-22. DOI: 10.2500/105065800779954400 PMID: 10979493.
- Wallwork B, Coman W, Feron F, Mackay-Sim A, Cervin A. Clarithromycin and prednisolone inhibit cytokine production in chronic rhinosinusitis. *Laryngoscope.* 2002;112:1827-30. DOI: 10.1097/00005537-200210000-00022 PMID: 12368623.
- Pushker N, Tejwani LK, Bajaj MS, Khurana S, Velpandian T, Chandra M. Role of oral corticosteroids in orbital cellulitis. *Am J Ophthalmol.* 2013;156(1):178-83. DOI: 10.1016/j.ajo.2013.01.031 PMID: 23622565.
- Kestenbaum A. Clinical methods of Neuro-ophthalmologic examination. 2nd ed. New York: Grune and Steatton; 1961. p237.
- Nageswaran S, Woods CR, Benjamin DK Jr, Givner LB, Shetty AK. Orbital cellulitis in children. *Pediatr Infect Dis J.* 2006;25:695-9. DOI: 10.1097/01.inf.0000227820.36036.f1 PMID: 16874168.
- Yen MT, Yen KG. Effect of corticosteroids in the acute management of pediatric orbital cellulitis with subperiosteal abscess. *Ophthal Plast Reconstr Surg.* 2005;21(5):363-6. DOI: 10.1097/01.iop.0000179973.44003.f7 PMID: 16234700.
- Yang M, Qyah BL Seah LL, Looi A. Orbital cellulitis in children-medical treatment versus surgical management. *Orbit.* 2009;28(2-3):124-36. DOI: 10.1080/01676830902765891 PMID: 19839897.
- Davies BW, Smith JM, Hink EM, Durairaj VD. C-reactive protein as a marker for initiating steroid Surg treatment in children with orbital cellulitis. *Ophthal Plastic Reconstr.* 2015;31(5):364-8. DOI: 10.1097/IOP.0000000000000349 PMID: 25393908.
- deGans J, van de Beek D. European Dexamethasone in Adulthood bacterial meningitis study investigators. Dexamethasone in adults with bacterial meningitis. *N Engl J Med.* 2002;347(20):1549-56. DOI: 10.1056/

NEJMoa021334

17. McIntyre PB, Berkey CS, King SM, Schaad UB, Kilpi T, Kanra GY, et al. Dexamethasone as adjunctive therapy in bacterial meningitis. A meta-analysis of randomized clinical trials since 1988. *JAMA*. 1997;278(11):925-31. DOI: 10.1001/jama.278.11.925 PMID: 9302246.
18. Quagliarello VJ, Scheld WM. Treatment of bacterial meningitis. *N Engl J Med*. 1997;336(10):708-16. DOI: 10.1056/NEJM199703063361007 PMID: 9041103.
19. Victor M, Adams R. Infections of nervous system. In: Ropper AH, Brown RH, eds. *Adams and Victor's Principles of Neurology*. 8th ed. New York: The McGraw Hill Co;2005:592-630.
20. Ramadan HH. Corticosteroids therapy during endoscopic sinus surgery in children: is there a need for a second look? *Arch Otolaryngol Head Neck Surg*. 2001;127:188-192. DOI:10.1001/archotol.127.2.188
21. Thwaites GE, Nguyen DB, Nguyen HD, et al. Dexamethasone for the treatment of tuberculous meningitis in adolescents and adults. *N Engl J Med*. 2004;351(17):1741-1751. doi: 10.1056/

NEJMoa040573. PMID: 15496623.

22. Katzung BG. Adrenocorticosteroids and adrenocortical antagonists. In: Chrousos GP, ed. *Basic and clinical pharmacology*. 9th ed. New York: The McGraw Hill CO; 2004:641-660.
23. Migirov L, Eyal A, Kronenberg J. Treatment of cavernous sinus thrombosis. *Isr Med Assoc J* 2002;4(6):468-469. PMID: 12073429.
24. Scheld WM, Dacey RG, Winn HR, Welsh JE, Jane JA, Sande MA. Cerebrospinal fluid outflow resistance in rabbits with experimental meningitis. Alterations with penicillin and methylprednisolone. *J Clin Invest* 1980;66(2):243-253. doi: 10.1172/JCI109850. PMID: 6995482.
25. Tauber MG, Khayam-Bashi H, Sande MA. Effects of ampicillin and corticosteroids on brain water content, cerebrospinal fluid pressure and cerebrospinal fluid lactate levels in experimental pneumococcal meningitis. *J Infect Dis*. 1985;151(3):528-534. DOI: 10.1093/infdis/151.3.528. PMID: 3973406.

Assessment of distribution of clinically undetectable mucogingival junction in mandibular anterior region: A single-institutional study

Soni Bista*¹, Rebicca Ranjit¹, Suraksha Subedi¹, Bijayata Shrestha²

¹Department of Periodontology and Oral Implantology, ²Department of Oral Pathology, Gandaki Medical College Teaching Hospital & Research Center, Pokhara, Nepal

ABSTRACT

Introduction: The mucogingival junction is considered one of the vital anatomic structures that mark the apical termination of the attached gingiva. However, due to various pathologies and conditions, it can be undetectable. This study aimed to assess the distribution of patients having teeth without clinically detectable mucogingival junction in mandibular anteriors. Various etiologies leading to clinically undetectable mucogingival junction were also identified. **Methods:** This cross-sectional study involved 312 patients who visited the department of Periodontics of Gandaki Medical College Teaching Hospital and Research Center, Pokhara from July 26 to November 26, 2022. The visual method, rolling probe method, tension test and histochemical staining were used to detect the mucogingival junction. To ascertain the relationship between age and gender with the distribution of data, descriptive analysis and the Pearson Chi-square test was used. A p-value <0.05 was considered statistically significant. **Results:** The majority of the patients 242(77.6%), had clinically detectable mucogingival junction, whereas the remaining 70(22.4%) didn't show its absence. Gingival recession, keratosis, deep pockets, and aberrant frenal attachment were all common etiologic factors for clinically undetectable mucogingival junction. Statistically significant number of male patients from age group above 45 years presented with clinically undetectable mucogingival junction. **Conclusions:** Nearly one-third of the study population presented with clinically undetectable mucogingival junction, which provides baseline data to determine the periodontal health of the study population and can represent as one of the significant diagnostic clues.

Keywords: Attached gingiva, baseline data, gingival recession, mucogingival junction.

*Correspondence:

Dr. Soni Bista
Department of Periodontology and Oral Implantology
Gandaki Medical College Teaching Hospital and Research Center
Pokhara, Nepal
Email: sonibista12345@gmail.com
ORCID iD: <https://orcid.org/0000-0002-2401-8091>

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INTRODUCTION

The mucogingival junction (MGJ) is an anatomical structure present in oral mucosa except the palatal surface. It is defined as a scalloped line separating the gingiva from the alveolar mucosa.¹ MGJ often serves as a clinical landmark in periodontal evaluation, specifically to determine the width of the attached gingiva. It can be identified by various methods including visual method, tension test, functional method, using Lugol's iodine solution, etc.²⁻⁴

Recently Tarnow et al.⁵ suggested new definitions for attached gingiva considering locations of MGJ, alveolar crest, and base of the intrabony defect around healthy and diseased teeth and implants. Hence, it can be considered an important landmark in determining periodontal health. It is well known that reduced periodontium secondary to periodontitis, advanced recession, or the presence of deep pockets leads to loss of tissue upto and beyond MGJ.⁶ These conditions make MGJ clinically non-detectable. Some conditions like the malpositioning of teeth, severe abrasion, abnormal frenal attachments, and abnormal habits may lead to marginal tissue recession beyond MGJ, making it undetectable.⁷ During the literature

review, we could not obtain any directed study exactly to report the absence of clinically detectable MGJ. However, various studies considered zero width of attached gingiva, immobile mucosa, or keratinized gingiva as an equivalent to the absence of MGJ.⁸

In light of the above reasons, and the paucity of such studies on Nepalese patients, it is important to have epidemiological data to estimate the distribution of such clinical landmarks during periodontal evaluation. Therefore, this study was conducted to assess the distribution of patients having teeth without clinically detectable MGJ on the labial aspect in mandibular anteriors and identify the etiologic factors.

METHODS

This descriptive cross-sectional study was conducted for four months (26 to November 26, 2022) in department of Periodontology and Oral Implantology of Gandaki Medical College Teaching Hospital and Research Centre (GMCTHRC) Pokhara, Nepal. Ethical approval was taken from the Institutional Review Committee of GMCTHRC. (Reference number 163/79/80. Informed consent was obtained from the participants before beginning of the study. The inclusion criteria of this study were patients (i) with permanent dentition having all the teeth present in mandibular anteriors (ii) with/without periodontal diseases and (iii) those who were willing to participate. Patients with mental and physical disabilities, uncontrolled systemic conditions, smokers, pregnant women, and those who were allergic to iodine or related products were excluded.

Convenience sampling was utilized for the study and the sample size was calculated based on a study conducted by Baghele et al.⁸

$$N = Z^2 p \times q / e^2$$

Where,

N= sample size

Z= 1.96 for 95% confidence level,

p= prevalence of absence of MGJ (24.54%)

e= permissible error (5%)

q= complement of p (100-24.54%)

Thus,

$$N = (1.96)^2 \times 24.54\% \times 75.46 / (5)^2 = 284$$

Adding a 10% non-respondent rate, the total sample size of 312 was calculated. Patients who fulfilled the inclusion criteria were selected for the study. After explaining the nature of the study, the demographic details of the participants were recorded. Under the strict aseptic conditions, MGJ was clinically assessed by using the

following four different methods:

1. Visual method (VM)¹: VM assessment was based on the color difference between the attached gingiva and alveolar mucosa. The mucosa beyond MGJ is darker red than that of the attached gingiva which is separated by scalloped MGJ (Figure 1).



