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Misconduct in research: The troubling practice of salami slicing

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Among various scientific misconducts like fabrication, falsifications, plagiarism, and salami slicing, salami slicing is very difficult to identify and is also considered less serious misconduct and got less attention as compared to others.[1] In research, salami slicing refers to the improper or unwarranted splitting of data that has the potential to be included in a single meaningful article or the practice of preparing and submitting two or more articles derived from the same data set, typically in the "minimum publishable unit of research" or "least publishable unit" merely with the purpose of increasing the number of publications.[2,3] It is also defined as publishing or seeking to publish parts of a study in several papers by authors instead of providing the full story in a single paper.[4] The sliced publications tend to have similar authors, research questions, hypotheses, methodologies, and participant cohorts but may differ by specific outcomes or subgroups.[5] The concept of salami slicing refers to a variety of deceitful tactics encompassing psychological manipulation, including hacking, confidence tricks, and theft.[6] Salami slicing takes place when the primary goal of advancing scientific knowledge is overshadowed by a secondary motive of pursuing external benefits.[5] While the concept of salami slicing in medical research is not new, its implications and the accompanying debate surrounding it have gained prominence with the advancement of time.[7] There are primarily two reasons why salami slicing occurs: one is unintentional, stemming from a lack of awareness regarding itself and ethical considerations, and the other is intentional and fraudulent. Publications produced through salami-slicing tactics often reflect propaganda rather than genuine contributions to scientific knowledge.[6]

Features of salami slicing:

I. Each publication tests the same hypothesis

II. Two or more publications drawn from the same body of data except in some conditions which are described below where multiple publications can be made with a single study

III. Repeating the same results,[6] overlapping words particularly data[8]

Reasons for intentional salami slicing:

IV. The aspirations of authors, particularly in a culture where the pressure is built to publish for tenure, promotion, increase in salary, and career advancement is high[9]

V. Pressure from grant funders[10]

VI. Pressured to inflate their curriculum vitae through the addition of publications[11]

Conditions where multiple publications can be made with a single study:

In certain situations, it may not be possible or appropriate to publish data from extensive clinical trials and epidemiological studies simultaneously in a single article either due to different and distinct research questions or having multiple unrelated endpoints. In such cases, presenting significant outcomes of these studies separately is acceptable. However, each paper should explicitly state its hypothesis and be acknowledged as a distinct section of a broader and comprehensive principal study.[12]

Basically, the following two criteria must be met while writing multiple articles from a single large study:

1. It is not possible to consolidate all the findings into a single cohesive article:

When it is impractical to encompass all the outcomes within a single article, it is essential to ensure that the written article is clear, easily understandable, and meaningful. The article should be structured in a way that prevents confusion and frustration among readers.

2. Each article has a distinct purpose

If the articles (a) address different research questions and (b) use different relevant literature.

If it is not feasible to write a single, comprehensive article (meeting criterion 1), but the purposes addressed by the multiple articles are not unique or separate (failing to meet criterion 2), then publishing multiple articles is not acceptable.[13]

It is very difficult for readers, editors, and reviewers to identify it as there is no software and clear-cut approach to detect it. However, in rare circumstances, editors and reviewers could suspect it.[14] Although there are no definitive methods to identify it, manuscripts that are suspected of being salami publications often exhibit similarities in sample size, hypothesis, research methodology, and results, and frequently have the same authors.[14] Sometimes the objectives, hypothesis, and results may look different at first glance, but when you go through deeper through the articles you may find similarities in the sliced articles.

Salami slicing may lead to self-plagiarism. Self-plagiarism is also known as text recycling[15] or auto-plagiarism.[7] Self-plagiarism refers to the act of incorporating one's own data or previously written work in a 'new' publication without providing proper acknowledgment or disclosure that the data set or written work has been utilized or published elsewhere.[15] But no clear statement of how much text using causes self-plagiarism. Samuelson in 1994 implies that "as a rule of thumb if one reuses no more than 30% of one's prose in another article, that's ok".[16] Almost after a decade in 2007, Bretag et al.[17] considered self-plagiarism as "the article which contained 10% or more of any one of the author's previous publications without appropriate attribution".

Nowadays some journals clearly state plagiarism in their author guidelines while others do not mention it. Those who had mentioned are also not checking properly before publications.[15]

Issues with salami slicing:

I. The practice exaggerates research findings, potentially threatens and skews the evidence base for care (e.g. systematic reviews) i.e. reduces the quality.[9]

II. Readers may not understand the importance of the work if the results are published in several papers.

III. Readers who access only one of the papers may misinterpret the findings.[18]

IV. Takes up valuable journal space and makes further demands upon and wastes the resources of editorial teams, peer reviewers, readers, and libraries.[9]

V. Misunderstanding or misrepresentation of evidence: When evidence is distorted, it creates flawed guidelines for clinical practice, resulting in patient care that is, at best, less than ideal and, at worst, potentially harmful.

VI. Unethical practice.

VII. Decreases motivation to pursue large-scale, methodologically rigorous studies that confirm and expand on preliminary findings.

VIII. Discovery of salami publication may damage the author's reputation and negatively impact their future career, especially if duplicitous attempts were made to conceal this malpractice.[5]

How to prevent or decrease salami-slicing:

It can be prevented by taking action from the author in the first phase followed by journal/editors and peer reviewers.

Author's Role:

An author should be very clear and cautious starting from the research proposal writing. All the processes starting from the research hypothesis, aims/objectives, and data collection technique should be clearly written and adhered to the protocol during the data collection and analysis technique. No data dredging should be done.

Recommendation for authors:

Try to publish a single research paper from a single study unless it is a large one.[14] Author should focus on quality research rather than quantity.[5]

A sliced article derived from previously published data should:

- Authors must alert the editor whenever two or more papers based on a subset of a larger data set have been published or are under review;[19]
- Provide explanations as to why multiple articles are required;[9]
- Appropriately cite the previously published article and provide all the references;
- Make a clear declaration that it is an integral component of a previously published study;
- Indicate all the additional knowledge incorporated in the subsequent manuscript;
- Avoid duplicating any of the data presented in the preceding article.
- Give a detailed explanation to the journal's editor on all the above-mentioned points because transparency is crucial.[14]

Peer Reviewers:

Reviewers should be aware of it and look at the manuscript cautiously, if any fishy is found then they should alert the editors.[4]

Journal's role/Editors:

- Journal should make criteria while submitting the manuscript and must mention the potential problems with plagiarism, auto-plagiarism, and salami-slicing in guidelines.[7]
- They are in the array of authority to check for the quality of evidence to deliver valid and correct information. Therefore all the editors must be fully cautious regarding salami slicing and prepare the appropriate guidelines for inspecting and handling it.
- To avoid self-plagiarism/text recycling all the journals should first look for plagiarism using valid software of plagiarism checker.
- Should clearly state the punishment for salami-slicing.[4]

Even within the journals that explicitly addressed salami publication, the specific guidelines have frequently been ambiguously defined, lacking mention of the repercussions for non-compliance. A loosely defined policy statement, such as "it is crucial to refrain from fragmenting a single study into multiple parts for the purpose of increasing submissions," clearly lacks practical feasibility.[20]

The International Committee of Medical Journal Editors (ICMJE) has established strict criteria to address the unethical practice of "salami slicing" in scientific research. The ICMJE guidelines aim to ensure that each publication represents a unique and substantial contribution to the scientific community. According to the ICMJE, researchers should refrain from dividing their research into multiple publications if the information can be adequately presented in a single manuscript. These criteria promote the integrity and transparency of research, discouraging the unnecessary proliferation of publications based on the same dataset. By adhering to the ICMJE guidelines, researchers contribute to the dissemination of valuable knowledge while maintaining ethical standards in scientific publishing.[21]

There is no clear idea about detection and if detected then no certainty of punishment, ranging from no action to rejection[7,22] and retraction of articles and inform to author institutions[23] and blacklisting authors[7]. If it is detected earlier before publication editor can reject it. If the authors managed to publish their articles then editors are obliged to publish public retractions, which are expected to have consequences for all the authors involved.[23] Therefore, it is always better to think twice and consult with seniors, research expertise persons, and editors before making slices of the main article. Authors are encouraged to publish quality articles rather than quantity.

Overall, salami slicing is a deceptive practice that impedes the integrity of scientific research and can lead to public mistrust in academia. Researchers, institutions, and the scientific community (editors, journals, reviewers) as a whole have a crucial responsibility to uphold ethical conduct and prioritize the quality and significance of research over mere quantity.

REFERENCES

1. Mojon-Azzi SM, Mojon DS. Scientific misconduct: from salami slicing to data fabrication. Ophthalmic research. 2004;36(1):1. [Internet]. [cited 2023 Jun 27]. Available from: https://karger.com/ore/article-pdf/36/1/1/3365443/000076104.pdf DOI: 10.1159/000076104 PMID: 15007234.

2. Ding D, Nguyen B, Gebel K, Bauman A, Bero L. Duplicate and salami publication: a prevalence study

of journal policies. Int J Epidemiol. 2020;49(1):281-8. DOI: 10.1093/ije/dyz187 PMID: 32244256.

3. Roberts J. An Author's Guide to Publication Ethics: A Review of Emerging Standards in Biomedical Journals. Headache J Head Face Pain. 2009;4(4):578-89. DOI: 10.1111/j.1526-4610.2009.01379.x PMID: 19338617.

4. Werner MU. Salami-slicing and duplicate publication: gatekeepers challenges. Scand J Pain. 2021 ;21(2):209-11.DOI: 10.1515/sjpain-2020-0181 PMID: 34387966.

5. Xie JS, Ali MJ. To Slice or Perish. Semin Ophthalmol. 2023;38(2):105-7. DOI: 10.1080/08820538.2023.2172813 PMID: 36703304.

6. Adams NN. Salami Slicing: clarifying common misconceptions for social science early-career researchers. SN Soc Sci. 2022;2(7):88. DOI: 10.1007/s43545-022-00389-6

7. Tolsgaard MG, Ellaway R, Woods N, Norman G. Salami-slicing and plagiarism: How should we respond? Adv Health Sci Educ. 2019;24(1):3-14. DOI: 10.1007/s10459-019-09876-7 PMID: 30756257.

8. Pierson CA. Salami slicing--how thin is the slice? J Am Assoc Nurse Pract. 2015;27(2):65. DOI: 10.1002/2327-6924.12210 PMID: 25708364.

9. Jackson D, Walter G, Daly J, Cleary M. Editorial: Multiple outputs from single studies: acceptable division of findings vs. 'salami' slicing. J Clin Nurs. 2014;23(1-2):1-2. DOI: 10.1111/jocn.12439 PMID: 24313937.

10. Luther F. Publication ethics and scientific misconduct: the role of authors. J Orthod. 2008;35(1):1-4. DOI: 10.1179/146531207225022347 PMID: 18287388.

11. Fanelli D, Larivière V. Researchers' Individual Publication Rate Has Not Increased in a Century. PLOS ONE. 2016;11(3):e0149504. DOI: 10.1371/journal.pone.0149504 PMID: 26960191.

12. Salami-Slicing-factsheet-March-2019.pdf [Internet]. Available from: https://www.elsevier.com/__data/assets/pdf_file/0011/653888/Salami-Slicing-factsheet-March-2019.pdf [Assessed 27th June 2023]

13. Fine MA, Kurdek LA. Publishing multiple journal articles from a single data set: Issues and recommendations. Journal of Family Psychology. 1994;8(4):371. DOI: 10.1037/0893-3200.8.4.371

14. Smolčić VŠ. Salami publication: definitions and examples. Biochem Medica. 2013;23(3):237-41. DOI : 10.11613/BM.2013.030 PMID: 24266293.

15. Horbach SPJM (Serge), Halffman W (Willem). The extent and causes of academic text recycling or 'self-plagiarism.' Res Policy. 2019;48(2):492-502. DOI: 10.1016/j.respol.2017.09.004

16. Samuelson P. Self-plagiarism or fair use. Commun ACM. 1994;37(8):21-5. DOI: 10.1145/179606.179731

17. Tracey Bretag SC. A Preliminary Study to Identify the Extent of Self-Plagiarism in Australian Academic Research. Plagiary Cross-Discip Stud Plagiarism Fabr Falsif [Internet]. 2007; Available from: http://hdl.handle.net/2027/spo.5240451.0002.010 [Accessed 23rd Jun 2023].

18. Sasaki K, Tan S. Publication ethic (1) "salami slicing." J Hepato-Biliary-Pancreat Sci. 2018;25(6):321-321. DOI : 10.1002/jhbp.561 PMID: 29788549.

19. Henly SJ. Duplicate Publications and Salami Reports: Corruption of the Scientific Record. Nurs Res. 2014;63(1):1. DOI: 10.1097/NNR.0000000000000015 PMID: 24335908.

20. Ijeeditorial. Salami publishing: why we need to talk about it [Internet]. IJEblog. 2019 Available from: https://ije-blog.com/2019/11/19/salami-publishing-why-we-need-to-talk-about-it/ [Accessed 23rd Jun 2023].

21. ICMJE. Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals. [Internet]. 2021; Available from: http://www.icmje.org/icmje-recommendations.pdf [Accessed 27th Jun 2023].

22. Okascharoen C. Editor's Note. Ramathibodi Med J [Internet]. 2019;42(4). Available from: https://

he02.tci-thaijo.org/index.php/ramajournal/article/view/231410 [Accessed 23rd Jun 2023].

23. Baggs JG. Issues and rules for authors concerning authorship versus acknowledgements, dual publication, self-plagiarism, and salami publishing. Res Nurs Health. 2008;31(4):295-7. DOI: 10.1002/nur.20280 PMID: 18324682.

Prevalence and factors influencing physical activity among secondary school adolescents: A cross-sectional study

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ABSTRACT

Introduction: Physical inactivity is a major health concern among adolescents and is an independent, modifiable risk factor for several non-communicable diseases. Despite the World Health Organization recommended physical activity levels, many adolescents do not meet these guidelines. This study was conducted among secondary school students in Palpa district of Nepal to assess their physical activity levels and associated factors. **Methods:** A modified version of the Physical Activity Questionnaire Adolescents was used to collect data from 506 grade eight and nine students from six schools in Palpa district. **Results**: The results revealed that only 25.31% of students engaged in physical activity quite often or always, and only 23.10% met the daily WHO recommendation of at least 60 minutes of physical activity per day. Additionally, females were less likely to achieve the recommended physical activity level compared with males. **Conclusions**: The low levels of physical activity among secondary school students in Palpa district of Nepal highlight the need for interventions to promote physical activity. This study identified several factors associated with low physical activity levels, including limited break time at school, lack of parks or playgrounds near homes, and gender differences.

Keywords: Adolescents, Nepal, physical activity, risk factors, school children, sedentary lifestyle.

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INTRODUCTION

The prevalence of physical inactivity among adolescents is a growing concern worldwide. Physical inactivity is an independent, modifiable risk factor for several non-communicable diseases such as cardiovascular disease, ischemic stroke, type 2 diabetes, colon cancer, and breast cancer.[1] Higher levels of physical activity are associated with better health-related quality of life.[2] Physical activity can occur in various domains and is influenced by a complex network of factors.[3] The prevalence of low physical activity among adolescents is high, with higher odds among females.[4,5] Several different factors are associated with low physical activity levels among adolescents, including non-working mothers, time constraints, exercise only when having ample time, and stretching before exercise.[6] Participating in more physical education classes may be an effective approach to increasing physical activity levels among adolescents in low- and middle-income countries.[7] Despite the World Health Organization recommendation of at least 150 to 300 minutes per week and 60 minutes of moderate to vigorous-intensity physical activity per day for adults and adolescents respectively, a significant proportion of adolescents fails to meet these guidelines.[8]

This trend is particularly true for adolescents, who are often engaged in sedentary activities such as cell phone use and watching television.[9]

Nepal is not an exception to this trend, and there are few studies on the physical activity levels among Nepalese adolescents.[4,10–16] The issue is particularly relevant in the hilly regions where the lack of open spaces and the presence of household chores limit outdoor activities. Therefore, further evidence about the factors influencing physical activity in Nepal is needed to develop effective interventions to improve adolescent physical activity levels.

The research gap in this study is the lack of information on physical activity levels among Nepalese adolescents, particularly in the hilly regions of the country where outdoor activities are limited. The rationale for conducting this study is to address this gap and identify the factors associated with low physical activity levels among secondary school students in Palpa district of Nepal. The study aimed to provide evidence to develop effective interventions that promote physical activity among adolescents in the region, ultimately improving their health outcomes. To achieve this objective, a cross-sectional study was conducted among secondary school students in Palpa district of Nepal to assess their physical activity levels and associated factors.

METHODS

A cross-sectional study was conducted among secondary school students in Palpa district, located in Lumbini Province of Nepal. The district consists of two urban municipalities and eight rural municipalities. The data were collected from January 7 to March 7, 2023.

To calculate the sample size, the formula; $n = z^2 (p \times q) / e^2$, where: z = 1.96 (95%CI), p = 0.4, q = 1 - p = 0.6, e = 0.05 (margin of error) was used. The allowable error was set at 5% to ensure accurate data and reduce bias. So, substituting the values, we got: $n = (1.96)^2 (0.4 \times 0.6) / (0.05)^2$, n = 385. After adding 10% non-respondents, the final minimum sample size was 424. The study employed a random sampling technique across six schools, three from each urban and rural municipality, with participants selected from either grade eight or nine. Choosing a random sampling technique in this study was necessary to ensure that the sample was representative of the population from which it was drawn. In other words, the use of the random sampling technique minimized selection bias. The random sampling technique ensured that each student had an equal chance of being selected to participate in the study, regardless of their gender, age, or socioeconomic status. This made the sample of students in the study more representative of the population of secondary school students in Palpa district of Nepal. Additionally, random sampling is considered to be an objective and unbiased sampling method, making the findings of the study more reliable and generalizable to the wider population.

Students with physical disabilities and absent in school at the time of data collection were excluded from the study. The study included only adolescent students and excluded those who were more than 19 years of age. The study selected grade eight and nine students because they are in the early adolescence stage, and this period is critical for forming health behaviors that may last into adulthood. Additionally, physical activity levels have declined with increasing age during adolescence. Data were collected using a modified version of the Physical Activity Questionnaire Adolescents (PAQ-A) questionnaire, which was validated for the Nepalese context through back-and-forth translation and pretesting.[4] The questionnaire was administered in the Nepali language to ensure maximum participation. The first part of the questionnaire consisted of general information such as age, gender, marital status, distance from school, mode of transport while going to school, playground availability at school and home, and involvement in extracurricular activities. The second part of the questionnaire consisted of involvement in physical activity for how often? ('I do not do physical activity' for no physical activity, 'Hardly ever' for 1 to 2 times a week, 'sometimes' for 3 times a week, 'often' for 4 to 5 times a week and 'always' for 6 to 7 times a week), during break-time (Sat down or walk around, 'ran around or played a bit', 'played hard most of the time'), after school activity ('none', '1 to 3 times last week' and '>4 times last week') and during weekend ('none', '1 to 2 hours in last week', '>3 hours in last week'), and for how long? (The length of time in which an activity or exercise is performed.) The physical activity was defined as any bodily movement that requires energy expenditure and muscle contraction. The PAQ-A asked about the duration and frequency of physical activities, including playing games, sports, walking to school, cycling, and planned exercises such as dance classes, with any activities lasting longer than ten minutes included in the study. Physical inactivity was defined as activities such as talking, reading, doing schoolwork, and sitting silently. The undergraduate medical students who were posted in the Department of Community Medicine for school-health programs were given orientation for data collection. The data collection date and time were fixed with the principal of each school. The questionnaire was distributed in the classroom for grades eight and nine of each school. The

students who were oriented would help the participants if any clarifications were needed. The participants filled in the questionnaire and returned.

Ethical approval was obtained from the Institutional Review Committee (IRC) of Lumbini Medical College (Protocol No: IRC-LMC-03/P-24). Written informed consent was obtained from the respective school principal on the grounds of loco parentis. The research team clarified the study purpose and ensured the confidentiality of the participant data. A total of 518 questionnaires were collected from the participants, and only 506 cases were included in the analysis due to incompleteness. Data cleaning procedures were followed to identify and exclude invalid or inconsistent responses. The data were entered and analyzed using the IBM Statistical Package for Social Sciences (SPSS) version 21.0. Descriptive analysis was performed using frequency, percentage, mean and standard deviation as per the need. Chi-square test was used to test the association between categorical variables. P-value less than 0.05 was considered as a statistically significant.

RESULTS

Nearly half (52.96%) were females and 81.02% were between the ages of 12 and 15 years with a mean age of 14.55±1.23 years. The majority of participants (82.80%) walked to school and 84% had sufficient playgrounds available at school. However, 62% of the participants did not have a playground or park near their homes. Furthermore, 91% of the participants were involved in some extracurricular activity (Table 1).

Table 1: Demographic characteristics of the study participants (N=506)

Variables		Number	Percentage (%)
Age group (in years)	12-15	410	81.02
	16-19	96	18.98
Mean age	14.55 ±1.23 years		
Sex	Female	268	52.96
	Male	238	47.04
Marital status	Married	7	1.38
	Unmarried	499	98.72
Part-time job	No	484	95.65
	Yes	22	4.35
Distance to school (in minutes)	<10	154	30.44
	10-30	231	45.65
	>30	121	23.91
Mode of transport	Walk	419	82.80
	Cycle	2	0.40
	Bike/Bus	85	16.80
Playground availability at school	Yes	425	84.00
	No	81	16.00
Park or playground availability around the home	Yes	191	37.74
	No	315	62.26
Extra-curricular activity	Yes	461	91.10
	No	45	8.90

Table 2 shows the gender difference in involvement in physical activity almost half of the students (45.84%) were involved 'sometimes' in physical activity. Most participants (84.18%) sat down or walked around during break time, while more than half was not involved in after-school activities (53.35%). Nearly half of the students (49.20%) had physical activity of one to two hours during the weekend, with internal motivation (85.57%) cited as the major factor for involvement in physical activity. There were significant differences in physical activity involvement, break time physical activity, after-school physical activity, and the weekend physical activity between males and females. (p-value <0.001)

Table 2: Physical activity involvement among males and females (during the last week) (N= 506)

	Variables	Male n(%)	Female n(%)	Total n(%)	Chi-square value	P-value
Involvement in physical activity	I do not do physical activity	15 (22.72)	51 (77.28)	66 (13.04)	84.62	<0.001
	Hardly ever	17 (21.25)	63 (78.75)	80 (15.81)		
	Sometimes	107 (46.12)	125 (53.88)	232 (45.84)		
	Quite often	34 (73.91)	12 (26.09)	46 (9.09)		
	Always	65 (79.26)	17 (20.74)	82 (16.22)		
Break time physical activity	Sat down or walk around	186 (43.66)	240 (56.34)	426 (84.18)	32.62	< 0.001
	Ran around & played a bit	40 (63.49)	23 (36.51)	63 (12.45)		
	Played a hard-most time	12 (70.58)	5 (29.42)	17 (3.35)		
	None	110 (40.74)	160 (59.26)	270 (53.35)		
After-school activity	1-3 times last week	86 (49.42)	88 (50.58)	174 (34.38)	27.54	<0.001
	>4 times last week	42 (67.74)	20 (32.26)	62 (12.27)		
	None	36 (21.55)	131 (78.45)	167 (33.00)		
Physical activity during the weekend	For 1-2 hours	144 (57.83)	105 (42.17)	249 (49.20)	70.83	<0.001
	>3 hours	58 (64.45)	32 (35.55)	90 (17.80)		
Motivation for physical activity	Internal motivation	206 (47.57)	227 (52.43))	433 (85.57)	0.53	0.55
	External motivation	32 (43.83)	41 (56.17)	73 (14.43)		

Table 3 shows the differences in the level of physical activity according to schools in urban or rural municipalities. The students in the rural municipality were more likely to engage in physical activities during break time. However, there was no significant difference in after-school physical activity levels between the two municipalities (p-value=0.40).

Table 3: Comparison of physical activity between schools of the urban and rural municipalities during last week

Variables		Urban Municipality	Rural Municipality	Total	Chi-square value	P-value
Involvement in physical activity	I do not do physical activity	38 (57.57)	28 (42.43)	66 (13.04)	15.20	0.004
	Hardly ever	23 (28.75)	57 (71.25)	80 (15.81)		
	Sometimes	99 (42.67)	133 (57.33)	232 (45.85)		
	Quite often	14 (30.43)	32 (69.57)	46 (9.10)		
	Always	31 (37.80)	51 (62.20)	82 (16.20)		
Break time physical activity	Sat down or walk around	185 (43.42)	241 (56.58)	426 (84.18)	11.64	0.02
	Ran around & played a bit	17 (26.99)	46 (73.01)	63 (12.45)		
	Played a hard-most time	3 (17.64)	14 (82.36)	17 (3.37)		
	None	115 (42.60)	115 (57.40)	270 (53.36)		
After-school activity	1-3 times last week	61 (35.05)	113 (64.95)	174 (34.39)	4.01	0.40
	>4 times last week	29 (46.77)	33 (53.33)	62 (12.25)		
Physical activity during the weekend	None	85 (50.90)	82 (49.10)	167 (33.00)	12.59	0.013
	1-2 hours	89 (35.74)	160 (64.26)	249 (49.20)		
	>3 hours	31 (34.44)	59 (65.56)	90 (17.80)		

Table 4 shows that only 23.10% of the participants engaged in physical activity for more than 60 minutes per day, as recommended by WHO. Females were less likely to achieve the recommended physical activity levels than males (p-value=0.02). However, there was no significant difference in physical activity levels between urban and rural municipalities (p-value=0.93). Overall, the mean time spent in physical activity was 30.76±23.02 minutes per day.

Table 4: Physical activity as per WHO recommendation during last week (N=506)

Variables	WHO recommended physical activity per day		p-value	Mean physical activity per day (in minutes)
	<60 min	≥60 min		
Male	172 (72.27%)	66 (27.73%)	0.02	30.76±23.02
Female	217 (81.00%)	51 (19.00%)		
Total N (%)	389 (76.90)	117 (23.10)		
Urban Municipality	158 (77.07%)	47 (22.93%)	0.93	
Rural Municipality	231 (76.74%)	70 (23.26%)		

DISCUSSION

The study assessed physical activity and its associated factors among secondary school students in Palpa district of Nepal. Results showed that only 25.30% of students were involved in physical activity quite often or always. Furthermore, only 23.10% of the participants met the daily WHO recommendation for physical activity. This figure is considerably lower than Nepal's physical activity report card, which showed physical activity levels at less than <40%.[10] It was observed that 45.85% of the students sometimes engaged in physical activity, while 84.18% remained seated or standing during break time at school. This could be due to a limited break time that is only given for snacks at school or inadequate playing materials.

When comparing gender, females were found to be less likely to engage in physical activity than males, which is supported by other studies.[4] A survey conducted to identify risk factors for non-communicable diseases in Nepal in 2019 also highlighted the lack of female engagement in physical activities.[17] Adolescent females spend their break time talking to their friends instead of engaging in physical activities.[18] In a domestic setting, adolescent females are more confined to indoor activities and household chores than their male counterparts who are allowed to play.[13,19]

Another factor associated with a sedentary lifestyle is screen time through the use of electronic media such as television, computers, cell phones, and smartphones. This decrease in physical activity is a significant risk factor for multiple health outcomes such as cardiovascular disease, dyslipidemia, obesity, and mortality.[20] Watching television for more than two hours per day was also found to be a significant risk factor for being overweight in the adolescent age group.[21]

Although most participants walk to school, they fail to meet the recommended levels of physical activity. The academic performance of students is typically prioritized over physical activity in our setting which often results in reduced physical activity levels.[22]

People from varying socioeconomic backgrounds may engage in different types of sedentary activities, such as academic pursuits or screen time on mobile or television. However, these variances may not result in a significant difference in overall sedentary behavior between the two groups.[13]

In Nepal, physical activity, particularly physical activity is not a primary concern within the community or schools, and there is a general lack of awareness regarding the health risks associated with physical inactivity.[13]

The study was conducted in the hilly region of Nepal, which resulted in the lack of playgrounds or parks near students' homes as one of the barriers to involvement in physical activity. Typically, adolescents perceive leisure time as an

opportunity for rest, recreation, and entertainment, which can often take priority over physical activity. Contributing factors such as social norms, lack of support, absence of physical education in schools, and deprioritization of physical activity often result in low levels of physical activity among adolescents.[11]

The findings depict a noticeable dissimilarity in physical activity participation, break time physical activity, and the weekend physical activity among individuals residing in urban and rural locales. People residing in rural setups usually utilize their after-school hours and the weekends to engage in supplemental household chores, such as farming. Moreover, students in rural areas are preoccupied with fulfilling academic obligations, including completing school assignments and attending additional classes.

The present study has some limitations. The first limitation is the cross-sectional design, which does not allow for the establishment of causal relationships between physical activity and associated factors. The study only captures a snapshot of the situation at one point in time. Therefore, the results obtained cannot determine whether the factors identified are the cause or effect of physical activity levels. The second limitation is the self-reported nature of the data collected. Since participants reported their physical activity levels, there may be potential bias due to social desirability bias or inaccurate recall. The third limitation is related to sampling. The study employed a random sampling technique, which may not be representative of the entire Palpa district's population. Additionally, the study did not include private schools, which may have different physical activity levels than public schools. The fourth limitation is related to the study's generalizability. Since the study was conducted in only one district in Nepal, it may not be generalizable to other districts or regions in Nepal or other countries with different sociocultural contexts. Finally, the study did not explore the relationship between physical activity and mental health outcomes, such as depression and anxiety, which are prevalent among adolescents.

CONCLUSIONS

In conclusion, physical inactivity is a major health concern among adolescents, which can lead to several non-communicable diseases. This study has highlighted the low levels of physical activity among secondary school students in Palpa district of Nepal, with only a quarter of the students reported being engaged in physical activity quite often or always, and a mere 23.10% meeting the recommended WHO guidelines for daily physical activity. The study has identified several factors associated with low physical activity levels, including limited break time at school, lack of parks or playgrounds near homes, and gender differences, with females found to be less likely to participate in physical activity than males. Increased screen time and interpersonal and environmental barriers also contribute to decreased physical activity. Therefore, interventions that address these factors need to be implemented to promote physical activity among adolescents in the region, ultimately improving their health outcomes.