Figure 1: Visual method for detecting mucogingival junction

2. Tension test (TT):^{2,3} This was done by stretching the lip or cheek in outward, downward/upward, and lateral directions. The gingival margin was then observed for any movement of the free gingiva. Any observable movement of the free gingival margin while stretching lips/cheeks indicated positive TT with inadequate attached gingiva and absence of MGJ.

3. Rolling probe method (RP) or functional method:³ MGJ was assessed as a borderline between alveolar mucosa and attached gingiva. Tissue mobility was elicited by pushing the adjacent alveolar mucosa coronally with a blunt end of the University of North Carolina-15 (UNC-15) probe. If the tissues moved with the instrument without a definite tissue stop coronally, then the width of attached gingiva was considered to be inadequate with the absence of MGJ. The fold formation of loose movable tissue during coronal movement with a definite coronal stop indicated the presence of MGJ.

4. Using Lugol's iodine (LI) solution:⁹ The staining of the mucogingival complex with 5% LI solution is based on the difference in the glycogen content. The attached gingiva is keratinized with no glycogen in the most superficial layer and gives an iodine-negative reaction. Thus, LI solution stains only the alveolar mucosa and demarcates the MGJ. If the whole of the marginal tissue got stained, it was considered as the absence of MGJ. The LI 5% solution (SRL Pvt. Ltd.) was thoroughly applied with a cotton pellet with light-pressure burnishing technique on the patient's gingiva and alveolar mucosa till a sharp demarcation between keratinized tissue and alveolar mucosa was observed (Figure 2).



Figure 2: Staining the mucosa using Lugol's iodine solution

Out of these methods, if MGJ was appreciated in all four methods then it is considered to be present and clinically detectable. Similarly, if MGJ was not detected in any of the four methods, then it will be considered absent and clinically undetectable. In addition to this, the various etiologic factors responsible for absence of MGJ were also assessed.¹⁰⁻¹⁹

The data collected by a single periodontist using predetermined subject proforma. The collected data were entered into the excel sheet and analyzed using the statistical package for the social sciences (SPSS) version 16.0. Univariate analysis was done including frequencies and percentage of the demographic data. The presence or absence of MGJ and the etiologic factor for the absence of MGJ were calculated. Pearson Chi-square analysis test was used to determine the association between MGJ with age and gender where p-value <0.05 was considered statistically significant.

RESULTS

A total of 312 participants were studied in the study. The mean age was 37.60 years. Nearly one-third 70 (22.4%) of the examined patients presented the absence of clinically detectable MGJ. Among the various etiologic factors for the absence of mucogingival junction, gingival recession 47(15.1%) was found to be the commonest cause. (Table 1)

Table 1: Demographic details of the study patients (N=312)

Demographic details	Frequency(%)
Age	
18-29	120(38.5%)
30-45	100(32.1%)
>45	92(29.5%)
Gender	
Male	128(41%)
Female	184(59%)
Mucogingival junction	
Present	242(77.6%)
Absent	70(22.4%)
Etiological factors	
Gingival recession	47(15.1%)
Pocket beyond MGJ	6(1.9%)
Abnormal frenal attachment	2(0.6%)
Miscellaneous	15(4.8%)

Additionally, in our study, out of 1872 teeth examined, 1720(91.8%) of the teeth showed clinically detectable mucogingival junction, whereas 152(8.1%) of teeth showed its absence. Among patients with clinically detectable mucogingival junction, 297(95.2%) of the teeth showed its presence at the left lateral incisor. Further, 34(10.9%) of the teeth showed an absence in the left canine (Table 2).

Table 2: Presence or absence of mucogingival junction based on individual teeth

Mucogingival junction	Mandibular anterior teeth: n(%)					
	31	32	33	41	42	43
Clinically detectable	282 (90.4%)	297 (95.2%)	278 (89.1%)	284 (91%)	296 (94.9%)	283 (90.7%)
Clinically undetectable	30(9.6%)	15(4.8%)	34(10.9%)	28(9%)	16(5.1%)	29(9.3%)

Agewise association with MGJ revealed, 111(45.87%) patients between 18 to 29 years had clinically detectable mucogingival junction, whereas 45(64.28%) patients above 45 years showed its absence. This association was found to be statistically significant (p<0.05). Similarly, gender-wise association with MGJ showed a majority of females 155(64.04%) had clinically detectable mucogingival junction compared to males 87(35.95%), which was statistically significant (p<0.05) (Table 3).

Table 3: Association between age and gender with MGJ

	Presence of MGJ	Absence of MGJ	p-value
Age			
18-29	111(45.87%)	9(12.86%)	
30-45	84(34.71%)	16(22.86%)	
>45	47(19.42%)	45(64.28%)	0.001*
Gender			
Male	87(35.95%)	41(58.57%)	
Female	155(64.04%)	29(41.42%)	0.001*

*Signifies statistically significant

DISCUSSION

This study was a unique attempt to determine the proportion of patients having teeth without clinically discernible MGJ in mandibular anterior region. We also evaluated the etiologic variables for the absence of MGJ. Because it serves as an important anatomical structure for measuring the width of attached gingiva, the MGJ is regarded as a significant clinical landmark. An improved level of protection from stress and insults is correlated with the existence of an adequate amount of attached gingiva. Additionally, it serves as the most important diagnostic hint for determining the likelihood of successful periodontal therapy.²⁰ However, we only came across a relatively small number of studies that dealt explicitly with the lack of clinically detectable MGJ in the literatures.^{8,21}

In the current study, MGJ was recognized in 77.6% of patients, while 22.4% of patients demonstrated its absence. This outcome was remarkably comparable to that of Baghele et al.⁸ who found that 75.4% of their patients had MGJ and 24.6% did not. Additionally, in our investigation, 1720(91.8%) of the 1872 teeth evaluated revealed clinically detectable MGJ, while 152(8.1%) of the teeth did not. The proportions of the absence of MGJ were higher than those of the study by Baghele et al.⁸ which found that 91(2.5%) of the teeth lacked MGJ. More evidence in favour of this was provided by Gliksberg et al.²² who discovered that only 1% of the teeth showed absence of MGJ. This difference seems more than plausible when taking into account our study's subjects and its design.

Additionally, the causes of teeth that had clinically undetectable MGJ were identified. It included gingival recession,¹⁰ pocket depth beyond MGJ,¹¹ parafunctional habits,¹² malpositioned teeth,^{13,14} trauma,¹⁵ severe abrasion,¹⁶ abnormal frenal attachments,¹⁷ and any other abnormalities (tobacco pouch keratosis, leukoplakia, desquamated gingivitis, and chemical).^{18,19} Among the various etiologic factors recorded, gingival recession was found to be the most prevalent cause. This outcome demonstrates resemblance to the research done by other study.²³ Miller's Classes II, III, and IV gingival recession show an expansion of marginal tissue to or beyond MGJ, causing MGJ to be clinically undetectable.¹⁰ However, compared to another study⁸ of a comparable nature, our study found a higher rate of gingival recession. Additionally, few individuals showed lack of clinically discernable MGJ brought on by other abnormalities like tobacco pouch keratosis and leukoplakia, which is in line with the results of other investigations.^{18,19} Conversely, this was not identified in the study by Baghele et al.⁸

In the current study, the presence of MGJ was significantly more common in patients belonging to 18 to 29 years whereas its absence was more frequent in patients belonging above 45 years. This finding was supported by previous studies,^{20,23} where different types of mucogingival problems can be seen with increasing age. It possibly indicates that youths tend to be more concerned about aesthetics and are more aware of their oral health when compared to older adults.²⁴ Similarly, when the prevalence of the presence of MGJ was compared genderwise, we found it more prevalent among females, which was statistically significant. This finding was in accordance with another study.⁸ This indicates that women are more concerned with maintaining good oral hygiene for optimal periodontal health.²⁵

Periodontitis in mandibular anterior teeth most often leads to horizontal destruction of the periodontium. This was perceived in the previous study conducted by Baghele et al.⁸ as they stated that 88% of their patients had lower anterior teeth (canine to canine) which were highly affected. Therefore, we observed the presence or absence of MGJ in mandibular anterior teeth. In our study, mandibular canines were more affected by mucogingival problems followed by central incisors and lateral incisors. On the contrary, the results from the previous study⁸ showed that mandibular central incisors were more affected by mucogingival problems leading to an absence of MGJ. This was consistent with the findings by Humagain et al.²³ The variation in the results could be the result of different sample sizes.

The limitations of this study are that the findings cannot be generalized to whole population. The relative merits of the four approaches used in this study to determine whether MGJ was present or not were not considered. However, the findings of this study can serve as baseline information to assess periodontal health and can also serve as one of the key diagnostic marker for determining the prognosis of periodontal treatment.

CONCLUSIONS

Nearly one-third of the study population presented the absence of clinically detectable MGJ, which suggests the initiation of mucogingival deformities and conditions. Timely recognition of such circumstances and management of the etiologic factors is necessary to maintain a healthy periodontium.