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AUTHORS CONTRIBUTION

SN did conceptualization, project administration, formal analysis, investigation, methodology, original draft preparation, reviewing & editing the manuscript, AM did the investigation, methodology, reviewing & editing of the manuscript, SS did the investigation, methodology, reviewing & editing the manuscript, DKK did the formal analysis, resources, visualization, review & editing the manuscript.

REFERENCES

1. Katzmarzyk PT, Friedenreich C, Shiroma EJ, Lee IM. Physical inactivity and non-communicable disease burden in low-income, middle-income and high-income countries. Br J Sports Med. 2022;56(2):101-6. DOI: 10.1136/bjsports-2020-103640 PMID: 33782046.
2. Wu XY, Han LH, Zhang JH, Luo S, Hu JW, Sun K. The influence of physical activity, sedentary behavior on health-related quality of life among the general population of children and adolescents: A systematic review. PLoS One. 2017;12(11):e0187668. DOI: 10.1371/journal.pone.0187668 PMID: 29121640.
3. de Rezende LF, Azeredo CM, Canella DS, Claro RM, de Castro IR, Levy RB, et al. Sociodemographic and behavioral factors associated with physical activity in Brazilian adolescents. BMC Public Health. 2014;14:485. DOI: 10.1186/1471-2458-14-485 PMID: 24884802.

4. Thapa K, Bhandari PM, Neupane D, Bhochhibhoya S, Rajbhandari-Thapa J, Pathak RP. Physical activity and its correlates among higher secondary school students in an urban district of Nepal. BMC Public Health. 2019;19(1):886. DOI: 10.1186/s12889-019-7230-2 PMID: 31277633.

5. Aniza I, Fairuz MR. Factors influencing physical activity level among secondary school adolescents in Petaling District, Selangor. Med J Malaysia. 2009;64(3):228-32. PMID: 20527274.

6. Zhan X, Clark CCT, Bao R, Duncan M, Hong JT, Chen ST. Association between physical education classes and physical activity among 187,386 adolescents aged 13-17 years from 50 low- and middle-income countries. J Pediatr (Rio J). 2021;97(5):571-8. DOI: 10.1016/j.jped.2020.11.009.Epub 2021 PMID: 33556333.

7. Kiyani T, Kayani S, Kayani S, Batool I, Qi S, Biasutti M. Individual, Interpersonal, and Organizational Factors Affecting Physical Activity of School Adolescents in Pakistan. Int J Environ Res Public Health. 2021;18(13):7011. DOI: 10.3390/ijerph18137011 PMID: 34209078.

8. Bull FC, Al-Ansari SS, Biddle S, Borodulin K, Buman MP, Cardon G, et al. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. Br J Sports Med. 2020;54(24):1451-62. DOI: 10.1136/bjsports-2020-102955 PMID: 33239350.

9. Fennell C, Barkley JE, Lepp A. The relationship between cell phone use, physical activity, and sedentary behavior in adults aged 18–80. Comput Human Behav. 2019;90:53–9. DOI: 10.1016/j.chb.2018.08.044

10. Subedi N, Paudel S, Nepal S, Karki A, Magar M, Mehata S, et al. Results from Nepal's 2018 Report Card on Physical Activity for Children and Youth. J Exerc Sci Fit. 2020;18(2):74-79. DOI: 10.1016/j.jesf.2020.02.001 PMID: 3212790.

11. Paudel S, Owen AJ, Smith BJ. Socio-ecological influences of leisure-time physical activity among Nepalese adults: A qualitative study. BMC Public Health. 2021;21(1):1443. DOI: 10.1186/s12889-021-11484-3 PMID: 34294069.

12. Vaidya A, Krettek A. Physical activity level and its sociodemographic correlates in a peri-urban Nepalese population: a cross-sectional study from the Jhaukhel-Duwakot health demographic surveillance site. Int J Behav Nutr Phys Act. 2014;11(1):39. DOI: 10.1186/1479-5868-11-39 PMID: 24628997.

13. Paudel S, Subedi N, Bhandari R, Bastola R, Niroula R, Poudyal AK. Estimation of leisure time physical activity and sedentary behaviour among school adolescents in Nepal. BMC Public Health. 2014;14:637. DOI: 10.1186/1471-2458-14-637 PMID: 24953522.

14. Paudel S, GC KB, Bhandari DB, Bhandari L, Arjyal A. Health Related Lifestyle Behaviors among Undergraduate Medical Students in Patan Academy of Health Sciences in Nepal. J Biosci Med (Irvine). 2017;05(09):43–53. DOI: 10.4236/jbm.2017.59005

15. Singh DR, Sunuwar DR, Dahal B, Sah RK. The association of sleep problem, dietary habits and physical activity with weight status of adolescents in Nepal. BMC Public Health. 2021;21(1):938. DOI: 10.1186/s12889-021-10985-5 PMID: 34001092.

16. Kowalski KC, Crocker PRE, Donen RM, Honours B. The physical activity questionnaire for older children (PAQ-C) and adolescents (PAQ-A) manual. College of Kinesiology, University of Saskatchewan [Internet]. 2004;87(1):1–38. Available from: https://www.prismsports.org/UserFiles/file/PAQ_manual_ScoringandPDF.pdf [Accessed 20th April 2022].

17. Dhimal M, Bista B, Bhattarai S, Dixit LP, Hyder MKA, Agrawal N, et al. Noncommunicable Disease Risk Factors: STEPS Survey Nepal 2019 [Internet]. Kathmandu; 2020. Available from: https://www.who.int/docs/default-source/nepal-documents/ncds/ncd-steps-survey-2019-compressed.pdf [Accessed 20th March 2022]

18. Yungblut HE, Schinke RJ, McGannon KR. Views of adolescent female youth on physical activity during early adolescence. J Sports Sci Med. 2012;11(1):39-50. PMID: 24149121.

19. Cerrato J, Cifre E. Gender Inequality in Household Chores and Work-Family Conflict. Front Psychol. 2018;9:1330. DOI: 10.3389/fpsyg.2018.01330 PMID: 30123153.

20. Piryani S, Baral KP, Pradhan B, Poudyal AK, Piryani RM. Overweight and its associated risk factors among urban school adolescents in Nepal: a cross-sectional study. BMJ Open. 2016;6(5):e010335. DOI: 10.1136/bmjopen-2015-010335 PMID: 27207624.

21. Khatri E, Baral K, Arjyal A, Yadav RK, Baral S.

Prevalence of and risk factors for overweight among adolescents of a sub-metropolitan city of Nepal. PLoS One. 2023;18(3):e0270777. DOI: 10.1371/journal.pone.0270777 PMID: 36877713.

22. Lee EY, Shih AC, Collins M, Kim YB, Nader PA, Bhawra J, et al. Report card grades on physical activity for children and adolescents from 18 Asian countries: Patterns, trends, gaps, and future recommendations. J Exerc Sci Fit. 2023;21(1):34–44. DOI: 10.1016/j.jesf.2022.10.008 PMID: 36408204.

A comparative study of students' performance in flipped classroom and structured interactive session teaching learning method in Conservative Dentistry and Endodontics

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ABSTRACT

Introduction: Flipped classroom is an element of blended learning, integrating both face-to-face learning in the class through group discussion and distance learning outside the class by watching video lessons and online collaboration. The objective of the study was to introduce and assess the effectiveness of flipped classroom in teaching and learning of Conservative Dentistry and Endodontics and to understand the perspective of students about the same. **Methods**: Third year undergraduate dental students were randomly divided into two groups: structured interactive session group and flipped classroom group. Structured interactive session group had their class taken in the traditional manner while the flipped classroom group was given power point presentation and videos beforehand so that students came to class being prepared. The in class time was utilized for group discussions and peer exercises. Same set of questions including multiple choice questions (MCQs) and problem based questions (PBQs) validated by the faculties involved in the research was used for assessment. A questionnaire was then provided to students regarding their perception of flipped classroom method. **Results**: Among the 41 students, 19 students were in structured interactive session group and 22 were in flipped classroom group. The mean MCQ and PBQ score in structured interactive session group was 69.47 and 59.39 respectively whereas it was 73.17 and 66.55 respectively in flipped classroom group. **Conclusions:** The performance of flipped classroom group was better in both MCQs and PBQs. Students preferred flipped classroom method and were ready to accept it as their teaching learning modality.

Keywords: Flipped classroom, teaching and learning method, undergraduate dental students.

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INTRODUCTION

In modern days, increasing interest of medical educationists in teaching and learning have raised concerns over passively transferring knowledge to learners using traditional lectures. This has created a pressure for medical education to move towards more student-centered, active learning.[1-3] It is believed that flipped classrooms (FCR) create a more student-centered, active learning environment than traditional lectures.[4] There is adequate evidence supporting flipped classroom as an effective method of teaching and learning in all the higher education including medical education.[5-11]

Recently, FCR approach has even been proposed as a new paradigm in medical education.[12] Various health professions have adopted this instructional approach into their curricula. An overwhelming positive response from students who attended flipped courses in health professions was found in the recent review. More specifically, students were highly satisfied with pre-class video lectures as they could be accessed at any time and as often as desired. Students also highly regarded small group discussion-based activities in face-to-

face sessions because these sessions helped to increase their motivation to learn, and enhance their level of engagement, and interest in the subject matter.[13] Traditionally, the teaching of Conservative Dentistry and Endodontics in many dental schools has been in large-sized lectures. Although a lecture is an efficient way to convey a large amount of information to a large group of students, teacher-centered lectures have been criticized for failing to engage students and develop higher-level cognitive and interaction skills.[14,15] FCR is an instructional approach in which foundational knowledge is delivered online for students to study at their own pace, and class time is devoted only to active learning activities to deepen students' comprehension of the content.[16] The goal of flipped classroom method is to make learning more student centered and to promote the development of higher level learning outcomes on Bloom's taxonomy.[17]

The FCR method has received much attention in health sciences education in recent years. However, its application in Conservative Dentistry and Endodontics education has not been well investigated. In this research, we introduced the flipped classroom method in the teaching and learning of Conservative Dentistry and Endodontics and helped to identify whether flipped classroom increases the students' learning ability of the subject. This research will also help to recognize the perspective of the students toward FCR as a potential learning tool.

METHODS

This quantitative study was conducted at the Department of Conservative Dentistry and Endodontics, BP Koirala Institute of Health Sciences, Nepal from November 2019 to February 2020. Approval from Institutional Review Committee, BPKIHS (Reference number 496/075/076-IRC) and Research Committee, BPKIHS (Reference number Acd.175/075/076) were obtained. The third-year undergraduate dental students who gave consent to participate in the study and were present on the day of intervention were included in the study. Enrollment of the students in between the intervention group and structured interactive session (SIS) group was done on the basis of randomized allocated method using a simple random sampling procedure.

The faculties involved selected a topic for intervention and for the assessment of students' knowledge ten multiple choice questions (MCQs) each carrying one mark and for critical thinking ability one problem-based question of eight marks pertinent to the topic was decided and validated. For the smooth conduction of the FCR method, various tools to be used during the process were prepared which included power point presentation, videos, study materials as well as tutor guide. Self-addressed questionnaires regarding student perception of the intervention method and the feedback form were decided upon.

The faculty allocated for the FCR group formed a WhatsApp group inclusive of all the enrolled students and faculties where power point presentation along with all the study materials was shared. The students were encouraged to put forward their doubts for active discussion on the online platform. They were also instructed to come for classes after going through the materials provided and were requested not to share these materials with the SIS group members. On the day of intervention, SIS and FCR were undertaken simultaneously in different classrooms by allocated faculties thus limiting contamination bias. This way it was ensured that there was not any crossover of students of different groups. The SIS group had a lecture with a question-answer session at the end followed by an assessment. The FCR group was further divided into small groups for effective discussion and demonstrations which was followed by an assessment at the end. The students were then given a questionnaire comprising seven close-ended questions and one open-ended question as feedback. A different faculty who was blinded to the allocation assessed the performance of the students.

Data were entered in Microsoft Excel and statistical analysis was done using statistical packages for the social sciences (SPSS) version 11.0 software. Data is presented as percentage, mean, standard deviation and calculated for descriptive statistics. Mean scores was calculated using the scores of the students in MCQ and PBQ for both the groups. For the inferential statistics, chi-square test was used to find out the association between categorical variable and groups. T-test was used to find out significant difference of mean MCQ and PBQ scores between SIS and FCR groups and the probability of significance was set at 5%.

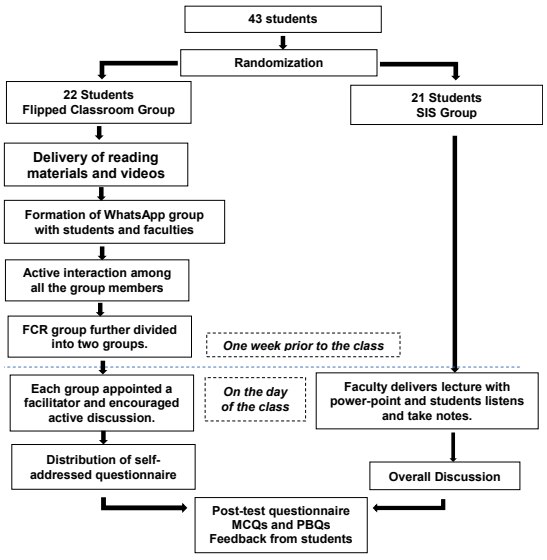

Figure 1: Schematic outline of the research conduction

RESULTS

Of the total 43 students, 41 gave consent. After randomization, there were 19 students in conventional lecture (males=10; females=9) and 22 in flipped classroom group (males=13, females=9). The response of the students was better among the FCR group compared to the SIS group both in MCQ and PBQ, however significantly better in the PBQ responses (Table 1). Majority of the students agreed that Flipped classroom was more engaging and provided opportunity to interact and communicate with others (Table 2). On qualitative review of the feedback, the students felt that FCR was more interesting, and they were ready to accept it as their teaching and learning method. Moreover, they also inferred the role of an inducive learning environment for better output (Table 3).

Table 1: Mean MCQ and PBQ scores of SIS and FCR group

		SIS Group (n=19)		FCR Group (n=22)		
S.N	**Group**	**Mean±SD**	**95% CI of the difference (lower- upper)**	**Mean±SD**	**95% CI of the difference (lower-upper)**	**p-value***
1.	MCQ	6.95±2.09	5.94 - 7.96	7.18±1.14	6.68 - 7.69	0.65
2.	PBQ	4.10±0.96	3.68 - 4.63	5.00±1.27	4.61 - 5.56	0.016**

*t-test, **statistically significant

Table 2: Students' perception of FCR

S.N	Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly
1.	The FCR is more engaging than traditional classroom	13	8	0	1	0
2.	All flipped videos in this course are interesting.	4	14	4	0	0
3.	I like watching short flipped videos	5	14	2	0	1
4.	FCR gives a chance to communicate with other friends.	15	5	2	0	0
5.	The FCR gives me more time to practice subject outside the class.	8	13	1	0	0
6.	The teacher's feedback is very important in FCR.	6	14	2	0	0
7.	The activity in the classroom should be more interactive and communicative.	11	8	2	0	1

Table 3: Students open feedback

S. N.	Fields	Suggestions
1.	**Content of course structure**	More clinical cases with case scenarios and pictures may help to relate more effectively with the course content
		More videos will be less boring
		More practicals and demonstrations will help to clear any doubts then and there
		Search, research and present sessions for students as well may help to retain what is learnt.
		More interaction during discussions in the in class time
2.	**Learning Environment**	More interaction and discussions in out of the class groups in internet
		Loud voice of the facilitator
		Audio visual aid during small group discussions
3.	**For out of the class activities**	Allocation of particular time for group work and interaction
		Not very lengthy off the class discussions and assignments

DISCUSSION

A FCR in recent days is emerging as a promising blended method of teaching and learning in health professions education.

Flipped classroom ensures more face-to-face time between learners and tutor which in turn leads to more interaction and collaborations between not just teacher and students but between students as well. One of the advantages of FCR is the fact that students can learn at their own pace. Since the contents would have been provided before the actual class it also encourages students to come to class prepared, raise their doubts and have a healthy discussion about the same. Practical setbacks like missing classes and concerns over students attending classes just for attendance also becomes less significant. Since most of the contents are delivered via online platform there is opportunity to create richer content.[18] In the FCR approach, classroom-based time is spent in the higher levels of Bloom's taxonomy: apply, analyze, and evaluate as compared to the traditional didactic classroom where in it is focused on; remember and understand according to the Bloom's taxonomy.[18]

FCR utilizes case or problem-based discussions where each student has an equal opportunity to speak and be heard. It is an instructor facilitated, learner centered activity which improves understanding and increases clinical application of acquired knowledge in addition to earning critical lifelong learning skills.[19-21] Active participation of students during the discussions and raising of doubts ensured that they came to the class being prepared. It has been well established that adult learners have ability to make practical application of knowledge gained through independent study during learner centered activities.[19] This finding is consistent with present study where the performance of students of flipped classroom group was found to be better in the PBQs than in

the MCQs. This could point out that the flipped classroom induced deep learning in the students such that they could understand the problems and concepts better. The similar scores of students in both the groups could indicate that FCR may be as effective as traditional classroom method if not better, when the students were accessed based on recall type questions.

The use of FCR approach is becoming increasingly common in medical education. Hew et al.[22] in his meta-analysis of well controlled studies showed significant inclination towards flipped classrooms over conventional classrooms for health professionals. Additionally, it was revealed that FCR proved to be more effective with the use of quizzes at the beginning of face to face time. More students were found to have preference for flipped to traditional classrooms which is similar to the results in our research. Chen et al.[19] noted that FCR is a promising teaching approach that increases learner motivation and engagement. This finding is consistent with current research where most of the students felt that flipped classrooms are more engaging than traditional classes. Most of the students felt that flipped classroom gave them more time to practice the topic outside the classroom and there was more interaction in the flipped classroom method. Although learning in FCR has many advantages, transitioning to the FC model can be challenging for both learners and educators. FCR is most effective when learners have completed their preparatory work and are ready to actively participate in classroom discussions. This differs from traditional teaching models in which learners rely on teachers to acquire knowledge and require little preparation for lessons. Getting busy learners ready for class can be challenging and requires intrinsic learner motivation. This can be better understood by seeking students' feedback to make the FC method more acceptable.

A growing body of literature indicates the popularity of this method among trainees, and educators. However, there is broad consensus that more rigorous studies are needed to generate evidence for or against the use of FCR in medical education. A frequently evaluated metric for knowledge and performance improvement is the immediate posttest result, which has been used as criterion for evaluation in this study. Rose et al.[23] and Graham et al.[24] revealed that emergency medicine and internal medicine residents improved their immediate post-test results with the FC approach, consistent with the post-test results of the current study. Although promising, the next question posed by educators was whether these effects were sustainable. To find out Rose et al.[23] and Martinelli et al.[25] did study of 25 internal medicine and 26 anesthesiology residents respectively which showed that the improved knowledge acquisition after FCR persisted months later. Furthermore, study done by Day[26] found that applying the FC approach to an anatomy course resulted in higher performance in both anatomy and subsequent kinesiology courses, and improved long-term retention of critical thinking skills which was able to be transferred to other courses as well.

We as investigators can only request the students to come prepared for the sessions and not share the study materials with the other group members but cannot ensure it. This can be considered as a limitation of the study as it may lead to contamination bias. The study only aimed to understand the perception of students taking part in the flipped classroom but did not assess the perception of teachers taking such class. More longitudinal studies considering all these factors and the longevity of the acquired knowledge by FCR would bridge the current gap of knowledge in this field.

CONCLUSIONS

The students in FCR group definitely performed better in problem-based questions. Even though the difference was not significant the students of the FCR group scored more in the MCQs. A study of greater sample size with longer duration of time and multiple number of sittings is required to confirm this result. Students felt that introduction of FCR will help them turn the conventional classroom into more interactive and student friendly one. They seemed to enjoy FCR more and also felt that use of videos and practical sessions will help to enhance their learning. Even though few students felt that FCR was too lengthy most students were ready to accept FCR as their teaching learning modality.

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REFERENCES

1. Prober CG, Heath C. Lecture halls without lectures- A proposal for medical education. N Engl J Med. 2012;366(18):1657–9. DOI: 10.1056/NEJMp1202451 PMID: 22551125.

2. Prober CG, Khan S. Medical education reimagined: A call to action. Acad Med. 2013;88(10):1407–10. DOI: 10.1097/ACM.0b013e3182a368bd PMID: 23969367.

3. Schwartzstein RM, Roberts DH. Saying goodbye to lectures in medical school - paradigm shift or passing

fad? N Engl J Med. 2017;377(7):605–7. DOI: 10.1056/NEJMp1706474 PMID: 28813217.

4. Young Hwan L, Kyong-Jee K. Enhancement of student perceptions of learner-centeredness and community of inquiry in flipped classrooms. BMC Med Educ. 2018;18:242. DOI: 10.1186/s12909-018-1347-3 PMID: 30352591.

5. O'Flaherty J, Phillips C. The use of flipped classrooms in higher education: A scoping review. Internet High Educ. 2015;25:85–95. DOI: 10.1016/j.iheduc.2015.02.002.

6. McLaughlin JE, Roth MT, Glatt DM, Gharkholonarehe N, Davidson CA, Griffin LM. The flipped classroom: a course redesign to foster learning and engagement in a health professions school. Acad Med. 2014;89(2):236–43. DOI: 10.1097/ACM.0000000000000086 PMID: 24270916.

7. Khanova J, Roth MT, Rodgers JE, McLaughlin JE. Student experiences across multiple flipped courses in a single curriculum. Med Educ. 2015;49(10):1038–48. DOI: 10.1111/medu.12807 PMID: 26383075.

8. Khandelwal A, Nugus P, Elkoushy MA, Cruess RL, Cruess SR, Smilovitch M. How we made professionalism relevant to twenty-first century residents. Med Teach. 2015;37(6):538–42. DOI: 10.3109/0142159X.2014.990878 PMID: 25594336.

9. Sharma N, Lau CS, Doherty I, Harbutt D. How we flipped the medical classroom. Med Teach. 2015;37(4):327–30. DOI: 10.3109/0142159X.2014.923821 PMID: 24934251.

10. Kalaian SA, Kasim RM. Effectiveness of various innovative learning methods in health science classrooms: A meta-analysis. Adv Health Sci Educ Theory Pract. 2017;22(5):1151–67. DOI: 10.1007/s10459-017-9753-6 PMID: 28091976.

11. Hew KF, Lo CK. Flipped classroom improves student learning in health professions education: A meta-analysis. BMC Med Educ. 2018;18(1):38. DOI: 10.1186/s12909-018-1144-z PMID: 29544495.

12. Mehta NB, Hull AL, Young JB, Stoller JK. Just imagine: New paradigms for medical education. Acad Med. 2013;88(10):1418–23. DOI: 10.1097/ACM.0b013e3182a36a07 PMID: 23969368.

13. Ramnanan CJ, Pound LD. Advances in medical education and practice: Student perceptions of the flipped classroom. Adv Med Educ Pract. 2017;8:63-73. DOI: 10.2147/AMEP.S109037 PMID: 28144171.

14. Gilboy MB, Heinerichs S, Pazzaglia G. Enhancing student engagement using the flipped classroom. J Nutr Educ Behav. 2015;47:109-14. DOI: 10.1016/j.jneb.2014.08.008 PMID: 25262529

15. Zheng M, Bender D, Nadershahi N. Faculty professional development in emergent pedagogies for instructional innovation in dental education. Eur J Dent Educ. 2017;21(2):67-78. DOI: 10.1111/eje.12180 PMID: 26663694

16. Bergmann J, Sams A. Flip your classroom: Reach every student in every class every day. Washington DC: International Society for Technology in Education; 2012. 120-190p

17. Krathwohl DR. A revision of Bloom's taxonomy: An overview. Theory into Practice. 2002;41:212-18. DOI 10.1207/s15430421tip4104_2

18. Bloom BS. Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook I. Michgen, USA: Longmans, Green and Co Ltd; 1956. 403p

19. Chen F, Lui AM, Martinelli SM. A systematic review of the effectiveness of flipped classrooms in medical education. Med Educ. 2017;51(6):585–97. DOI: 10.1111/medu13272 PMID: 28488303.

20. French H, Gray M, Gillam-Krakauer M, et al. Flipping the classroom: a national pilot curriculum for physiology in neonatal-perinatal medicine. J Perinatol. 2018;38(10):1420–27. DOI: 10.1038/s41372-018-0185-9 PMID: 30087455.

21. Izatt S, Gray M, Dadiz R, French H. Development and implementation of a national neonatology flipped classroom curriculum. J Grad Med Educ. 2019;11(3):335–36. DOI: 10.4300/JGME-D-18-00907.1 PMID: 31210868.

22. Hew KF, Lo CK. Flipped classroom improves student learning in health professions education: a meta-analysis. BMC Med Educ. 2018;18(1):38. DOI: 10.1186/s12909-018-1144-z PMID: 29544495.

23. Rose E, Claudius I, Tabatabai R, Kearl L, Behar S, Jhun P. The Flipped Classroom in Emergency Medicine

Using Online Videos with Interpolated Questions. J Emerg Med. 2016;51(3):284-91. DOI: 10.1016/j.jemermed.2016.05.033 PMID: 27381954.

24. Graham KL, Cohen A, Reynolds EE, Huang GC. Effect of a flipped classroom on knowledge acquisition and retention in an internal medicine residency program. J Grad Med Educ. 2019;11(1):92–7. DOI: 10.4300/JGME-D-18-00536.1 PMID: 30805104.

25. Martinelli SM, Chen F, DiLorenzo AN, et al. Results of a flipped classroom teaching approach in anesthesiology residents. J Grad Med Educ. 2017;9(4):485–90. DOI: 10.4300/JGME-D-17-00128.1 PMID: 28824763.

26. Day LJ. A gross anatomy flipped classroom effects performance, retention, and higher-level thinking in lower performing students. Anat Sci Educ. 2018;11(6):565–74. DOI: 10.1002/ase.1772 PMID: 29356452.

Incidence and reasons for conversion of laparoscopic cholecystectomy to open cholecystectomy

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ABSTRACT

Introduction: Cholelithiasis is one of the most common problems affecting the gastrointestinal tract. The objective of the study was to find the incidence of cases converted to open cholecystectomy from laparoscopic cholecystectomy and find the association with other intra-operative and preoperative findings. **Methods:** This is a prospective observational study. One hundred elective laparoscopic cholecystectomy cases in the institution of the study were the study sample. Pre-operative and intra-operative findings were noted. Conversion in surgery from laparoscopic cholecystectomy to open cholecystectomy was also recorded and the association was tested through Fisher's exact test. **Results**: The rate of conversion from laparoscopic cholecystectomy to open cholecystectomy was 5%. which was significantly related to sex, time duration of the surgery, bleeding, and anatomical difficulties. **Conclusions:** The conversion rate is only 5% which was significantly associated with sex, time duration of surgery, intraoperative bleeding, and anatomical difficulties.

Keywords: Cholelithisis, conversion, laparoscopic choleystectomy.

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INTRODUCTION

Cholelithiasis is one of the most common problems affecting the gastrointestinal tract. Approximately 20 million cases of cholelithiasis are reported in the United States, out of which one million new cases of cholelithiasis develop each year.[1] In Nepal, cholelithiasis is mainly attributed to the westernization of diet and diverse socioeconomic structure. The practice of laparoscopic cholecystectomy (LC) is gaining popularity in Nepal as equipment and trained surgeons are now available in most of tertiary hospitals. LC is the gold standard technique nationally and internationally for treatment of gallbladder disease in both elective and emergency surgery because it is associated with fewer postoperative complications and shorter hospital stay as compared to open surgery.[2,3] At times LC becomes difficult, takes longer times due to bleeding and bile leakage, which requires conversion to open cholecystectomy. Conversion rate of laparoscopy to open cholecystectomy ranges from 5 to 10%.[4]

Incidence of biliary injury is twice that as with open cholecystectomy.[5] Conversion to open cholecystectomy is not a failure of surgery, it carries a high morbidity, so it should only be performed if other strategies for safe surgery have failed.[6] There are different reasons reported for conversion of LC to open cholecystectomy like difficult anatomy, gall bladder wall thickness more than 4 mm, recent history of cholecystitis, males, bile duct injury and bile leak, etc.[7]

The main objective of the study was to find the incidence of cases converted to open cholecystectomy from laparoscopic cholecystec-

tomy and to find the association with other intra-operative and preoperative findings.

METHODS

This was a prospective observational study conducted for six months. This study was conducted at Pokhara Academy of Health Sciences, Western Regional Hospital, Pokhara, Kaski, Nepal. All the patients who underwent elective laparoscopic cholecystectomy in this institution were the study population. Precision based sample size formula was used for the sample size calculation of sample size. Required sample size calculated for the study was about 73. However, having the large number of cases of cholecystectomy in the institution, we included 100 consecutive cases of elective laparoscopic cholecystectomy. All the LC were performed by experienced surgeons who had completed at least 25 LC independently. The intraoperative findings of all the cases were recorded in separate performa. Causes for conversion of LC to open cholecystectomy were recorded with intraoperative findings like bleeding, difficult anatomy, bile leak etc.

Outcome variable for this study was conversion of the surgical technique from laparoscopic cholecystectomy to open cholecystectomy. We made two categories of the outcome variable as "not converted to open" and "converted to open". Similarly, all the independent variables were used as binary variables. Variable age was grouped as "less than or equal to 60 years" as one category and "more than 60 years" as another category. We categorized age into such two categories because open cholecystectomy leads to greater period of hospital stay and also out of active workforce which may have greater impact over people below 60 years. We also distributed duration of surgery as "less than an hour" and "more than an hour" because average time taken for the surgery in this institution is one hour.

Ethical clearance was obtained from Institutional Review Committee (Ref. No: 129/079). Data were entered into Microsoft Excel and all the statistical analysis was performed through STATA 15.1. Fisher's exact test or Chi Square test was used where applicable to analyze the relationship between conversion of cholecystectomy surgical technique and other predicting variables. The level of statistical significance was set at a p-value <0.05.

RESULTS

A total of 100 participants were included in the study. Therefore, frequency and percentage being same, we presented only frequency to show the distribution of variables in table 1. Rate of conversion of surgical technique from laparoscopic cholecystectomy to open cholecystectomy was 5%. Duration of the surgery was less than an hour in 97% of cases and 79% of the patients who underwent the surgery were females.