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REFERENCES

1. Orban B. Clinical and histologic study of the surface characteristics of the gingiva. *Oral Surg Oral Med Oral Pathol.* 1948;1(9):827-41. DOI: 10.1016/0030-4220(48)90014-0 PMID: 18880859.
2. Vincent JW, Machen JB, Levin MP. Assessment of attached gingiva using the tension test and clinical measurements. *J Periodontol.* 1976;47(7):412-4. DOI: 10.1902/jop.1976.47.7.412 PMID: 1065738.
3. Guglielmoni P, Promsudthi A, Tatakis DN, Trombelli L. Intra- and inter-examiner reproducibility in

- keratinized tissue width assessment with 3 methods for mucogingival junction determination. *J Periodontol.* 2001;72(2):134-9. DOI: 10.1902/jop.2001.72.2.134 PMID: 11288784.
4. Pietrokovski J, Massler M. Ridge remodelling after tooth extraction in rats. *J Dent Res.* 1967;46(1):222-31. DOI: 10.1177/00220345670460011501 PMID: 5226389.
 5. Tarnow D, Hochman M, Chu S, Fletcher P. A new definition of attached gingiva around teeth and implants in healthy and diseased sites. *Int J Periodontics Restorative Dent.* 2021;41(1):43-9. DOI: 10.11607/prd.5195 PMID: 33528450.
 6. Dodwad V. Etiology and severity of gingival recession among young individuals in Belgaum district in India. *Ann Dent Univ Malaya.* 2001;8:1-6. DOI: 10.22452/adum.vol8no1.1
 7. Gorman WJ. Prevalence and etiology of gingival recession. *J Periodontol.* 1967;38(4):316-22. DOI: 10.1902/jop.1967.38.4.316 PMID: 5230025.
 8. Baghele ON, Bezalwar KV. A study to evaluate the prevalence of teeth without clinically detectable mucogingival junction. *J Indian Soc Periodontol.* 2022;26(2):162-8. DOI: 10.4103/jisp.jisp_808_20 PMID: 35321301.
 9. Weinmann JP, Meyer J, Mardfin D, Weiss M. Occurrence and role of glycogen in the epithelium of the alveolar mucosa and of the attached gingiva. *Am J Anat.* 1959;104:381-402. DOI: 10.1002/aja.1001040304 PMID: 13843601.
 10. Pini Prato G. The Miller classification of gingival recession: limits and drawbacks. *J Clin Periodontol.* 2011;38(3):243-5. DOI: 10.1111/j.1600-051X.2010.01655.x. PMID: 21158897.
 11. Henry H, Takei E, Todd S, Robert R, Azzi EP, Edgard PA. Periodontal plastic and esthetic surgery. In: Newman MG, Takei HH, Klokkevold PR, Carranza FA, editors. *Carranza's Clinical Periodontology.* 11th ed. Estados Unidos: Elsevier Saunders; 2012. p. 595-600.
 12. Stewart DJ. Minor self-inflicted injuries to the gingivae: Gingivitis artefacta minor. *J Clin Periodontol.* 1976;3:128-32. DOI: 10.1111/j.1600051x.1976.tb01859.x. PMID: 1064596.
 13. Maynard JG, Ochsenbein C. Mucogingival problems, prevalence and therapy in children. *J Periodontol.* 1975;46:543-51. DOI: 10.1902/jop.1975.46.9.543 PMID: 1057647.
 14. Rose ST, App GR. A clinical study of the development of the attached gingiva along the facial aspect of the maxillary and mandibular anterior teeth in the deciduous, transitional and permanent dentitions. *J Periodontol.* 1973;44:131-9. DOI: 10.1902/jop.1973.44.3.131 PMID: 4510657.
 15. Rawal SY, Claman LJ, Kalmar JR, Tatakis DN. Traumatic lesions of the gingiva: A case series. *J Periodontol.* 2004;75:762-9. DOI: 10.1902/jop.2004.75.5.762 PMID: 15212360.
 16. Danser MM, Timmerman MF, IJzerman Y, Bulthuis H, van der Velden U, van der Weijden GA. Evaluation of the incidence of gingival abrasion as a result of toothbrushing. *J Clin Periodontol.* 1998;25:701-6. DOI: 10.1111/j.1600-051X.1998.tb02510.x PMID: 9763324.
 17. Priyanka M, Sruthi R, Ramakrishnan T, Emmadi P, Ambalavanan N. An overview of frenal attachments. *J Indian Soc Periodontol.* 2013;17:12-5. DOI: 10.4103/0972-124X.107467 PMID: 23633765.
 18. Rafiuddin S, Pradeep Kumar YG, Biswas S, Prabhu SS, Chandrashekar BM, Rakesh MP. Suppl 1: M13: Iatrogenic damage to the periodontium caused by orthodontic treatment procedures: An overview. *Open Dent J.* 2015;9:228-34. DOI: 10.2174/1874210601509010228 PMID: 26312093.
 19. Gunsolley JC, Quinn SM, Tew J, Gooss CM, Brooks CN, Schenkein HA. The effect of smoking on individuals with minimal periodontal destruction. *J Periodontol.* 1998;69:165-70. DOI: 10.1902/jop.1998.69.2.165 PMID: 9526915.
 20. Bowers GM. A study of the width of attached gingiva. *J Periodontol.* 1963;34(3):201-9. DOI: 10.1902/jop.1963.34.3.201
 21. Cortellini P, Bissada NF. Mucogingival conditions in the natural dentition: Narrative review, case definitions, and diagnostic considerations. *J Periodontol.* 2018;89 Suppl 1:S204-S213. DOI: 10.1002/JPER.16-0671 PMID: 29926948.
 22. Gliksberg JH, Mintz A, Hochberg MS, Sher MR. The incidence of mucogingival defects: Report of case. *J Am Dent Assoc.* 1989;119:625-6. DOI: 10.1016/s0002-8177(89)95015-0 PMID: 2607063.
 23. Humagain, M, Kafle, D. The Evaluation of Prevalence, Extension and Severity of Gingival Recession among

- Rural Nepalese Adults. *Orthodontic Journal of Nepal*. 2013;3(1); 41-6. DOI: 10.3126/ojn.v3i1.9281
24. Nakata H, Masaki Y, Watanabe Y, Ohkubo M, Sugiyama T, Kobayashi K. Relationship between Knowledge and Attitude toward Oral Function in Middle-Aged and Older Adults. *Int J Dent*. 2022;2022:1-9. DOI: 10.1155/2022/3503644
25. Rajeh MT. Gender differences in oral health knowledge and practices among adults in Jeddah, Saudi Arabia. *Clin Cosmet Investig Dent*. 2022;14:235-44. DOI: 10.2147/CCIDE.S379171

Multidrug resistant and extended spectrum β -lactamase producing gram negative bacterial uropathogens among females in a tertiary hospital, Pokhara

Raju Pandey¹, Samjhana Bhattarai¹, Binita Subedi¹, Rajan Paudel¹, Bipin Chapagain¹, Suresh Jaiswal¹, Bishnu Raj Tiwari*¹

¹School of Health and Allied Sciences, Faculty of Health Sciences, Pokhara University, Kaski, Nepal

ABSTRACT

Introduction: Extended spectrum β -lactamase producing gram negative bacilli has emerged and spread worldwide as an important cause of urinary tract infections and indicates a major threat. The study aimed to determine the prevalence of multidrug resistant and extended spectrum beta-lactamase producing gram negative bacterial uropathogens among females in a tertiary level hospital. **Methods:** A hospital-based cross-sectional study was conducted in Pokhara Academy of Health Sciences, Pokhara from February to November, 2019. A total number of 301 midstream urine samples were collected and examined using MacConkey agar and blood agar medium. Antimicrobial susceptibility testing was done by Kirby Bauer disk diffusion method on Mueller Hinton agar using Clinical and Laboratory Standards Institute guidelines. **Results:** Out of 301 mid-stream urine samples, 99(33%) sample showed significant bacterial growth. Among them, 78(79%) were gram negative bacteria. Escherichia coli were the predominant organism. Multidrug resistant gram negative isolates were 65.4%. Among 78 Gram negative isolates, 31(39.7%) were extended spectrum β -lactamase producers. Among extended spectrum β -lactamase producers, 27(87.1%) were MDR. Highest frequency of extended spectrum β -lactamases production was seen in E. coli, 23(74.2%). Majority of gram negative bacteria showed susceptibility toward colistin and nitrofurantoin. Ampicillin was found to be highly resistant towards gram negative uropathogen. **Conclusions:** This study found that higher proportion of multi-drug resistants were among gram negative isolates and further more among extended spectrum β -lactamase producing gram negative isolates. Thus, there is urgent need to address the issue of antimicrobial resistant and promote rational use of the antibiotics in our region.

Keywords: Extended spectrum β -lactamase, gram negative isolates, multidrug resistant, urinary tract infection.