Table1: Distribution of exposure and outcome variables for the data of 100 patients

Variables	Category	Total (N=100)
Age	≤60 years	71
	>60 years	29
Sex	Female	79
	Male	21
Past history of cholecystitis	No	88
	Yes	12
Difficult anatomy	No	97
	Yes	3
Pulsatile bleeding	No	97
	Yes	3
Bile duct injury	No	99
	Yes	1
Duration of surgery	Less than one hour	97
	More than one hour	3
Conversion to open	No	95
	Yes	5

The relationship of the conversion of surgical technique from laparoscopic cholecystectomy to open cholecystectomy with other preoperative and intraoperative findings. (Table 2)

Table 2: Relationship between exposure variables and the outcome, surgical technique conversion (N=100)

Variables	Category	Not Converted to open (n=95)		Converted to open (n=5)		P-value
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	
Age (years)	<60	68	(71.58%)	3	(60%)	0.62
	>60	27	(28.42%)	2	(20%)	
Sex	Female	78	(82.11%)	1	(20%)	0.007
	Male	17	(17.89%)	4	(80%)	
Past history of Cholecystitis	No	85	(89.47%)	3	(60%)	0.10
	Yes	10	(10.53%)	2	(40%)	
Difficult Anatomy	No	95	(100%)	3	(60%)	0.002
	Yes	0	0	2	(40%)	
Pulsatile Bleeding	No	95	(100%)	2	(40%)	< 0.001
	Yes	0	0	3	(60%)	
Bile duct injury	No	95	(100%)	4	(80%)	0.05
	Yes	0	0	1	(20%)	
Duration of Surgery (hour)	<1 hour	95	(100%)	2	(40%)	< 0.001
	>1 hour	0	0	3	(60%)	

Fisher's exact test was used to analyze the association between outcome variable and other covariates. Result has

shown that there was a statistically significant association (p-value <0.001) between the conversion of surgical technique and other three covariates bleeding (p-value<0.001), duration of surgery (p-value<0.001), difficult anatomy (p-value=0.002), and sex (p-value=0.007). There was no statistically significant association between surgery conversion and bile duct injury (p-value=0.05), between conversion of surgical technique and variables 'age' and 'cholecystitis' suggested by p-value 0.626 and 0.108 respectively.

DISCUSSION

Cholelithiasis is one of the most common problems affecting the gastrointestinal tract. The prevalence of cholelithiasis varies from place to place. Approximately 20 million cases of cholelithiasis are reported in United states out of which one million new cases of cholelithiasis develop each year.[1] Professor Dr. Med Erich Muhe of Boblingen, Germany, performed the first laparoscopic cholecystectomy in September 12, 1985.[8]

In this study, female population had undergone LC more than male population which were 82.11% and 17.89% respectively. There were no cases of third sex. The conversion to open cholecystectomy was 5%, which lies in the same range one to 15% as in other studies.[9,10] Different studies at different institution showed that the most common reasons for conversion to open cholecystectomy were inflammation, recent history of cholecystitis and difficult anatomy.[11] In this study, 80% were male among conversion population. The conversion was common among male due to dense fibrosis and inflammation.[12,13] Gall bladder wall thickness more than 4 mm is one of the causes for conversion of LC to open cholecystectomy but during our study period not a single patient found to have gall bladder wall thickness more than 4 mm.

In this study, 40% of cases among conversion group had past history of cholecystitis and difficult anatomy. Difficult anatomy is more significant statistically than history of cholecystitis in this study. Sixty percentage among conversion group had pulsatile intraoperative bleeding which is statistically significant because trying to control bleeding is difficult laparoscopically. If delayed in controlling bleeding may threaten life of the patient so conversion is high among bleeding conditions.

In this study, only 20% among conversion group had bile duct injury. Increased risk of conversion with statistical significance was found among bile duct injury patients. Biliary injury is common among difficult callot's anatomy patients which is same in our study.[15] Surgeons should be aware of difficult cholecystectomy to decrease complications and conversion to open cholecystectomy.

CONCLUSIONS

Conversion of surgical technique from laparoscopic cholecystectomy to open cholecystectomy had relationship with sex, anatomical difficulties, duration of surgery, and pulsatile bleeding. Surgeons should be aware of different reasons for difficulties of laparoscopic cholecystectomy. We need further large-scale studies for further verification of the reasons for conversion of laparoscopic cholecystectomy to open cholecystectomy.

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AUTHORS CONTRIBUTION

AA did concept designing, definition of intellectual content, literature search, data acquisition and analysis, manuscript preparation, review and editing; NVG and SRP did concept designing, literature search, data analysis and manuscript review.

REFERENCES

1. Nidoni R, Udachan TV, Sasnur P, Baloorkar R, Sindgikar V, Narasangi B. Predicting Difficult Laparoscopic Cholecystectomy Based on Clinicoradiological Assessment. Journal of clinical and diagnostic research : J Clin Diagn Res. 2015;9(12):PC09-12. DOI: 10.7860/JCDR/2015/15593.6929 PMID: 26816942.
2. Di Buono G, Romano G, Galia M, Amato G, Maienza E, Vernuccio F, et al. Difficult laparoscopic cholecystectomy and preoperative predictive factors. Scientific reports. 2021;11(1):2559. DOI: 10.1038/s41598-021-81938-6 PMID: 33510220.
3. Bhandari TR, Khan SA, Jha JL. Prediction of difficult laparoscopic cholecystectomy: An observational study. Ann Med Surg (Lond). 2021;72:103060. DOI: 10.1016/j.amsu.2021.103060 PMID: 34815866.
4. Livingston EH, Rege RV. A nationwide study of conversion from laparoscopic to open cholecystectomy. Am J Surg. 2004;188(3):205-11. DOI: 10.1016/j.amjsurg.2004.06.013 PMID: 15450821.
5. Gupta V, Jain G. Safe laparoscopic cholecystectomy: Adoption of universal culture of safety in cholecystectomy. World J Gastrointest Surg. 2019;11(2):62-84. DOI: 10.4240/wjgs.v11.i2.62 PMID: 30842813.

6. Nassar AHM, Zanati HE, Ng HJ, Khan KS, Wood C. Open conversion in laparoscopic cholecystectomy and bile duct exploration: subspecialisation safely reduces the conversion rates. Surgical endoscopy. 2022;36(1):550-8. DOI: 10.1007/s00464-021-08316-1 PMID: 33528666.

7. Randhawa JS, Pujahari AK. Preoperative prediction of difficult lap chole: a scoring method. The Indian Journal of surgery. 2009;71(4):198-201. DOI: 10.1007/s12262-009-0055-y PMID: 23133154.

8. Reynolds W, Jr. The first laparoscopic cholecystectomy. JSLS : Journal of the Society of Laparoendoscopic Surgeons. 2001;5(1):89-94.

9. Kaafarani HM, Smith TS, Neumayer L, Berger DH, Depalma RG, Itani KM. Trends, outcomes, and predictors of open and conversion to open cholecystectomy in Veterans Health Administration hospitals. Am J Surg. 2010;200(1):32-40. DOI: 10.1016/j.amjsurg.2009.08.020 PMID: 20637334.

10. Gholipour C, Fakhree MB, Shalchi RA, Abbasi M. Prediction of conversion of laparoscopic cholecystectomy to open surgery with artificial neural networks. BMC surgery. 2009;9:13. DOI: 10.1186/1471-2482-9-13 PMID: 19698100.

11. Peters JH, Krailadsiri W, Incarbone R, Bremner CG, Froes E, Ireland AP, et al. Reasons for conversion from laparoscopic to open cholecystectomy in an urban teaching hospital. Am J Surg. 1994;168(6):555-8; discussion 558-9. DOI: 10.1016/S0002-9610(05)80121-7 PMID: 7977995.

12. Tang B, Cuschieri A. Conversions during laparoscopic cholecystectomy: risk factors and effects on patient outcome. J Gastrointest Surg. 2006;10(7):1081-91. DOI: 10.1016/j.gassur.2005.12.001 PMID:16843880.

13. Warchalowski L, Luszczki E, Bartosiewicz A, Deren K, Warchalowska M, Oleksy L, et al. The Analysis of Risk Factors in the Conversion from Laparoscopic to Open Cholecystectomy. Int J Environ Res Public Health. 2020;17(20):7571. DOI: 10.3390/ijerph17207571 PMID: 33080991.

14. Sutcliffe RP, Hollyman M, Hodson J, Bonney G, Vohra RS, Griffiths EA, et al. Preoperative risk factors for conversion from laparoscopic to open cholecystectomy: a validated risk score derived from a prospective U.K. database of 8820 patients. HPB (Oxford). 2016;18(11):922-8. DOI: 10.1016/j.hpb.2016.07.015 PMID: 27591176.

15. Roy AF, Passi RB, Lapointe RW, McAlister VC, Dagenais MH, Wall WJ. Bile duct injury during laparoscopic cholecystectomy. Canadian journal of surgery Journal canadien de chirurgie. 1993;36(6):509-16.

Anosmia and dysgeusia associated with COVID-19 infection among patients visiting a tertiary hospital at Kaski, Nepal

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ABSTRACT

Introduction: A number of studies have shown that anosmia and dysgeusia present as symptoms of COVID-19. These symptoms can appear with sudden onset following COVID-19 infection. The objective of the study was to observe epidemiological and clinical profile of COVID-19 patients who had experienced anosmia and dysgeusia. **Methods:** A cross-sectional study was carried out in Ear, Nose and Throat outpatient department of Pokhara Academy of Health Sciences over a period of two months, from February 2022 to March 2022. Patients visiting the outpatient department were enquired about the COVID-19 infection status in the past and symptoms related to taste and smell impairment were asked about. **Results:** Out of total 198 patients, 141(71%) had experienced impairment of taste and smell, either one or both, while the rest did not develop such features after testing positive for COVID-19 virus. **Conclusions:** Anosmia and dysgeusia were common features in COVID-19 infection.

Keywords: Anosmia, COVID, dysgeusia, post-viral inflammation.

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INTRODUCTION

Coronavirus disease-2019 (COVID-19) initiated global changes in public health and socioeconomic conditions since 2020 A.D. It has threatened the whole world as a serious public health concern and still continues to cause outbreaks from time to time in various parts of the world.[1,2]

COVID-19 is an acute respiratory disease caused by SARS-CoV-2 virus from the corona family of viruses. The disease caused by this virus is called COVID-19.[3] The virus has been renamed from 2019-nCoV(Novel Coronavirus)to severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2).[4,5] SARS-CoV-2 infections can range from asymptomatic cases to acute respiratory distress. COVID-19 was declared as a Public Health Emergency of International Concern (PHEIC) at the beginning of 2020 and a pandemic a few months later on March, 2020.[6]

Regarding patients presenting to the Ear, Nose, and Throat outpatient department (ENTOPD), the common symptoms following COVID infection were nasal discharge, headache, fever, cough, fatigue, malaise and sore throat. These symptoms could be the presenting features following upper respiratory tract infections caused by other viruses like adenovirus, rhinovirus, etc. Some atypical presentations observed in COVID infection were loss of smell (anosmia), deranged sense of smell (parosmia), loss of taste sensation (ageusia), and altered sense of taste (dysgeusia). Change in taste and smell sensation

can lead to a decreased appetite and apprehension. Anosmia is commonly associated with post-viral inflammation and chronic rhinosinusitis, which can occur not only after COVID infection but after other viral infections too.[7] Non-infective causes are nasal polyps, head trauma, tumors, radiotherapy etc.[8,9]

Different studies have shown anosmia and dysgeusia to be present as symptoms of COVID-19 in variable degrees.[10,11] Some reports have noted that post-viral anosmia is a common event (upto 40% of anosmia) and others have mentioned a rate of up to 30% in 2000 tested patients.[8] Post-viral olfactory dysfunction caused by neuroepithelial dysfunction is a common cause of reduced olfactory function.[10] Anosmia may recover after relief of nasal obstruction and inflammation, in addition to self-regeneration of olfactory neurons through stem cells in the olfactory neuroepithelium.[9]

This study aimed to find out the epidemiological and clinical profile of patients who developed anosmia and dysgeusia following COVID infection.

METHODS

A descriptive cross-sectional study was conducted at ENT OPD, Pokhara Academy of Health Sciences (PoAHS), Western Regional Hospital, Pokhara, Nepal. Patients visiting ENT OPD for any ear, nose, throat problems were enquired about COVID infection in the past. It was first confirmed (via history) that anosmia developed during or after COVID infection. The presence of anosmia in the past with other nasal symptoms was asked about, to rule out other nasal pathology leading to anosmia. ENT examination was done in OPD which ensured that the patient did not have other nasal pathologies. Those who were proven to have COVID infection following RT-PCR of nasopharyngeal swab were questioned regarding anosmia, dysgeusia and other points. The questionnaire was based on the Anosmia tool developed by the American Academy of Otolaryngology.[11] Questions were adapted and modified from the Anosmia tool[11] which included data regarding COVID infection test result, presence or absence of anosmia, whether anosmia resolved or persisted, time period of recovery of anosmia and whether anosmia resolved completely or partially. Each patient enrolled in the study was interviewed to fill up the questionnaire. Data collection was done over a period of two months' time, February 2022 to March 2022. Ethical clearance was obtained from the Institutional Review Committee, PoAHS before study was commenced (Reference number: 84/078). Consent was taken prior to enrollment of patients in the study. All patients who had history of proven COVID-19 infection (RT-PCR positive) were included in the study. Those patients who had symptoms of COVID-19 in the past but did not take RT-PCR were excluded from the research. The data collected were analyzed using MS Excel and presented in tables and percentages.

RESULTS

Total 198 patients were included in the study out of which 104(52%) were females. The age range of the patients ranged from 11 to 80 years of which majority 54(27%) belonged to age group 31 to 40 years (fourth decade) followed by 46(23%) patients in 21 to 30 years age group, 7(3%) in age group 11 to 20 years, 20% in age group 51 to 60 years, 12(6%) in group 61 to 70 years and 2(1%) in the age group above 70 years. Around 114(57%) patients suffered from both anosmia and dysgeusia and in 57(28%) cases, there was no disturbance in taste and smell sensation. (Table 1)

Table 1: Demographic profile of patients (N=198)

Parameters	n(%)
Mean age± SD	40.80 ± 13.37
Male	94(47%)
Female	104(52%)
Anosmia only	18(9%)
Dysgeusia only	9(4.5%)
Anosmia and dysgeusia both	114(57%)
Taste and smell not disturbed	57(28%)

Tables 2 shows the time period of recovery, as recalled by patients. Most of the patients recovered within two weeks, and others took up to a month. It can be noticed from the table that 67 % of patients recovered in two weeks to one month time. We found that six patients (4.2%) recovered after three months. One patient gave history of recovery in five months. All patients had complete recovery from anosmia and dysgeusia.

Table 2: Time period for recovery (n=141*)

Recovery	n(%)
Average time period for recovery	20.21 days± 22.63
Time period for recovery in range	2 days to 5 months
Cases that recovered in one week	33(23.40%)
Cases that recovered in two weeks	43(30.49%)
Recovery in 2 weeks to one month	20(14.18%)

*those who developed anosmia, dysgeusia or both

Out of total cases, 56 patients were found to have co-morbidites. Regarding co-morbidities, 24(12.12%) patients had history of hypertension, 12(6.06%) had diabetes, 4

(2.02%) had COPD, 4 (2.02 %) had CKD, one case (0.5%) had hypothyroidism, while 11(5.55%) patients had hypertension and diabetes both.