*Correspondence:

Dr. Bishnu Raj Tiwari
School of Health and Allied Sciences, Faculty of Health Sciences
Pokhara University, Kaski, Nepal
Email: bishnurajtiwari@gmail.com

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INTRODUCTION

Urinary tract infection (UTI) is a type of microbial infection that affects the urinary tract. It is categorized as upper UTI or lower UTI on the basis of anatomical classification and symptomatic or asymptomatic UTI on the basis of clinical diagnosis.¹ Bacterial colony count $\geq 10^5$ CFU/ml is considered as significant bacteria.² Major causative agents of UTI are Escherichia coli, Klebsiella spp., Proteus spp., Staphylococcus aureus, coagulase negative Staphylococcus, Pseudomonas aeruginosa and Citrobacter spp.^{3,4} Urinary tract infection (UTI) is the second most common bacterial infection, accounting for 25% of all the infections. It results from the invasion of the bacteria into the urinary tract, either from an endogenous source or an exogenous source. Females are more likely than males to develop UTI due to a shorter urethra, facilitating the bacteria to enter into the bladder more easily, closer proximity to the anus and the absence of prosthetic secretions.^{3,5}

Every year, about 150 million people worldwide are diagnosed with UTI. *Escherichia coli* (*E. coli*) alone accounts for 80 to 90% of urinary tract infections.⁶ In addition, antibiotic resistance of urinary tract pathogens has been known to increase worldwide, especially to commonly used anti-microbials. The pattern of antibiotic resistance may vary over time and also depends on the site of isolation and environmental conditions.⁷ The majority of the problems associated with antimicrobial resistance have been shown to be due to the presence of transferable plasmids encoding multidrug resistance and their dissemination among different bacterial species.⁸

Multidrug resistant isolates have emerged as major complications in the therapeutic management of patients with infectious diseases.⁹ The evolution of beta-lactamases mediated resistance by extended spectrum β -lactamase (ESBL)-producing bacteria has been associated with increased and irrational use of antibiotics, particularly the 3rd generation of cephalosporins.¹ ESBLs are defined as enzymes produced by certain bacterial pathogens that are capable of hydrolyzing penicillin, broad and extended spectrum cephalosporin and monobactams and are inhibited by clavulanic acid. In addition, ESBLs producing organisms are frequently resistant to many other class of antibiotics including aminoglycosides and fluoroquinolones. Thus, treatment of this infection is often a therapeutic challenge. ESBLs was first detected among *Klebsiella* spp and then later among *E. coli*, *P. aeruginosa* and *Serratia* spp. and other gram negative bacilli.¹⁰

ESBLs are plasmid-borne and evolved from point mutations that altered the configuration of the beta lactamases, active site. They were first isolated in 1983 in Germany.¹¹ Most ESBLs can be classified into 4 major groups: temoneira (TEM), sulfhydryl variant (SHV), cefotaximase munich (CTX-M) and oxacillinase (OXA). However, other groups of ESBLs, such as VEB, PER, GES, TLA, IBC, SFO-1, BES-1, and BEL-1, have also been reported.¹²

This study was undertaken to determine the prevalence of MDR and extended spectrum beta-lactamase producing gram negative bacterial uropathogens among females.

METHODS

This hospital-based cross-sectional study was carried out at the Pokhara Academy of Health Sciences, Pokhara, Nepal, from February to November 2019. A total of 301 midstream urine samples were collected in well-labelled, screw-capped sterile containers and examined using standard microbiological techniques. Samples from both symptomatic and asymptomatic females were included in

the study. Urine collected from the catheter was excluded. The further processing of the sample was done according to standard procedures. Urine sample was cultured in MacConkey agar and blood agar medium by a semi-quantitative culture technique using a standard loop. Culture media were inoculated and incubated aerobically at 37°C for 24 hours. Following the incubation, the total number of colony-forming unit per millilitre (CFU/ml) of urine was estimated in accordance with the volume of urine inoculated previously, and the total count per millilitre was calculated.

The bacterial count was reported as following¹: less than 10⁴ CFU/ml organisms=insignificant bacteriuria, 10⁴-10⁵ CFU/ml organisms=low count significant bacteriuria, and more than 10⁵ CFU/ml organisms=significant bacteriuria. On the culture plate showing significant growth, bacterial colony morphology, staining reaction, and biochemical properties were followed for identification of bacteria. Mueller Hinton Agar (MHA) was used for antimicrobial susceptibility testing by the Kirby Bauer disk diffusion method. Antibiotics were chosen according to Clinical and Laboratory Standards Institute (CLSI) guidelines. ampicillin (10 mcg), amikacin (30 mcg), ceftriaxone (30 mcg), ceftazidime (30 mcg), ceftazidime-clavulanic acid (30 mcg/10 mcg), ciprofloxacin (5 mcg), colistin (10 mcg), imipenem (10 mcg) and nitrofurantoin (300 mcg) antibiotics were used. The plates were incubated at 37°C for 24 hours and examined. Sensitive, intermediate and resistance of the test organism to each antibiotics were noted.¹³

The multidrug resistance pattern of the isolates was identified by observing the resistance pattern of the isolates to the antibiotics of three or more than three classes.⁴

All MDR gram negative bacteria were tested for ESBLs. Isolates showing inhibition zone size ≤ 22 mm with ceftazidime and ≤ 27 mm with cefotaxime were identified as potential ESBL producers.¹⁴ In this study, disc of ceftazidime (30mcg), disc of ceftazidime and clavulanic acid (30mcg/10mcg) were used for the confirmation of ESBLs producing strains. Discs were placed at 25mm apart, centre to centre, on a lawn culture of the test isolate on MHA plate and incubated overnight at 37°C. An increase of more than 5 mm in the diameter of the inhibition zone in combination with clavulanic acid versus its zone when tested with antibiotics alone confirmed ESBLs.^{4,14}

Ethical approval was taken from the Institutional Review Committee (IRC), Pokhara University (Ref.no.46/076/077). Informed consent was taken from the participants who

were enrolled in this study. Data entry was done in microsoft office excel 2013. Data cleaning and statistical analysis were done using statistical packages for the sciences (SPSS) version 20.0. Frequency and percentages were computed, and a diagrammatical presentation was done.

RESULTS

Out of 301 total samples included, 190(63.0%) samples showed no growth, 12(4.0%) showed insignificant bacterial growth and 99(33.0%) showed significant bacterial growth. As shown in Table 1, the majority of the participants in this study were in the age group of 21 to 30 years 109(36.2%), whereas age group less than 20 years was the least 30(10.0%). The higher proportion of bacterial growth was found in the age group of 21 to 30 which was 25(25.3%).

Table 1: Distribution of bacterial growth among different age group (n=301)

Age group (in years)	Bacterial Growth		Total
	No, n (%)	Yes, n (%)	
≤ 20	22(10.9)	8 (8.0)	30 (10.0)
21-30	84 (41.6)	25(25.3)	109 (36.2)
31-40	48 (23.7)	21 (21.2)	69 (22.9)
41-50	25 (12.4)	20 (20.2)	45 (15.0)
≥ 51	23(11.4)	25 (25.3)	48 (15.9)
Total	202 (100)	99 (100)	301 (100)

Table 2 shows that there were 21(21%) gram positive and gram negative 78(79%) bacterial species isolated in urine. Out of 78 gram negative isolates, 51 (65.4%) isolates showed multidrug resistance. In this study, among 31 ESBLs producers 27(87.1%) were MDR and 4(12.9%) were Non-MDR and among 47 ESBLs Non- producers 24(51.1%) were MDR and 23(48.9%) were Non-MDR.

Table 2: Proportion of gram negative isolates and ESBL producer and non-producer with MDR and Non-MDR

Type of isolates (n=99)	Non-MDR, n (%)	MDR, n (%)	Total n (%)
Gram positive	10 (47.6)	11(52.4)	21 (100.0)
Gram negative isolates (n=78)	27 (34.6)	51(65.4)	78 (100.0)
Gram negative ESBLs (n=78)			
ESBLs producer	4(12.9)	27(87.1)	31 (100.0)
ESBLs Non-producer	23(48.9)	24(51.1)	47 (100.0)

Gram negative isolates were highly sensitivity to colistin (99%), imipenem (77%), nitrofurantion (77%), amikacin (72%) and ceftazidime (45%) with ampicillin (24%)

having the least sensitivity. Three isolates were sensitive to all antibiotics tested as shown in Figure 1.

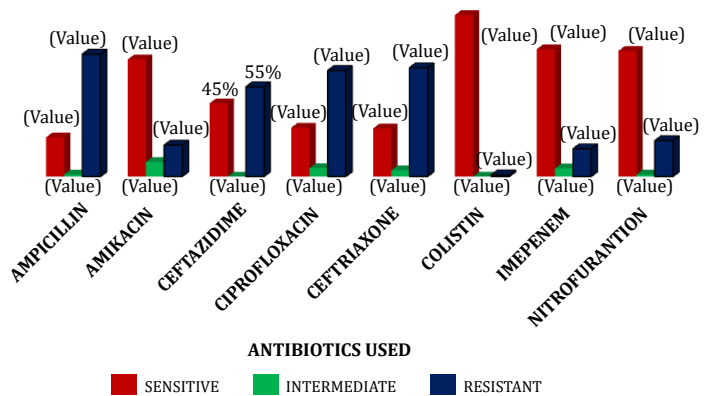


Figure 1: Antibiotic sensitivity test of gram negative isolates

Table 3 shows the distribution of identified bacteria by gram reaction and ESBL producer. All the gram negative isolates were screened for ESBLs. Among the 78 gram negative isolates, 31(39.7%) were ESBL producer and 47(60.3%) were non-ESBL producer. Among ESBL producers, highest frequency of ESBL production was seen in E. coli 23 (74.2%) isolates.

Table 3: Distribution of gram negative bacteria on the basis of ESBL producer and non-producer

Type of gram negative bacteria (n=78)	ESBL producer n (%)	ESBL non-producer n (%)	Total
E. coli	23 (74.2)	20 (42.6)	43 (55.1)
K. pneumoniae	3 (9.7)	9 (19.1)	12 (15.4)
Acinetobacter spp	2(6.5)	6 (12.8)	8 (10.3)
K. oxytoca	1(3.2)	3 (6.4)	4 (5.1)
P. aeruginosa	1(3.2)	3 (6.4)	4 (5.1)
P. vulgaris	1(3.2)	1 (2.1)	2 (2.6)
Enterobacter spp	0	3 (6.4)	3 (3.8)
C.furundii	0	2 (4.2)	2 (2.6)
Total	31 (39.7)	47 (60.3)	78 (100)

Among 31 ESBLs producing gram negative isolates, the highest sensitivity was found (74%). Only about three-fifth isolates were sensitive with imipenem and the least sensitivity was found with ampicillin (3.0%) (Figure 2).

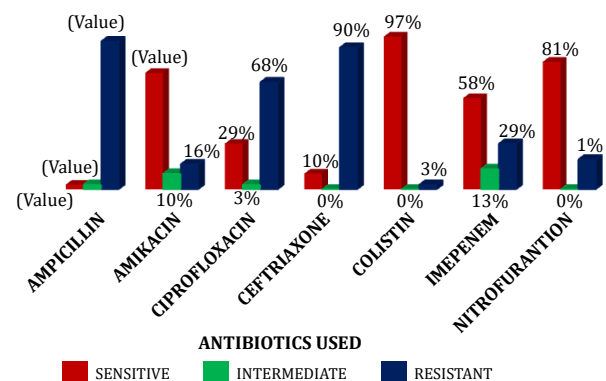


Figure 2: Antibiotics sensitivity test of ESBLs producer gram negative isolates

Among 23 ESBL producer *E. coli* isolates, the highest sensitivity was found with colistin (96.0%), followed by nitrofurantoin (83.0%) and amikacin (70.0%). Only half of the isolates were sensitive with imipenem (52.0%) and 4% with ceftriaxone. None of isolates were sensitive with ampicillin as shown in Figure 3.

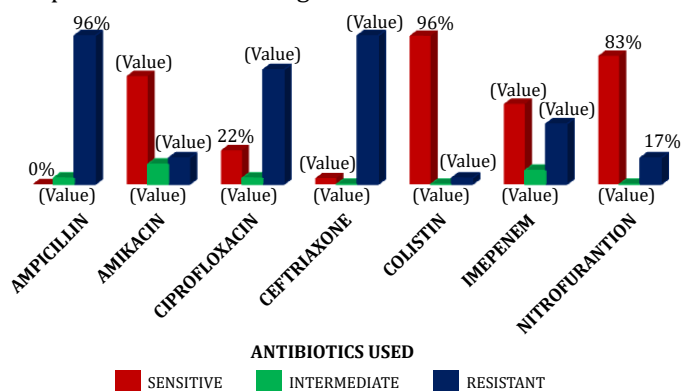


Figure 3: Antibiotics sensitivity test of ESBLs producing *E. coli*

Among four ESBLs producing *Klebsiella* spp, the highest sensitivity was found with nitrofurantoin (100%), colistin (100%), followed by imipenem (75%), amikacin (75%). Only one -fourth of the isolates were sensitive with ceftriaxone and ciprofloxacin. None of the isolates were sensitive with ampicillin (Figure 4).

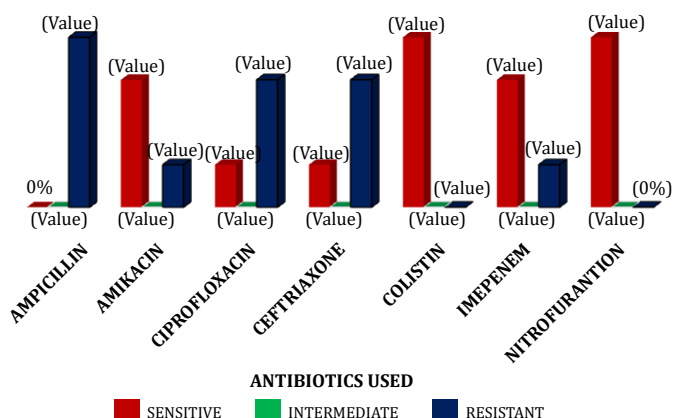


Figure 4: Antibiotics sensitivity test of ESBLs producing *Klebsiella* spp.

DISCUSSION

The study examined patterns of multidrug resistant and extended spectrum beta-lactamases producing gram negative bacterial uropathogens among females in a tertiary level hospital. Among total 99 isolates, about 79% were gram negatives isolates. Gram negative isolates were examined for multidrug resistance and ESBL production in the study. Among gram negatives isolates, the most common isolate was *E. coli* i.e. 43 (55.5%) followed by *Klebsiella* spp. This means *E. coli* is one of the most

common bacteria causing UTI in females. A study by Thapa et al.¹⁵ also found that *E. coli* was the predominant bacterial pathogen i.e. 65.1%. In contrast to the study, higher proportion of *E. coli* was found in a study by Tiwari et al.⁴ i.e.70%. Based on the ESBL production, 39.7% Gram negative isolates were ESBLs producers; and among ESBL producer isolates also, the most common isolates was *E. coli* i.e. 23 (74.2%) which indicates the risk of treatment failure by beta-lactam antimicrobials.

The age group analysis of microbial growth shows that the females of 20-30 years had highest proportion of UTI (25.3%). This proportion is similar to the study done by Thapa et al.¹⁵ which found that 27.8% UTI was in the age group of 21 to 30. The study found that *E. coli* was predominant gram negative isolate followed by *Klebsiella pneumoniae*. Among total gram negative isolates, prevalence of *E. coli* was 55.1% in the study. Similar to this study, previous studies by Thapa et al. (55.3%) and Kattel et al. (59.6%) also reported that *E. coli* was the most frequently isolated uropathogen.^{16,17} However, slightly higher prevalence was reported in a study by Bhandari et al that showed 63.4% gram negative isolates was *E. coli* followed by *Klebsiella pneumoniae* with 8% isolates.⁵ The study also found that 74.2% ESBL producing isolates were *E. coli*. It means that among ESBL producing gram negative isolates, about three-fourth (74.2%) were *E. coli* only. Similar to this study, a study conducted by Poudyal et al.¹⁸ also found that *E. coli* (80.0%) was the major ESBL producer followed by *Klebsiella pneumoniae*.

Among the common antibiotics used against all the gram negative isolates, colistin showed higher susceptibility (99.0%) followed by imipenem (78.0%), and nitrofurantoin (77.0%). Similarly, a study by Thapa et al.¹⁶ revealed that nitrofurantoin was one of the most effective antibiotics for gram negative bacteria (78%). In contrast to this study, higher proportion of gram negative isolates i.e. 93.5% were sensitive to nitrofurantoin in the previous study conducted in 2017 in a tertiary care hospital of Nepal.⁵ On the other hand, about-three-fourth of the gram negative isolates were resistant to ampicillin in the present study. The study shows that imipenem, ceftriaxone and ampicillin were less effective for gram negative isolates. About half of *E. coli* isolates were sensitive to imipenem, only 4% with ceftriaxone and none of isolates were sensitive with ampicillin. A previous study also found that 87.1% gram negative isolates were resistant to ampicillin.⁵ Although this proportion is higher as compared to our study, important meaning is that ampicillin has limited sensitivity to gram negative isolates.

In our study, 65.4% gram negative isolates were MDR strains. Almost, similar results of MDR have been reported by Poudyal et al.¹⁸ i.e. 64.6%, Bhandari et al.⁵ i.e.73.2% and Thapa et al.¹⁶ i.e.73%. However, higher prevalence of MDR was reported by Ullahet al.⁶ which was 83.0%, and by Ansari et al.¹⁹ i.e. 78.0%. At the same time, a study by Awasthi et al.²⁰ has found the lower prevalence of MDR i.e.42.8%. Higher MDR results might be due to many factors including misuse of antibiotics by the health care professionals, non-skilled practitioners as well as self-medication practice of general public and also inadequate surveillance system.

Among 78 gram negative isolates, 65.5% were MDR; and among ESBL producer gram negative isolates, the proportion of MDR was further higher that i.e. 87.1% which is the most important finding of the study. Among 78 gram negative isolates, 31(39.7%) of isolates were ESBLs producer. Almost similar results were obtained by Giwa et al. that shows the 34.3% of ESBLs producer.²¹ The higher prevalence of ESBL was shown by Akram et al.²² i.e. 42.0% and Sankar et al.²³ i.e. 48.5%. In contrast to the above findings, lower prevalence of ESBL was reported by Kader et al. which was only 4.8%.²⁴ The prevalence of ESBLs among clinical isolates varies from country to country and from institution to institution and these differences may be due to geographical variations, local antibiotic prescribing habits.²⁴

Among 31 ESBLs producers, *E. coli* attributes highest prevalence (74.2%) followed by *K. pneumonia* (9.7%) in the study. Our finding is similar with the finding of the study of Tiwari et al.⁴ i.e. 75.8%. In contrast to the study, higher prevalence of ESBLs producing *E. coli* were reported by Poudyal et al.¹⁸ i.e. 80%, Hassan et al.²⁵ i.e. 85%. However, lower prevalence of ESBLs *E. coli* was reported by Thapa et al.¹⁶ i.e. 7.6%. The study conducted by Khadri et al.²⁶ reported the higher prevalence of ESBLs producing *Klebsiella* spp i.e. (34.1%) than *E. coli* i.e. (30.3%). We can conclude that *E. coli* was the highest among ESBL producing gram negatives isolates.