DISCUSSION

There are many signs and symptoms in COVID-19 infection, among which two are anosmia and dysgeusia. Though self-limiting, these symptoms might be very distressing to the patients. Sometimes it may take a long period for the normal function of smell and taste to return. Loss of smell and taste sensation can lead to decreased appetite leading to prolonged morbidity.

Potential hypothesis of olfactory dysfunction is direct extension through the nasal mucosa and extension to the olfactory bulb.[10,11] Han et al.[12] have discussed that mechanism of anosmia in COVID infections can only be speculated at present, because of paucity of published data in this topic. Bilinska et al.[13] have highlighted the need for new systematic studies using infectious virus and animal models to get unequivocal answers in this area.

Various researches and literatures have shown that olfactory and gustatory dysfunctions represent common clinical findings in COVID-19 infected patients. ENT specialists and clinicians need to be aware of this diagnostic option when evaluating cases of sudden onset of ageusia and non-specific anosmia that are not associated with rhinitis symptoms.[14] In COVID-19 infection, ageusia and anosmia may not be necessarily accompanied by nasal obstruction or other features of rhinitis like purulent nasal discharge. Authors have suggested that this is probably due to the direct damage done by the virus on the olfactory and gustatory receptors.[14,15]

Hornuss et al.[16] have discussed in their publication that 49% of people studied had anosmia in their cohort study. Another study reported that 47% (54 out of 114 patients) were confirmed to have anosmia. Mean age of the 54 patients was 47±16 years; 67% were females.[17] In our study, 57% of patients recalled having suffered from anosmia and dysgeusia both, while patients with anosmia only were just 9%, which is comparable to the findings shown by Klopfenstein et al. [17]

Han et al.[12] have reviewed a number of studies in their research regarding anosmia in COVID infection. They have quoted that different studies have shown the incidence of anosmia in COVID infection to be in the range of 20 to 85% of patients and about 72% of patients with olfactory dysfunction recovered within the first eight days of morbidity.[12] This figure suggests that olfactory abnormalities in COVID infection have a temporary pathophysiology. In contrast to this, the present study revealed that 30.49% of patients recovered from anosmia in two weeks time, while the proportion of patients that recovered in one week was 23.40%.

Mao et al.[18] published a multi-centric research based in Wuhan, China. They have divided neurologic manifestations into three categories: central nervous system manifestations, peripheral nervous system manifestations (taste, smell and vision impairment), and skeletal muscular injury manifestations. The authors concluded that the most common neurological features were hyposmia (5.1%) and hypogeusia (5.6%) among 214 patients selected for study.[18]

The study consists of a small population of patients studied in a small period of time.We also figured that due to recall bias, some patients may have been confused regarding the duration of symptoms. The data includes co-morbidities of the total cases i.e, 198 patients. It would have been more meaningful if co-morbidities in affected individuals only were taken, more importantly of those with prolonged morbidity of anosmia and dysgeusia.

CONCLUSIONS

Anosmia and dysgeusia were common features in COVID-19 infection. All age groups were affected and all patients in study group recovered over a period of time. Sudden loss of taste and smell sensation in absence of other nasal problems should lead to suspicion of COVID infection. Though the rate of COVID-19 infection in the public has significantly decreased to a bare minimum, it still threatens the country and the whole world of recurring outbreaks and so remains a public health concern.

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AUTHORS CONTRIBUTION

SS did works on concepts, design and definition of intellectual content, literature search, data acquisition, data analysis, statistical analysis, manuscript preparation, editing and review. AMB contributed in literature search, data analysis and manuscript review. UA contributed in literature search, statistical analysis and manuscript review. AS worked on data acquisition, manuscript preparation and review. BG worked on data acquisition, manuscript

editing and review. LB contributed in concepts of study, data acquisition and review.

REFERENCES

1. Chu DT, Vu Ngoc SM, Vu Thi H, Nguyen Thi YV, Ho TT, Hoang VT, et al. COVID-19 in Southeast Asia: Current status and perspectives. Bioengineered. 2022;13(2):3797-809. DOI: 10.1080/21655979.2022.2031417 PMID: 35081861.
2. Basnet BB, Bishwakarma K, Pant RR, Dhakal S, Pandey N, Gautam D, et al. Combating the COVID-19 pandemic: experiences of the first wave from Nepal. Frontiers in Public Health. 2021;9:613402. DOI:10.3389/fpubh.2021.613402 PMID: 34322466.
3. Bilgin E, Ertenli Aİ. Proposal of a new nomenclature for the underlying pathogenetic mechanism of severe coronavirus disease-19:"inflammatory thrombosis with immune endotheliitis—ITIE". Rheumatology International. 2021;41(3):679-80. DOI: 10.1007/s00296-020-04768-1 PMID: 33388970.
4. Fauzi MA, Paiman N. COVID-19 pandemic in Southeast Asia: intervention and mitigation efforts. Asian Education and Development Studies. 2021;10(2):176-84. DOI: 10.1108/AEDS-04-2020-0064
5. Panthee B, Dhungana S, Panthee N, Paudel A, Gyawali S, Panthee S. COVID-19: the current situation in Nepal. New microbes and new infections. 2020;37:100737. DOI: 10.3390/COVID208007
6. Khanna RC, Cicinelli MV, Gilbert SS, Honavar SG, Murthy GV. COVID-19 pandemic: Lessons learned and future directions. Indian Journal of Ophthalmology. 2020;68(5):703-10. DOI: 10.4103/ijo.IJO_843_20 PMID: 32317432.
7. Tanasa IA, Manciuc C, Carauleanu A, Navolan DB, Bohiltea RE, Nemescu D. Anosmia and ageusia associated with coronavirus infection (COVID19)-what is known?. Experimental and therapeutic medicine. 2020;20(3):2344-7. DOI: 10.3892/etm.2020.8808 PMID: 32765712.
8. Russell B, Moss C, Rigg A, Hopkins C, Papa S, Van Hemelrijck M. Anosmia and ageusia are emerging as symptoms in patients with COVID-19: What does the current evidence say?. ecancermedicalscience. 2020;3(14):ed98. DOI: 10.3332/ecancer.2020.ed98 PMID: 32269598.
9. Mak PQ, Chung KS, Wong JS, Shek CC, Kwan MY. Anosmia and ageusia: not an uncommon presentation of COVID-19 infection in children and adolescents. The Pediatric Infectious Disease Journal. 2020;39(8):e199-e200. DOI: 10.1097/INF.0000000000002718 PMID: 32516281.
10. Kaye R, Chang CD, Kazahaya K, Brereton J, Denneny III JC. COVID-19 anosmia reporting tool: initial findings. Otolaryngology–Head and Neck Surgery. 2020;163(1):132-4. DOI: 10.1177/0194599820922992 PMID: 32340555.
11. Kaye R, Chang CWD, Kazahaya K, Brereton J, Denneny JC 3rd. COVID-19 Anosmia Reporting Tool: Initial Findings. Otolaryngol Head Neck Surg. 2020;163(1):132-4. DOI: 10.1177/0194599820922992.Epub PMID: 32340555.
12. Han AY, Mukdad L, Long JL, Lopez IA. Anosmia in COVID-19: mechanisms and significance. Chemical senses. 2020;45(6):423-8. DOI: 10.1093/chemse/bjaa040 PMID: 32556089.
13. Bilinska K, Butowt R. Anosmia in COVID-19: a bumpy road to establishing a cellular mechanism. ACS chemical neuroscience. 2020;11(15):2152-5. DOI: 10.1021/acschemneuro.0c00406 PMID: 32673476.
14. Vaira LA, Salzano G, Deiana G, De Riu G. Anosmia and ageusia: common findings in COVID-19 patients. The Laryngoscope. 2020;130(7):1787. DOI: 10.1002/lary.28692 PMID: 32237238.
15. Vaira LA, Deiana G, Fois AG, Pirina P, Madeddu G, De Vito A, et al. Objective evaluation of anosmia and ageusia in COVID-19 patients: single-center experience on 72 cases. Head & neck. 2020;42(6):1252-8. DOI: 10.1002/hed.26204 PMID: 32342566.
16. Hornuss D, Lange B, Schroeter N, Rieg S, Kern WV, Wagner D. Anosmia in COVID-19 patients. Clinical Microbiology and Infection. 2020;26(10):1426-7. DOI: 10.1016/j.cmi.2020.05.017 PMID: 32447049.
17. Klopfenstein T, Kadiane-Oussou NJ, Toko L, Royer PY, Lepiller Q, Gendrin V, et al. Features of anosmia in COVID-19. Médecineet Maladies infectieuses. 2020;50(5):436-9. DOI: 10.1016/j.medmal.2020.04.006 PMID: 32305563.
18. Mao L, Jin H, Wang M, Hu Y, Chen S, He Q, et al. Neurologic manifestations of hospitalized patients with coronavirus disease 2019 in Wuhan, China. JAMA neurology. 2020;77(6):683-90. DOI: 10.1001/jamaneurol.2020.1127 PMID: 32275288.

Complementary feeding practices among mothers of 6-23 months of aged children at a tertiary level hospital in Nepal

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ABSTRACT

Introduction: Complementary feeding is defined as the process starting when breast milk is no longer sufficient to meet the nutritional requirements of infants then other foods and liquids are needed, along with breast milk. This study was conducted to assess the complementary feeding practice among mothers of 6-23 months of aged children. **Methods**: A cross-sectional study was conducted in Kathmandu among 240 mothers of 6-23 months of aged children attending the pediatric outpatient department and community medicine from June to September, 2022. A purposive sampling technique was used and data were collected using a structured questionnaire through a face-to-face interview. The obtained data were entered into Epi-data and converted into Statistical Package for the Social Sciences-20. Descriptive and inferential statistics were used for statistical analysis. **Results:** The prevalence of Minimum Dietary Diversity (MDD), Minimum Meal Frequency (MMF), and Minimum Acceptable Diet (MAD) was 49.16% (0.42-0.55, 95% Confidence Interval), 44.58% (0.48-0.61, 95% Confidence Interval) and 27.91% (0.65-0.77, 95% Confidence Interval) respectively. Children of age 18-23 months were statistically significantly associated with MDD, MMF, and MAD respectively. Type of family, listening to radio as media, along with breastfeeding and bottle feeding since six months were statistically significantly associated with MMF and along with breastfeeding as well as bottle feeding since birth to six months were statistically significantly associated with MAD. **Conclusions:** This study concluded that the children aged 18-23 months were more likely to have recommended standard complementary feeding practices than other younger-aged groups.

Keywords: Children, complementary feeding practices, tertiary level hospital.

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INTRODUCTION

Child feeding practices, an important for child growth and development moreover help to make lower morbidity and mortality for less than two years. More than two-thirds of malnutrition occurs during the golden 1000 days of life due to inappropriate feeding practices.[1] Appropriate feeding practices enhance the nutrition, survival, growth, and development of infants and young children which include exclusive breastfeeding for six months and providing nutritionally adequate complementary feeding starting from six months with continued breastfeeding to two years of age or beyond.[2] Whether it is breastfeeding or complementary feeding, the practices adopted by mothers or caretakers have a direct effect on child health.[3]

World Health Organization (WHO) and United Nations International Children's Emergency Fund (UNICEF) define complementary feeding as the process of starting solid, semi-solid, or other food to

the child along with breastfeeding when breast milk alone is no longer sufficient to meet the nutritional requirements of infants.[4] Complementary feeds bridge the energy, vitamin A, and iron gaps that arise in breastfed infants at six months of age[5] and are often inadequate if they are given too early or too late, in too small amounts, or not frequently enough.[6]

Globally, one in three children under five are not growing well due to malnutrition and one in two suffers from hidden hunger, undermining the capacity of millions of children to grow and develop to their full potential.[5] Poor complementary foods in quantities and quality in children less than two years of age have a detrimental effect on their health and growth. Even with exclusive breastfeeding, children do not receive sufficient dietary diversity and meal frequency after six months of age.[7]

The WHO minimum acceptable diet recommendation, which combines minimum dietary diversity and minimum meal frequency, differs between breastfed and non-breastfed children.[8] It is estimated that only one in three Nepali children is fed with the minimum frequency and dietary diversity.[9]

According to Nepal Demographic Health Survey (NDHS) 2016, eighty-three percent of children ages 6-8 months receive timely complementary foods, and only 10% of children aged 18- 23 months have been weaned.[8, 10] The golden thousand days starting from the women's pregnancy till the child's second birthday is an extraordinary period wherein malnutrition and its consequences can be prevented by focusing on breastfeeding, micronutrient supplementation, and timely and appropriate initiation of complementary feeding practices.[11] Hence, the study was conducted to identify the prevalence of complementary feeding practices among mothers of children aged 6-23 months and to find out the association of complementary feeding practices with selected independent variables such as the age of the child, type of family, exposure to mass media, initiation of breastfeeding, along with breastfeeding, bottle feeding.

METHODS

A hospital-based analytical cross-sectional study was conducted in the pediatric OPD and community medicine department of Nepal Medical College and Teaching Hospital, Attarkhel, Kathmandu, Nepal. The hospital has got major health care services including pediatric OPD, and a community medicine department that used to provide services on immunization according to the National immunization program, where the study has been carried out. The study population was all mothers of child (6-23 months) attending pediatric OPD and community medicine department who meets the set inclusion criteria and willing to participate in the study and mothers having twins, mothers whose two children are below two years of age, a child who has not yet initiated complementary feeding and mothers with babies suffering from chronic illness were excluded. A purposive sampling technique was adopted and the sample size was calculated at a 95% confidence level based on the prevalence of correct complementary feeding practices (83%).10 The sample size was estimated to be 240 participants after adding a non-response rate of 10%. A pre-tested semi-structured questionnaire was developed after an extensive literature review and consulting with experts. The tool was translated into Nepali language and back-translated into English; the Nepali version of the tool was then pretested among 24 participants (10% of the total participants) for validation before the final administration.

The research instrument consisted of the following parts:

Part one: Socio-demographic and obstetric characteristics such as mother and child age, gender of the child, type of delivery, birth order of the child, literacy, and occupation of the family.

Part two: Feeding practices related information like timely initiation of breastfeeding, exclusive breastfeeding, age of cessation of breastfeeding, the introduction of pre-lacteal feeding/its type, age of introduction of solid food, complementary feeding with breastfeeding, and bottle feeding with complementary feeding.

Part three: Information related to complementary feeding practices which include the following components according to WHO Infant and Young Child Feeding (IYCF) guidelines:

a) Minimum Dietary Diversity (MDD): Proportion of children 6–23 months of age who received foods from four or more food groups of the seven food groups such as grains, roots, and tubers; legumes and nuts; dairy products (milk, yogurt); Flesh foods (meat, fish, poultry and liver/organ meats); eggs; vitamin A rich fruits and vegetables; and other fruits and vegetables.[13]

b) Minimum Meal Frequency (MMF): Proportion of breastfed and non-breastfed children 6–23 months of age, who receive solid, semi-solid, or soft foods (but also including milk feeds for non-breastfed children). This indicator was defined as: twice for breastfed infants 6–8 months, three times for breastfed children 9–23 months, and four times for non-breastfed children 6–23 months.[13]

c) Minimum acceptable diet (MAD): The proportion of children 6–23 months of age who received both minimum dietary diversity and minimum meal frequency.[13]

The study was carried out after obtaining formal permission from the Institutional Review Committee of Nepal Medical College with ethical reference number 075-078/079 from June 1 to September 30, 2022, in the pediatric OPD and community medicine department of Nepal Medical College Teaching Hospital through face to face interviews. Permission for data collection was obtained from the hospital director and head of the department of pediatric OPD and community medicine department of the hospital. The participants of the children were asked for general information about the child and the child's family. Most of the participants were mothers of the child. The procedure and purpose of the study were explained to the participants who were recruited based on inclusion and exclusion criteria. Those willing to participate were interviewed in the waiting area of the pediatric OPD and community medicine department. Written informed consent was taken from the parents after explaining the objectives of the study. Privacy and confidentiality were maintained throughout the study. None of the respondents were forced to participate in the study.

The collected data was entered into Epi-data which was finally converted into Statistical Package for Social Sciences (SPSS-20) for statistical analysis. Descriptive statistics such as frequency and percentage distribution were used. A chi-square test and multivariate analysis were performed to find out the association between MDD, MMF, and MAD with selected demographic variables. The level of significance was set at a p-value <0.05 and a 95% confidence interval.

RESULTS

The prevalence of MDD, MMF, and MAD was found to be 49.16% (0.42-0.55), 44.58% (0.48-0.61), and 27.91% (0.65-0.77) respectively (Table 1).

Table 1: Prevalence of Complementary Feeding Practices (N=240)

Characteristics	Frequency	Percentage	95% C.I.
Minimum Dietary Diversity (MDD)	118	49.16	0.42-0.55
Minimum Meal Frequency (MMF)	107	44.58	0.48-0.61
Minimum Acceptable Diet (MAD)	67	27.91	0.65-0.77

Nearly one-fourth (23.33%) belonged to 6-9 months, 31.25% belong to 9-12 months, 34.58% belong to 12-18 months and 10.83% belong to 18-23 months. More than half (60.41%) belong to a nuclear family which is statistically significant (p-value= 0.04) in MMF. Regarding exposed to mass media in which only 16.66% of them listen to the radio which is statistically significant (p-value 0.01) in MMF. More than half (55.41%) babies were initiated breast feeding within an hour which is statistically significant (p-value= 0.01). Likewise, half of the babies (50.41%) were fed breast feed only which is statically significant (p-value = 0.01) in MMF and (0.03) in MAD respectively. Nearly one third (33.33%) used to bottle feeding which is statistically significant (p-value= 0.03) in MDD and (p-value= 0.03) in MMF respectively. More than one-fourth (27.08%) of the baby was bottle feeding since birth to six months and 9.58% of the baby were bottle feeding from 6 months and above which is statically significant with p-value <0.001 in MDD, 0.02 in MMF, and 0.002 in MAD respectively (Table 2).

Table 2: Association of socio-demographic variables with MDD, MMF, and MAD (N=240)

Socio-demographic Characteristics	Total n (%)	MDD n (%)	CHI-SQUARE (p-value)	MMF n (%)	CHI-SQUARE (p-value)	MAD n (%)	CHI-SQUARE (p-value)
Age of the Child							
6-9 Months	56 (23.33)	15 (26.78)		41 (73.21)		12 (21.42)	
9-12 Months	75 (31.25)	36 (48.00)	18.073 (<0.001)	25 (33.33)	28.205 (<0.001)	18 (24.00)	8.085 (0.04)
12-18 Months	83 (34.58)	50 (60.24)		27 (32.53)		24 (28.91)	
18-23months	26 (10.83)	17 (65.38)		14 (53.84)		13 (50.00)	
Type of family							
Nuclear	145 (60.41)	69 (47.58)	0.366 (0.54)	57 (39.31)	4.122 (0.04)	36 (24.82)	1.737 (0.18)
Joint	95 (39.58)	49 (51.57)		50 (52.63)		31 (32.63)	
Exposure to mass media (Radio)							
Yes	40 (16.66)	23 (57.50)	1.334 (0.24)	25 (62.50)	6.237 (0.01)	16 (40.00)	3.483 (0.06)
No	200 (83.33)	95 (47.50)		82 (41.00)		51 (25.50)	
Initiation of breastfeeding							
Yes	133 (55.41)	69 (51.87)	0.879 (0.34)	66 (49.62)	3.068 (0.08)	46 (34.58)	6.595 (0.010)
No	107 (44.58)	49 (45.79)		41 (38.31)		21 (19.62)	
Along with breastfeeding							
Only breast milk	121 (50.41)	64 (52.89)	1.355 (0.24)	63 (52.06)	5.530 (0.01)	41 (33.88)	4.319 (0.03)
Other than breast milk	119 (49.58)	54 (45.37)		44 (36.97)		26 (21.84)	
Bottle feeding							
Yes	80 (33.33)	47 (58.75)	4.410 (0.03)	28 (35.00)	4.461 (0.03)	21 (26.25)	0.166 (0.68)
No	160 (66.66)	71 (44.37)		79 (49.37)		46 (28.75)	
Bottle feeding since							
Never	152 (63.33)	65 (42.76)	15.703 (<0.001)	74 (48.68)	7.382 (0.02)	42 (27.63)	12.246 (0.002)
Since birth-6 months	65 (27.08)	33 (50.76)		20 (30.76)		12 (18.46)	
6 months and above	23 (9.58)	20 (86.95)		13 (56.52)		13 (56.52)	

All of them (100.0%) consumed grains, roots, and legumes

in 18-23 months whereas more than 90% consumed in all other three groups. The pattern of feeding legumes and nuts was increased with increasing age reaching 100.0% feeding in 18-23 months. Dairy product consumption was seen more in the 12-18 months group (56.62%). Half of the children were fed with flesh food in 18-23 months which was the highest among all groups. Most of all babies were introduced to eggs in all age groups except in the 6-9 months age group. Other various fruits and vegetables were the least introduced in feedings (Table 3).

Table 3: Feeding practices of Minimum Dietary Diversity among 6-24 months children according to their age (N=240)

Food groups	Age of Child			
	6-9 Months n (%)	9-12 Months n (%)	12-18 Months n (%)	18-23 Months n (%)
Grains, roots and tubers	53(94.64)	73(97.33)	80(96.38)	26(100.0)
Legumes and nuts	51(91.07)	73(97.33)	81(97.59)	26(100.0)
Dairy products	17(30.35)	33(44.00)	47(56.62)	13(50.00)
Flesh food	11(19.64)	21(28.00)	35(42.16)	13(50.00)
Eggs	18(32.14)	49(65.33)	54(65.06)	20(76.92)
Vitamins A rich fruits and vegetables	10(17.85)	22(29.33)	21(25.30)	5(19.23)
Grains, roots and tubers	53(94.64)	73(97.33)	80(96.38)	26(100.0)

The age of the child and bottle feeding since were significantly associated with MDD. The children aged 18-23 months [AOR 6.60 (2.29-19.01)] were more likely than 6-9 months of the child to be fed with proper MDD. Those with never introduced bottle feeding [AOR 0.05, (0.006-0.471)] were less likely than bottle feeding since six months and above.

The age of the child and listening radio along with breastfeeding were statistically significantly associated with MMF. It was found that aged 18-23 months child [AOR 0.36, (0.12-1.0)] were less likely than 6-9 months aged children to meet the recommendation of MMF. Likewise related to listening to the radio as a mass media [AOR 2.30, (1.034-5.11)] was more likely than not listening to the radio as mass media.

The age of the child, along with breastfeeding and bottle feeding since were significantly associated with the recommended MAD. It was found that aged 18-24 months child [AOR 3.59, 95% C.I. (1.25-10.27)] were more likely than 6-9months aged children to meet the recommendation of MAD. Likewise, only breast milk introductions [AOR 2.21, (1.05-4.65)] were more likely to provide the recommended minimum acceptable diet than other than breast milk. Regarding bottle feeding, those who never bottle feed [AOR 0.17, (0.06-0.49)] were less likely than bottle feeding from birth to six months and above (Table 4).

Table 4: Multivariate analysis of MDD, MMF, and MAD with selected socio-demographic variables (n=240)

Variables	MDD		MMF		MAD	
	AOR with 95% C.I.	p-value	AOR with 95% C.I.	p-value	AOR with 95% C.I.	p-value
Age of the child						
6-9 months	1	-	1	-	1	-
9-12 months	2.94 (1.32-6.51)	0.008	0.16 (0.07-0.38)	<0.001	1.20 (0.50-2.88)	0.67
12-18 months	4.75 (2.15-10.48)	<0.001	0.14 (0.06-0.32)	<0.001	1.31 (0.57-3.04)	0.51
18-23 months	6.60 (2.29-19.01)	<0.001	0.36 (0.12-1.03)	0.05	3.59 (1.25-10.27)	0.01
Introduction of bottle feeding						
No	1		1		-	-
Yes	0.53 (0.07-3.67)	0.52	0.46 (0.08-2.54)	0.37	-	-
Bottle feeding since						
6 months and above	1	-	1	-	1	-
Never	0.05 (0.006-0.47)	0.008	0.34 (0.06-1.94)	0.22	0.17 (0.06-0.49)	0.001
Birth to	0.15 (0.04-0.61)	0.008	0.33 (0.11-1.03)	0.05	0.20 (0.07-0.61)	0.004
Type of Family						
Joint	-	-	1		-	-
Nuclear	-	-	1.66 (0.91-3.04)	0.09	-	-
Listening radio						
No	-	-	1		-	-
Yes	-	-	2.30 (1.03-5.11)	0.04	-	-
Along with BF						
Other than breast milk	-	-	1		1	
Only breast	-	-	1.99 (1.02-3.90)	0.44	2.21 (1.05-4.65)	0.03
Initiation of breastfeeding						
No	-	-	-	-	1	
Yes	-	-			1.77 (0.93-3.38)	0.08

Note: Only significant predictors have been shown in table 4 and "-" no any significant association.

DISCUSSION

In this study, the prevalence of Minimum Dietary Diversity among children aged 6-23 months was 49.16% where the findings were higher than the study conducted in North West Iran (42.3%),[12] Nepal (34%),[13] (30.4%),[14] and (35%),[15] respectively and lower than the study conducted in Nepal (72.3%),[16] (61.5%)[17] and India (57%)[18] respectively. This might be due to the fact that there are educational, socioeconomic, and cultural differences.

In this present study, Minimum Meal Frequency was 44.58% which is higher than the study conducted in North West Iran (42.7%)[12] and contrary to the study conducted in Nigeria (46.9%).[19] Even some studies conducted in

Nepal too has got contrasting findings having low feeding practices.[10, 14, 20, 21] This might be due to study area, country context, and educational level of parents regarding complementary feeding practices.

The current study determined that the minimum acceptable diet was 27.91% which is almost similar to the study conducted in Nepal (26.5%)[17] but lower than the study conducted in Bangladesh (36%) [4] and India (58%)[18] respectively. This study is higher than the study conducted in Southern Benin[22] only 12.3% of them got MAD. The findings of the study are different due to the differences in the research methodology, the availability of the food, and the education level of the parents.

In the present study, the minimum dietary diversity rate was almost similar i.e. more than 90% in each age group mothers tried to feed their baby grains, roots, and tubers. The finding is consistent with the study conducted in Nepal[20] and Southern Benin.[22] Likewise, regarding legumes the finding of the study is in contrast with the study conducted in Nepal[13] and Southern Benin.[22] Near about 50% of babies were fed dairy products which is consistence with the study conducted in Nepal.[20] The study findings showed that the increasing age group from 6-9 months to 6-23 months was uniformly lowered in offering flesh food.[17,20] Similarly, regarding eggs with increasing age more than 50% were fed which very essential for proper nourishment which is consistency with the study conducted in Nepal.[20] Only one-third of the babies consume Vitamin A rich fruits and vegetables and less than one-third of babies only consume other fruits and vegetables which is consistence to the study conducted in Nepal[13] and Southern Benin.[22] Various studies showed that there is a lack of variety of nutritious diets and believed that green leafy vegetables are considered cold and are not given to children at an early age. Therefore, emphasis on the need for improved dietary quality of complementary foods and the inclusion of animal-source foods, vegetables, and fruits in the diet of children needs to be addressed.

The minimum dietary diversity rate was statically significant with the age of the child which was six times more likely to meet the MDD which is consistent with the study conducted in Nepal[10,13] and contradictory with the study conducted in Southern Ethiopia[24] and Bangladesh[25] where children aged 18-23 months were nearly two to three times. This finding suggested that the youngest age group 6–9 months received the lowest proportion of food from all seven categories of food which was least likely to meet the recommended meal diversity and acceptable diet standard than the older aged (12–18) children.

The minimum meal frequency rate was statistically significant with the age of 18-23 months which was less likely to meet the minimum meal frequency which is contradictory with the study conducted in Nigeria[19] and Bangladesh[25] was nearly two to three or four times more like to have MMF.

Regarding the type of family, the nuclear family was nearly two to four times more likely to feed MMF than the joint family. This study is supported by the study conducted in South Ethiopia[24] and North West Ethiopia[23] more than twelve times more likely than joint family. The probable reason behind this finding may be the decision-making by their parents, mothers having enough time to prepare food or to feed their children, and maybe the educational level and awareness of their parents regarding food as well as the availability of the food.

The present study reported that those parents who listen to the radio as a mass media were two to five times more likely than not listening to the radio as mass media to meet the recommendation of MMF. This study is in congruence with the study conducted in Bangladesh[25] and Nepal[1] where the findings were nearly two to seven times more likely than not listening to radio as mass media and contrast with the findings of the study conducted in Ethiopia.[23]

In this study, the introduction of breast milk only was nearly two times more likely than other breast milk such as lito, cow milk, formula feeding, cerelac, etc to meet the recommended MMF. These findings support the study conducted in Nigeria[12] was two to five times more likely to have breast milk. On the contrary, the study conducted in Nepal[20] showed that not enough mother milk was the reason to introduce early complementary feeding.

Regarding bottle feeding since, those who never bottle feed were less likely than bottle feeding since birth to six months and above to meet the recommendation of MMF. The study was contrast with the study conducted in Nepal.[26] The possible reason behind it may be those mothers who underwent cesarean section were usually advised or preferred to give bottle-feeding and had easy access to infant formulas.

There was statistically significant with age of 18-23 months child which were three to ten times more likely to meet the minimum acceptable diet which is consistent with the study conducted in Nepal[13], Southern Ethiopia[24], and Bangladesh[25] were nearly two to seven times more likely to have MAD. This study is contradictory to the study conducted in Nepal.[3]

Regarding initiation of breastfeeding, those who initiate

within an hour were nearly two to three times more likely to meet the recommendation of MAD than those who does not initiate breastfeeding on time. On the contrary, the study conducted in India (59.5%)[18] and Ethiopia (68.6%)[23] initiate breastfeeding within an hour.

In this study introduction of breast milk only was statistically significant two to four times more likely to provide the recommended MAD than other than breast milk. The study conducted in India (41%)[18] and Pakistan(32.3%)[27] respectively introduced only breastfeeding rather than other feedings.

This was a hospital-based study and may not reflect values present in the general population. Recall bias may have occurred regarding the initiation of feeding complementary food. Further in-depth studies are needed to explore complementary feeding practices in Nepal to generalize the results.