According to our study, 27(87.1%) ESBLs producing isolates were found to be MDR whereas only 24(51.1%) ESBLs non-producing isolates were MDR. Higher MDR patterns among ESBL producer might be due to higher plasmid mediated resistance to antimicrobial agents, alteration of target site of antibiotics, impermeability of antibiotics etc.²⁷ ESBLs producing *E.coli* shows higher sensitivity to Colistin i.e. (96.0%) followed by nitrofurantoin i.e. (83.0%) and amikacin (70.0%). This result is supported by Thapa et al.¹⁶ and highly resistant to ampicillin and ceftriaxone

which is similar to the study done by Chander et al.²⁸

A higher proportion of ESBL-producing gram negative isolates and limited sensitivity to some antibiotics such as ceftriaxone and ampicillin indicate that drug resistance is increasing, and drug prescription should be based on the sensitivity test result.

The limitation of this study was that only phenotypic characteristics of organisms were studied; and species - subspecies were not isolated.

CONCLUSIONS

Among gram negative isolates, about two-fifth isolates were ESBLs producers and *E. coli* was the most common ESBLs producing bacteria. More importantly, about 90% of ESBLs producers were MDR. Gram negative isolates showed higher susceptibility with colistin and nitrofurantoin; and imipenem, ceftriaxone and ampicillin were less effective for gram negative isolates. Only half of *E. coli* isolates were sensitive to imipenem, only 4% with ceftriaxone and none of isolates were sensitive with ampicillin, which indicates the major future threat of drug resistant in Nepal. Findings of the study show that there is urgent need to address the issue of antimicrobial resistance. Antibiotics should be prescribed only after performing the antimicrobial susceptibility test to decrease the resistance. ESBLs testing should be adopted as a routine laboratory test.

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REFERENCES

1. Tille PM. Bailey & Scott's Diagnostic Microbiology. 14th ed. Elsevier; 2017.
2. Emiru T, Beyene G, Tsegaye W, Melaku S. Associated risk factors of urinary tract infection among pregnant women at Felege Hiwot Referral Hospital, Bahir Dar, North West Ethiopia. BMC Res Notes. 2013;6(1):292. DOI: 10.1186/1756-0500-6-292 PMID: 23885968.
3. Faidah HS, Ashshi AM, El-Ella GAA, Al-Ghamdi AK, Mohamed A. Urinary tract infections among pregnant women in Makkah, Saudi Arabia. Biomedical & Pharmacology Journal. 2013;6(1):1-7. DOI: 10.13005/bpj/376

4. Sharma K, Bhandari P, Adhikari N, Tripathi P, Khanal S, Tiwari BR. Extended Spectrum β -lactamase (ESBL) Producing Multi Drug Resistant (MDR) Urinary Pathogens in a Children Hospital from Nepal. *Kathmandu Univ Med J*. 2018;62(2):151-5. PMID: 30636756.
5. Bhandari P, Joshi DR, Sharma KR, Khanal S, Acharya G, Adhikari N. High frequency of multidrug resistant urinary isolates in pregnant women in a tertiary care hospital of Nepal. *SOJ Microbiology & Infectious Diseases*. 2016;4(4):1-5. DOI: 10.15226/sojmid/4/4/00161
6. Ullah F, Malik S, Ahmed J. Antibiotic susceptibility pattern and ESBL prevalence in nosocomial *Escherichia coli* from urinary tract infections in Pakistan. *Afr J Biotechnol*. 2009;8(16):3921-3926.
7. Alemu A, Moges F, Shiferaw Y, Tafess K, Kassu A, Anagaw B, et al. Bacterial profile and drug susceptibility pattern of urinary tract infection in pregnant women at University of Gondar Teaching Hospital, Northwest Ethiopia. *BMC Res Notes*. 2012;5(1):197. DOI: 10.1186/1756-0500-5-197 PMID: 22534117.
8. Elsayed T, Ismail H, Elgamal S. The Occurrence of Multidrug Resistant *E. coli* which Produce ESBL and Cause Urinary Tract Infections. *J Appl Microbiol Biochem*. 2017;2(1):8. DOI: 10.21767/2576-1412.100008
9. Iqbal R, Majid A, Alvi IA, Hayat A, Andaleeb F, Gul S, et al. Multiple drug resistance and ESBL production in bacterial urine culture isolates. *Amer J Biosci*. 2014;2:5-12. DOI: 10.11648/j.ajbio.20140201.12
10. Shrestha A, Manandhar S, Pokharel P, Panthi P, Chaudhary D. Prevalence of extended spectrum beta-Lactamase (ESBL) producing multidrug resistance gram negative isolates causing urinary tract infection. *EC Microbiol*. 2016;4:749-55.
11. Gangane R, Firdous J. Isolation and Antibiotic Sensitivity Pattern of Extended Spectrum Beta Lactamases (ESBL) Producing *Escherichia coli* Isolated from Urinary Tract Infection. *Int J Curr Microbiol App Sci*. 2017;6(6):279-86. DOI: 10.20546/ijcmas.2017.606.034
12. Thirapanmethree K. Extended spectrum β -lactamases: critical tools of bacterial resistance. *Mahidol Univ J Pharm Sci*. 2012;39:1-8.
13. Clinical and Laboratory Standards Institute. Performance standards for antimicrobial susceptibility testing; twenty-first informational supplement. M100-S21 2011;31:42-46.
14. Raut S, Gokhale S, Adhikari B. Prevalence of extended Spectrum Beta-lactamases among *Escherichia coli* and *Klebsiella spp* isolates in Manipal teaching hospital, Pokhara, Nepal. *J Microbiol Infect Dis*. 2015;5(2):69-75. DOI: 10.5799/ahinjs.02.2015.02.0179
15. Thapa P, Parajuli K, Poudel A, Thapa A, Manandhar B, Laudari D, et al. Causative agents and susceptibility of antimicrobials among suspected females with urinary tract infection in Tertiary Care Hospitals of Western Nepal. *JCMC*. 2013;3(2):16-9. DOI: 10.3126/jcmc.v3i2.8436
16. Thapa R, Lamichhane P, Banjara MR, Acharya GP. Prevalence of extended spectrum betalactamase producing uropathogens in pregnant women. *Asian J Pharm Clin Res*. 2015;8(1):207-210.
17. Kattel HP, Acharya J, Mishra SK, Rijal BP, Pokhrel BM. Bacteriology of urinary tract infection among patient attending TU Teaching Hospital, Kathmandu, Nepal. *Journal of Nepal Association for Medical Laboratory Sciences*. 2008;9:25-9.
18. Poudyal S, Bhatta D, Shakya G, Upadhyaya B, Dumre S, Buda G, et al. Extended spectrum β -lactamase producing multidrug resistant clinical bacterial isolates at National Public Health Laboratory, Nepal. *Nepal Med Coll J*. 2011;13(1):34-8.
19. Ansari S, Nepal HP, Gautam R, Shrestha S, Neopane P, Gurung G, et al. Community acquired multi-drug resistant clinical isolates of *Escherichia coli* in a tertiary care center of Nepal. *Antimicrobial Resistance and Infection Control*. 2015;4(1):15. DOI: 10.1186/s13756-015-0059-2 PMID: 25937923.
20. Awasthi TR, Pant ND, Dahal PR. Prevalence of multidrug resistant bacteria in causing community acquired urinary tract infection among the patients attending outpatient Department of Seti Zonal Hospital, Dhangadi, Nepal. *Nepal Journal of Biotechnology*. 2015;3(1):55-9. DOI: 10.3126/njb.v3i1.14232
21. Giwa FJ, Ige OT, Haruna DM, Yaqub Y, Lamido TZ, Usman SY. Extended-Spectrum beta-lactamase production and antimicrobial susceptibility pattern of uropathogens in a Tertiary Hospital in Northwestern Nigeria. *Annals of Tropical Pathology*. 2018;9(1):11. DOI: 10.4103/atp.atp_39_17

22. Akram M, Shahid M, Khan AU. Etiology and antibiotic resistance patterns of community-acquired urinary tract infections in JNMC Hospital Aligarh, India. *Annals of clinical microbiology and antimicrobials*. 2007;6(1):4. DOI: 10.1186/1476-0711-6-4 PMID: 17378940.
23. Sankar S, Narayanan H, Kuppanan S, Nandagopal B. Frequency of extended-spectrum β -lactamase (ESBL) -producing Gram negative bacilli in a 200-bed multi-specialty hospital in Vellore district, Tamil Nadu, India. *Infection*. 2012;40(4):425-9. DOI: 10.1007/s15010-012-0261-6 PMID: 22531882.
24. Kader AA, Kumar AK. Prevalence of extended spectrum beta-lactamase among multidrug resistant gram negative isolates from a general hospital in Saudi Arabia. *Saudi Med J*. 2004;25(5):570-4. PMID: 15138522.
25. Hassan SA, Jamal SA, Kamal M. Occurrence of multidrug resistant and ESBL producing *E. coli* causing urinary tract infections. *Journal of Basic & Applied Sciences*. 2011;7(1):8.
26. Khadri H, Alzohairy M. High prevalence of multi-drug-resistance (MDR) and extended spectrum β -lactamases (ESBL) producing bacteria among community-acquired urinary tract infections (CAUTI). *J Bacteriol Res*. 2009;1(9):105-10.
27. Tankhiwale SS, Jalgaonkar SV, Ahamad S, Hassani U. Evaluation of extended spectrum beta lactamase in urinary isolates. *Indian J Med Res*. 2004;120(6):553-6.
28. Chander A, Shrestha CD. Prevalence of extended spectrum beta lactamase producing *Escherichia coli* and *Klebsiella pneumoniae* urinary isolates in a tertiary care hospital in Kathmandu, Nepal. *BMC Res Notes*. 2013;6(1):487. DOI: 10.1186/1756-0500-6-487 PMID: 24274894.

Assessment of open surgical outcome of patients with lower limb varicose vein disease at a tertiary care center of Eastern Nepal

Bijay Sah*¹, Lokesh Shekhar Jaiswal¹, Rakesh Kumar Gupta¹

¹Department of Surgery, B.P Koirala Institute of Health Sciences, Dharan, Nepal

ABSTRACT

Introduction: The trend of varicose vein disease seems to be rising globally and its treatment options and outcome vary from the institution by institution. Management of the disease has also changed from high ligation, stripping, avulsion, and sclerotherapy to minimally invasive endovenous thermal ablation. **Methods:** A retrospective observational study was carried out to find out the treatment methods and outcome of lower limb varicose vein disease at the cardiothoracic vascular surgery unit of the surgery department of B.P. Koirala Institute of Health Science from February 2019 to February 2020. The medical record of the patients was studied, relevant data entered and analyzed in statistical package for social sciences statistical software. **Results:** Total registered patient during the study period were 46; which included 29(63%) male and 17(37%) female with mean age 38.41±10.12. Saphenous femoral junction reflux was seen in 38(82.60%) cases, saphenous popliteal junction reflux was seen in nine (19.60%) cases while perforator reflux was seen in 37(80.40%) cases. Saphenous femoral junction ligation, saphenous popliteal junction ligation was performed in 36(78.30%) and 7(15.20%) cases respectively. Stripping of the greater saphenous vein was done in 35(76.10%) cases, and 9(19.60%) cases were managed conservatively. Only 5(10.90%) cases developed infection, and none of the cases were found with recurrence or nerve injury. All the cases remained satisfied during the management course. **Conclusions:** Saphenous femoral junction reflux was seen common and saphenous femoral junction ligation was performed on majority of the cases. Only 10% cases developed infection and all patients were satisfied during management course. Early surgical management of the disease overcomes complications and improves in the quality of life of the patients.

Keywords: Flush ligation and stripping, greater saphenous vein, short saphenous vein, varicose vein, venous insufficiency.

*Correspondence:

Dr. Bijay Sah
Department of Surgery
B.P Koirala Institute of Health Sciences
Dharan, Nepal
Email: bijaysah@hotmail.com

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INTRODUCTION

Varicose vein diseases of the lower limb are encountered commonly in different specialty clinic and there is an increase in the disease spectrum globally. The prevalence of the disease varies and is thought to be between 1 to 73% in women, and 2 to 56% in men.^{1,2} It is thought to be underdiagnosed and treatment options are limited to few centers only. Early diagnosis and treatment of the disease prevents further complications and improve quality of life.^{1,3}

The disease can have various presentations with different uncomplicated reflux patterns, involving superficial, deep, and perforating veins, alone or in combinations. It can present late with complications like severe skin changes, healed or unhealed ulcer and thrombosis, or sometimes can be late asymptomatic presentation also.^{4,5} Standard open surgical treatment of uncomplicated varicose vein involves flush ligation with or without stripping of the greater saphenous vein or small saphenous vein with ligation of reflux perforating veins.^{6,7}

Standard open surgery of the varicose vein has been standard

procedure for many years and remains popular in many centers. However, the treatment options have changed recently from standard open surgery to minimally invasive, less traumatic techniques.^{5,8} Although there have been many advances in minimally invasive surgical techniques, such treatments are expensive and limited to fewer centers only. There are some randomized controlled trials (RCTs) comparing standard surgery and endovenous thermal ablation, looking at certain measures such as recurrence, neovascularization, post-procedural complications, and quality of life, whose long-term reports are eagerly awaited.^{5,9-11}

Complicated varicose vein disease with active venous ulcers have longer conservative treatment course with four layers of compression bandage application which seems to provide better outcome. With the advancement of technology and economy, the management of varicose vein disease aims for faster recovery, excellent cosmetic results, few complications, and less recurrence rate. However, the standard varicose vein surgery clinical outcome and results of the procedure seems to be satisfactory at our contest as reported by many patients. So, we aimed to retrospectively evaluate the treatment and outcome of lower limb varicose vein disease at our setup.

METHODS

Study Design and Setting

A single-centered, retrospective cross-sectional observational analysis was conducted from February 2019 to February 2020 by reviewing the medical records of patients from the medical record section which were managed for lower limb varicose vein disease under cardiothoracic vascular surgery unit. We included 46 patients managed during the study period. The study was conducted after obtaining ethical clearance from the Institutional Review Committee of B.P Koirala Institute of Health Science, Dharan. (Ref. No.: 223/076/077-IRC)

Data Management

All the relevant information from the medical record section, including age, sex, clinical features, Duplex scan of affected limbs, types of surgery performed, total hospital stay and complications or any problems encountered during the patient care were taken and entered in statistical package for social sciences statistical (SPSS) software (version 16.0). Mean and standard deviation was computed for continuous data and percentages were calculated for categorical data.

Pre-operative Assessment

The inclusion criteria for the surgery were reflux in saphenous femoral junction (SFJ) or saphenous popliteal junction (SPJ) clinically and with duplex scan, with or without any perforator involved. Complete clinical examination and local examination of the lower limb varicose veins along with a color duplex scan were done before management. Patients having deep vein thrombosis or severe infections or active ulcers of the affected limb were excluded and managed conservatively. Surgery was planned if the clinical examination and a color duplex scan showed symptoms linked to varicose vein disease and the patient was likely to improve after the procedure.

The color duplex scan showed reflux in the SFJ or SPJ or perforator vein. Standard open surgery with SFJ ligation, stripping, SPJ ligation and avulsion, was planned accordingly with the preoperative marking of the veins under spinal anesthesia after obtaining written consent from the patients.

Surgical Management

The open surgery protocol for flush ligation and stripping was followed. At the groin, the cribriform fascia was incised along standard lines to expose the SFJ adequately, for high ligation, ligation of all its branches, and preparing to remove 10 cm below the knee or sometimes strip to the ankle. Surgery was performed for primary and few recurrence cases. After the SFJ high ligation, the stripper was downward passed through the greater saphenous vein and stripped below applying a 15-minute continuous compression.

After compression, hemostasis was checked and then avulsion of remaining varicose veins marked previously was performed. Crepe bandage was applied after proper dressing of the wounds closed subcuticularly. Patients were managed with intravenous antibiotics, analgesic, and other supportive measures. Routine use of subcutaneous heparin was avoided, and given for high-risk patients only. Crepe bandage was removed and replaced by anti-embolism stockings after the wounds were dry preferably on the second postoperative day. All patients stayed for minimum of two to five days in the hospital where all measures were taken to assess and manage complications of the procedure if any.

Postoperative follow-up

All patients were first followed up between five to fifteen days after surgery. Clear instructions were given for wound care and to identify any adverse effects and ways to tackle

it. Patients were asked to continue stockings for a minimum of three weeks of surgery and the second followed up was planned after one month of surgery. Initially, the patients were followed for 90 days and then yearly, to assess for any late complications.

RESULTS

There were 46 patients managed for lower limb varicose vein disease, which included 29(63%) male and 17(37%) female, with mean age of 38.41±10.12. Right leg varicose vein was seen in 18(39.10%) cases and left leg varicose vein was seen in 16(34.80%) cases while both lower limb varicose veins were seen in 12(26.10%) cases (Table 1). SFJ reflux was seen in 38(82.60%) cases, SPJ reflux was seen in 9(19.60%) cases while perforator reflux was seen in 37(80.40%) cases. Majority of the patient had skin changes 21(45.70%) followed by edema in 14(30.40%) patients (Table 2).

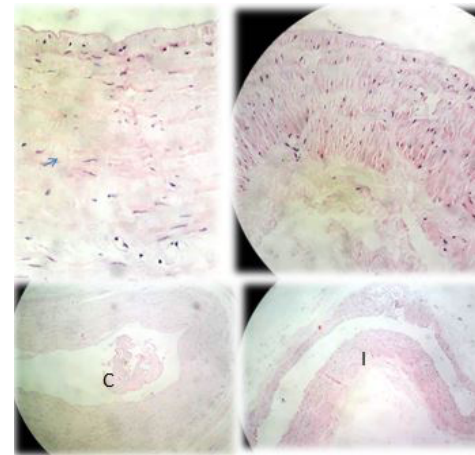
SFJ ligation (A section of HPE in Figure 1), SPJ ligation was performed in 36 (78.30%) and 7(15.20%) cases respectively. Stripping of GSV with avulsion was done in 35(76.10%) cases and 9(19.60%) cases were managed conservatively. There were five (10.90%) cases with infection, and there were no cases with recurrence or nerve injury. All the patients remained satisfied during the management course. The mean hospital stay of the cases was 3.22(2 to 5) days.

Table 1: Characteristics of patients of lower limb varicose diseases

Variables	Frequency	Percentage(%) /median/mean
Age (in years, Median)	46	36.50
Gender		
Female	17	37
Male	29	63
Limb involved		
Right	18	39.10
Left	16	34.80
Both	12	26.10
Reflux		
SFJ Reflux	38	82.60
SPJ Reflux	9	19.60
Perforator Reflux	37	80.40
Management		
SFJ Ligation	36	78.30
SPJ Ligation	7	15.20
Stripping (GSV)	35	76.10
Conservative Management	9	19.60
Complication		
Infection/Hematoma	5	10.90
Nerve	0	0
Recurrence	0	0
Patient Satisfaction		
Satisfied	46	100
Unsatisfied	0	0
Total Hospital Stay (Mean)	46	3.22

Table 2: Clinical characteristics of patients

Clinical Stage	Frequency	Percentage (%)
Edema	14	30.40
Skin Changes	21	45.70
Healed Venous Ulcer	9	19.60
Active Venous Ulcer	2	4.30
Total	46	100.00



H&E stained vein section of varicose vein disease shows proliferation of collagen fibers (C) in intimal layer causing intimal hypertrophy (I)

Figure 1: Shows vein section of SFJ Incompetence

DISCUSSION

Varicose vein disease is rising globally and its treatment options and outcome vary from the institution by institution. The disease itself have various presentations with different reflux patterns involving superficial, deep, and perforating veins alone or in combinations.⁴ The disease can present late with severe skin changes, healed or unhealed ulcers or sometimes can be even asymptomatic presentation.^{4,6,12} The majority of our cases had edema (30.40%), while healed venous ulcer and active venous ulcer was seen in 19.60% cases and 4.30% cases respectively.

Depending upon the nature and presentation of the disease, high ligation of the great saphenous vein or small saphenous vein is performed, after which stripping of the GSV and avulsion of varicosities or ligation of reflux perforating veins is performed according to the preoperative assessment.^{5,7,13} Our study showed that 36(78.30%) cases required SFJ ligation and 7(15.20%) cases underwent SPJ ligation. Stripping with avulsion was done in 35(76.10%) cases while 9(19.60%) cases were managed conservatively.

The disease is a common problem affecting a large proportion of patients and it affects the quality of life significantly.^{14,15} Standard varicose vein surgeries involving SFJ ligation and stripping has been performed to manage uncomplicated cases for over a century. The surgery remains the gold standard against which newer minimally

invasive techniques with laser, radio-frequency ablation or sclerotherapy are evaluated.^{3,5,7}

Our study demonstrated that standard open surgical treatment offers satisfactory results with the satisfactory patient outcome at our center. Treating cases of SFJ reflux with flush ligation, ligation of all its tributaries, and stripping is a routine part of treating long saphenous varicose vein disease. SPJ reflux is carefully ligated at the junction and careful dissection is performed to avoid injury to the adjacent nerve structures. A simple surgical loop can sometimes be helpful with accurate dissection. Dwerryhouse et al.¹⁶ demonstrated that SFJ flush ligation and stripping reduces the rate of recurrence after several years of surgery.

To reduce recurrence and complications, accurate location and ligation of the reflux veins are crucial and with the preoperative marking of the veins and identification of the pathological points, we were able to reduce our recurrence case and complications like nerve injury. Hammarsten et al.¹⁷ reported similar results for flush ligation and stripping at 52 months follow-up.

In the study conducted by Rasmussen et al.^{9,10} on the complication of varicose vein surgery, they reported complications like deep vein thrombosis, paraesthesia, and hyperpigmentation in the postoperative period. There were no such complications seen in our study. There were five cases (10.90%) that had an infection which was managed with systemic antibiotics and other supportive measures. Like in the MAGNA study⁸, infection rate was higher but are not statistically significant with the standard open surgical techniques.

Standard open surgical techniques tend to have a longer recovery period of 3.89 days as shown by Defty et al.^{15,18} Our study also showed similar results of mean hospital stay of 3.22 days. However, only 1.15 days of hospital stay was seen with minimally invasive techniques like radiofrequency ablation.^{9,10} All the cases in our study stayed satisfied after treatment till a follow-up period of 90 days. The study conducted by Mackenzie et al. also concluded that there is a patient's satisfaction and improvement in the quality of life soon after four weeks from standard open surgery.

CONCLUSIONS

Saphenous femoral junction reflux was seen common and Saphenous femoral junction ligation was performed on majority of the cases. Only 10% cases developed infection and all patients were satisfied during management course. Early management of the disease overcomes complications and improves in the quality of life.

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REFERENCES

1. Callam MJ. Epidemiology of varicose veins. *British Journal of Surgery*. 1994;81:167-73. DOI: 10.1002/bjs.1800810204 PMID: 8156326.
2. Beebe-Dimmer JL, Pfeifer JR, Engle JS, Schottenfeld D. The epidemiology of chronic venous insufficiency and varicose veins. *Annals of Epidemiology*. 2005;15:175-84. DOI: 10.1016/j.annepidem.2004.05.015 PMID: 15723761.
3. van den Bremer J, Moll FL, Mosquera D. Historical Overview of Varicose Vein Surgery. *Annals of Vascular Surgery*. 2010;24:426-432. DOI: 10.1016/j.avsg.2009.07.035 PMID: 20144527.
4. Lim CS, Davies AH. Pathogenesis of primary varicose veins. *British Journal of Surgery* 2009;96:1231-1242. DOI: 10.1002/bjs.6798 PMID: 19847861.
5. Leopardi D, Hoggan BL, Fitridge RA, Woodruff PW, Maddern GJ. Systematic Review of Treatments for Varicose Veins. *Annals of Vascular Surgery*. 2009;23:264-276. DOI: 10.1016/j.avsg.2008.10.007 PMID: 19059756.
6. Ombrellino M, Kabnick LS. Varicose vein surgery. *Seminars in Interventional Radiology*. 2005;22:185-194. DOI: 10.1055/s-2005-921951 PMID: 21326692.
7. Perkins JMT. Standard varicose vein surgery. *Phlebology*. DOI: 10.1258/phleb.2009.09s004 2009;24:34-41. PMID:19397439.
8. Biemans AAM, Kockaert M, Akkersdijk GP, van den Bos RR, de Maeseneer MG, Cuypers P, et al. Comparing endovenous laser ablation, foam sclerotherapy, and conventional surgery for great saphenous varicose veins. *Journal of Vascular Surgery*. 2013;58:727-734.e1. DOI: 10.1016/j.jvs.2012.12.074 PMID: 23769603.
9. Rasmussen LH, Bjoern L, Lawaetz M, Lawaetz B, Blemings A, Eklöf B. Randomised Clinical Trial Comparing Endovenous Laser Ablation with Stripping of the Great Saphenous Vein: Clinical Outcome and

- Recurrence After 2 Years. *European Journal of Vascular and Endovascular Surgery*. 2010;39:630–635. DOI: 10.1016/j.ejvs.2009.11.040 PMID: 20064730.
10. Rasmussen LH, Lawaetz M, Bjoern L, Vennits B, Blemings A, Eklof B. Randomized clinical trial comparing endovenous laser ablation, radiofrequency ablation, foam sclerotherapy and surgical stripping for great saphenous varicose veins. *British Journal of Surgery*. 2011;98:1079–1087. DOI: 10.1002/bjs.7555 PMID: 21725957.
 11. Brittenden J, Cotton SC, Elders A, Ramsay CR, Norrie J, Burr J, et al. A randomized trial comprising treatments for varicose veins. *New England Journal of Medicine*. 2014;371:1218–1227. DOI: 10.1056/NEJMoa1400781 PMID: 25251616.
 12. Critchley G, Handa A, Maw A, Harvey A, Harvey MR, Corbett CR. Complications of varicose vein surgery. *Annals of the Royal College of Surgeons of England*. 1997;79:105–110. PMID: 9135236.
 13. Gloviczki P, Comerota AJ, Dalsing MC, Eklof BG, Gillespie DL, Gloviczki ML, et al. The care of patients with varicose veins and associated chronic venous diseases: Clinical practice guidelines of the Society for Vascular Surgery and the American Venous Forum. *Journal of Vascular Surgery*. 2011;53:2S-48S. DOI: 10.1016/j.jvs.2011.01.079 PMID: 21536172.
 14. Kurz X, Lamping DL, Kahn SR, Baccaglioni U, Zuccarelli F, Spreafico G, et al. Do varicose veins affect quality of life? Results of an international population-based study. *Journal of Vascular Surgery*. 2001;34:641–648. DOI: 10.1067/mva.2001.117333 PMID: 11668318.
 15. MacKenzie RK, Paisley A, Allan PL, Allan PL, Lee AJ, Ruckley CV, et al. The effect of long saphenous vein stripping on quality of life. *Journal of Vascular Surgery*. 2002;35:1197–1203. DOI: 10.1067/mva.2002.121985 PMID: 12042731.
 16. Dwerryhouse S, Davies B, Harradine K, Earnshaw JJ. Stripping the long saphenous vein reduces the rate of reoperation for recurrent varicose veins: Five-year results of a randomized trial. *Journal of Vascular Surgery*. 1999;29:589–592. DOI: 10.1016/S0741-5214(99)70302-2 PMID: 10194484.
 17. Hammarsten J, Pedersen P, Cederlund CG, Campanello M. Long saphenous vein saving surgery for varicose veins. A long-term follow-up. *European Journal of Vascular Surgery*. 1990;4:361–364. DOI: 10.1016/S0950-821X(05)80867-9 PMID: 2204548.
 18. Defty C, Eardley N, Taylor M, Toma M, Nicolescu C. A Comparison of the Complication Rates Following Unilateral and Bilateral Varicose Vein Surgery. *European Journal of Vascular and Endovascular Surgery* 2008; 35: 745–749. DOI: 10.1016/j.ejvs.2008.01.009 PMID: 18343168.