CONCLUSIONS

The prevalence of MDD, MMF and MAD among children aged between 6 and 23 months was found to be sub-optimal. Age of the child, the introduction of bottle feeding, and bottle feeding since were significantly associated with MDD. Likewise, the age of the child, type of family, listening to radio as media, along with breastfeeding, introducing bottle feeding, and bottle feeding since birth to six months and above were significantly associated with MMF. Similarly, the age of the child, initiation breastfeeding, along with breastfeeding and bottle feeding since birth to six months and above were significantly associated with MAD. Hence, this study concluded that there is a need for special attention and complementary feeding practices counseling to improve the practice of appropriate feeding of young children to the parents. Further programs incorporating infant feeding guidelines in health workers' training manuals and more focus on educating mothers and caregivers may improve complementary feeding practices.

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AUTHORS CONTRIBUTION

PG, PP, BG, PP, KS, RR, and PG were involved in conceptual design. PG, PP, BG, and KS were involved in data collection. PG, PP, and BG were involved in the statistical analysis and interpretation of the data. PG, PP, PP, RR, and PG were involved in preparing the draft and completion of the manuscript. A manuscript was reviewed by all the authors.

REFERENCES

1. Sah AK, Paudel R, Devkota MD, Sigdel R, Pandey A. Minimum acceptable diet and stunting among children aged 6-23 months in Dalit and Non-Dalit and associated factors: A cross-sectional comparative study of Dhanusha district, Nepal. Res Sq. 2019. [preprint]. DOI:10.21203/rs.3.rs-93727/v1
2. Government of Nepal, Ministry of Health and Population and Department of Health Service. 2019 Annual Report 2018/2019. Kathmandu, Nepal: Department of Health Services. Available from: https://dohs.gov.np/wp-content/uploads/2020/11/DoHS-Annual-Report-FY-075-76-.pdf. [Accessed 22nd March, 2022].
3. Subba SH, Chandrashekhar TS, Binu VS, Joshi HS, Rana MS, Dixit SB. Infant feeding practices of mothers in an urban area in Nepal. Kathmandu Univ Med J. 2007;5(1):42-7. PMID: 18603985.
4. World Health Organization. Complementary Feeding: Summary of Guiding Principles. Report of the Global Consultation, 10–13 December 2001. Geneva, Switzerland: World Health Organization; 2002. Available from: https://www.who.int/publications/i/item/924154614X. [Accessed 22nd March 2022].
5. Chapagain RH. Factors affecting complementary feeding practices of Nepali mothers for 6 months to 24 months children. J Nepal Health Res Counc. 2013; 11(24):205-7. PMID: 24362612.
6. World Health Organization. Infant and Young Child Feeding: Model Chapter for textbook for medical students and allied health professionals. Available from: https://www.ncbi.nlm.nih.gov/books/NBK148965/pdf/Bookshelf_NBK148965.pdf. [Accessed 26th March 2022].
7. United Nations International Children's Emergency Fund: Office of innovation. Available from: https://www.unicef.org/innovation/complementary-feeding-bowl. [Accessed on 21st March 2022].
8. Basnet S, Sathian B, Malla K, Koirala DP. Reasons for early or late initiation of complementary feeding: a study in Pokhara. Am J Public Health Res.

2015;3(4A):69-75. DOI: 10.12691/ajphr-3-4A-15

9. Ministry of Health Nepal, New ERA and ICF. 2017. Nepal Demographic and Health Survey 2016. Kathmandu Nepal: Ministry of Health, Nepal. Available from: https://www.healthynewbornnetwork.org/hnn-content/uploads/Nepal-DHS-2016-Key-indicators.pdf. [Accessed 26th March 2022].
10. Ulak N, KC D, Tiwari K. Complementary Feeding Practices and its Associated Factors among Mothers in Selected Urban Area of Nepal. Asp Biomed Clin Case Rep. 2020;3(1):6-14. DOI: 10.36502/2020/ASJBCCR.6176
11. Na M, Aguayo VM, Arimond M, Dahal P, Lamichhane B, Pokharel R, et al. Trends and predictors of appropriate complementary feeding practices in Nepal: An analysis of national household survey data collected between 2001 and 2014. Matern Child Nutr. 2018;14:1-13. DOI: 10.1111/mcn.12564 PMID: 29148183.
12. Kamran A, Sharifirad G, Nasiri K, Soleymanifard P, Savadpour M, Akbar Haghighat M. Determinants of complementary feeding practices among children aged 6-23: a community based study. Int J Pediatr. 2017;5(3):4551-60. DOI: 10.22038/ijp.2016.7811
13. Joshi N, Agho KE, Dibley MJ, Senarath U, Tiwari K. Determinants of inappropriate complementary feeding practices in young children in Nepal: secondary data analysis of Demographic and Health Survey 2006. Matern Child Nutr. 2012;8:45-59. DOI: 10.1111/j.1740-8709.2011.00384.x PMID: 22168518.
14. Khanal V, Sauer K, Zhao Y. Determinants of complementary feeding practices among Nepalese children aged 6–23 months: findings from demographic and health survey 2011. BMC Pediatr. 2013;13(1):1-3. DOI: 10.1186/1471-2431-13-131
15. Gautam KP, Adhikari M, Khatri RB, Devkota MD. Determinants of infant and young child feeding practices in Rupandehi, Nepal. BMC Res Notes. 2016;9(1):1-7. DOI 10.1186/s13104-016-1956-z
16. Sapkota, S. and Shrestha, S. Complementary feeding practices among the caretakers of the young children at Kathmandu. J Chitwan Med Coll. 2013;3(4):25-29. DOI: 10.3126/jcmc.v3i4.9550
17. Adhikari N, Acharya K, Upadhya DP, Pathak S, Pokharel S, Pradhan PM. Infant and young child feeding practices and its associated factors among mothers of under two years children in a western hilly region of Nepal. PloS One. 2021;16(12):1-15. DOI: 10.1371/journal.pone.0261301 PMID: 34914802.
18. Jain S, Bhan BD, Bhatt GC. Complementary feeding practices and their determinants among children 6–23 months of age in an outpatient hospital setting in Central India: A cross-sectional study. J Family Med Prim Care. 2020;9(2):1187-90. DOI: 10.4103/jfmpc.jfmpc_958_19 PMID: 32318490.
19. Ariyo O, Aderibigbe OR, Ojo TJ, Sturm B, Hensel O. Determinants of appropriate complementary feeding practices among women with children aged 6-23 months in Iseyin, Nigeria. Sci Afr. 2021;13:1-10. DOI:10.1016/j.sciaf.2021.e00848
20. Kandel KP, Sah BK, Kafle S, Khanal S, Adhikari B. Factors affecting complementary feeding among mothers of under two years children in Darai and Kumal communities of Mangalpur, Chitwan. J Chitwan Med Coll. 2016;6(4):24-30. DOI:10.3126/jcmc.v6i4.16711
21. Locks LM, Dahal P, Pokharel R, Joshi N, Paudyal N, Whitehead Jr RD, et al. Infant and young child feeding (IYCF) practices improved in 2 districts in Nepal during the scale-up of an integrated IYCF and micronutrient powder program. Curr Dev Nutr. 2018;2(6):1-14. DOI: 10.1093/cdn/nzy019 PMID: 29984348.
22. Mitchodigni IM, Amoussa Hounkpatin W, Ntandou-Bouzitou G, Avohou H, Termote C, Kennedy G, et al. Complementary feeding practices: determinants of dietary diversity and meal frequency among children aged 6–23 months in Southern Benin. Food Secur. 2017;9:1117-30. DOI 10.1007/s12571-017-0722-y
23. Ayana D, Tariku A, Feleke A, Woldie H. Complementary feeding practices among children in Benishangul Gumuz Region, Ethiopia. BMC Res Notes. 2017;10(1):1-8. DOI: 10.1186/s13104-017-2663-0
24. Kassa T, Meshesha B, Haji Y, Ebrahim J. Appropriate complementary feeding practices and associated factors among mothers of children age 6–23 months in Southern Ethiopia, 2015. BMC Pediatr. 2016;16(1):1-10. DOI: 10.1186/s12887-016-0675-x PMID: 27542833.
25. Kabir I, Khanam M, Agho KE, Mihrshahi S, Dibley MJ, Roy SK. Determinants of inappropriate complementary feeding practices in infant and young children in Bangladesh: secondary data analysis of Demographic Health Survey 2007. Matern Child Nutr. 2012;8:11-27. DOI: 10.1111/j.1740-8709.2011.00379.x PMID:

22168516.

26. Pandey S, Tiwari K, Senarath U, Agho KE, Dibley MJ. South Asia Infant Feeding Research Network (SAIFRN)*. Determinants of infant and young child feeding practices in Nepal: secondary data analysis of Demographic and Health Survey 2006. Food Nutr Bull. 2010;31(2):334-51. DOI: 10.1177/156482651003100222 PMID: 20707237.

27. Ariff S, Saddiq K, Khalid J, Sikanderali L, Tariq B, Shaheen F, et al. Determinants of infant and young complementary feeding practices among children 6–23 months of age in urban Pakistan: a multicenter longitudinal study. BMC Nutr. 2020;6(1):1-9. DOI: 10.1186/s40795-020-00401-3

Awareness on breast cancer among females at Bharatpur metropolitan, Chitwan, Nepal

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ABSTRACT

Introduction: Breast cancer is the most frequently diagnosed cancer in the world and second most common malignancy among Nepalese women with high prevalence. Countries with lower level of resources like Nepal, prevention of breast cancer is more important. The objective of the study was to find out the level of awareness on breast cancer among female at Bharatpur Metropolitan, Nepal. **Methods:** An analytical cross- sectional study was conducted among 263 female of Bharatpur Metropolitan city, Nepal. Non probability purposive sampling technique was used for data collection. Data was entered and analyzed by using SPSS-20, p-value <0.05 was considered as statistically significant. **Results:** The mean±SD of age was found 34.40±11.42 years. Study showed that 61.2% (with 95% CI as 55.32-67.1%) had good awareness on risk factors, 60.5% (with 95% CI as 54.54-66.36) had good awareness on warning sign and symptoms and only 44.5% (with 95% CI as 38.48-50.49) had good awareness on screening and prevention. Overall level of awareness on breast cancer was found poor (50.2%). The mean+SD of overall awareness of the respondents on breast cancer was 15.51±2.84. Statistical significant association was found between overall level of awareness and respondents' education (p=0.039), husband education (p=0.011) and occupation (p=0.046) of the respondents. **Conclusions:** More than half of the respondents has poor level of awareness on breast cancer among women in Bharatpur, Chitwan, Nepal. Better health awareness among women in the community, breast cancer screening programmes and national policies to establish effective cancer literacy programs would cause a favorable and positive clinical picture in the country.

Keywords: Breast cancer, prevention and screening, risk factor, sign and symptoms.

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INTRODUCTION

Breast cancer refers to a malignant tumour that has developed from the cells in the breast. It is the most frequently diagnosed cancer in women, accounting for 27% of all new cases of cancer among females in 2009. It is the leading cause of death due to cancer for women aged 20 to 59 years of age.[1] Worldwide, breast cancer is one of the most common cancer and second leading cause of cancer death among women.[2] In India, breast cancer has ranked number one cancer among women. Age adjusted rate is 25.8 per 100, 000 women and mortality 12.7 per 100,000 women[3] and in Nepal, among 4608 new diagnosed cancer cases, 466(10.11%) were breast cancer that is third rank in men and women and second rank in women after cervical cancer.[4] Around half (49%) of the women were aware of breast cancer. The women who were aware of breast cancer considered lump in breast (75%), change in shape and size of breast (57%), lump under armpit (56%), pain in one breast (56%) as the important and common symptoms. Less than one-fifth of the women who were aware of breast cancer reported late pregnancy (15%) and obesity (19%) as the risk factors for breast cancer.[5] Among 900 respondents, approximately half of the respondents 435(51.8%) were aware of breast cancer. Of these, 99(22.7%) believed that it was caused by a medical condition, followed by old

age (71; 16.4%), heredity (56; 12.8%), and pregnancies in older women (33; 7.5%). Overall, 152 participants (34.9%) were aware of breast self-examination (BSE), but only 93 (11%) had performed it.[6] Most of the women (57%) who had some knowledge about breast cancer came from media (television, radio, and newspapers). Other sources were hospital staff (19%) and neighbors and relatives (11%). Regarding different aspects studied, 58% had a knowledge of at least one of the symptoms and 59% knew at least one of the risk factors for breast carcinoma.[7]

Several studies were conducted focusing on prevention and treatment. Although, breast cancer prevention remains very difficult task, different intervention studies suggest that modifiable risk factors may be prevented through promotion of healthy diet, regulating alcohol consumption, avoiding smoking and controlling weight can help to reduce the incidence of breast cancer.[5] There are different screening approach including mammogram, to reduce mortality.[4] Now, breast cancer is global issue but it is diagnosed in the late stages due to the lack of awareness.[8] It places a substantial burden on health care system.[9] Public awareness on risk factors and improved screening helps earlier diagnosis, complete surgical resection and cure. Early diagnosis of the disease can lead to good prognosis and improved survival.[10] Therefore, the present study tries to assess the awareness on signs and symptoms, risk factors and screening and prevention of breast cancer among women in the low socio-economic community.

METHODS

An analytical, cross-sectional study was conducted among female at Bharatpur metropolitan city-8, Chitwan, Nepal from November 29, 2022 to January 27, 2023. Research was approved by COMSTH-IRC Bharatpur Chitwan. Ethical clearance was obtained from Institutional Ethical Committee (Reference no. 2022-38/1). Data collection permission was obtained from Bharatpur Metropolitan City, 8 no. ward office on 2079/08/13 (Ref No.079/080, Chalani no. 1312). Informed and written consent was taken from all the females before data collection. In Bharatpur ward no.8 there are 22 toles. Among them, three toles were selected purposively because majority of the females in this areas belonged to a low socioeconomic status family (marginalized people live in these toles). The study population of this research was females of age between 16 to 60 years. Women who were already diagnosed with breast cancer and under treatment were excluded from this study.

A study conducted by Thapa et al., among female worker (attendants) of at Patan Hospital and Lalitpur Nursing Campus of Patan Academy of Health Science showed that 35.43% had good level of awareness.[12] By taking this as a prevalence with a 95% confidence interval and 6% as the margin of error sample size was calculated (n=244). By adding 8% non-response rate, the optimal sample size will be= 244+19=263. Data was collected by using face to face interview method. Privacy of respondents' information was maintained by taking interviews in a separate room. Respondent's dignity was maintained by giving them the right to reject or discontinue the research study at any time if they do not want to participate in the study. Confidentiality was maintained by not disclosing the information to others. All collected data were reviewed and checked daily for its completeness, consistency, and accuracy. Data were edited, organized, coded, and entered in IBM SPSS Statistics 20.0 for analysis. Data were analyzed using descriptive and inferential statistical tools. In the descriptive statistics for categorical variables frequency and percentage were be calculate. While for continuous variable mean and standard deviation was be calculated. In the inferential statistics to find the association between categorical variable chi-square test will be used. P-value <0.05 will be considered as statistically significant.

RESULTS

Out of 263 respondents, 79(30.04%) were less than 25 years and only 47(17.87%) were more than 45 years with Mean±SD = 34.40±11.42 and the range was 17 to 60 years. Most of the women were married 219(83.27%) and followed Hindu religion 214(81.37%) and Adivasi/ Janajati were 127(47.15%). Concerning educational status, 110(41.82%) had secondary education and 21(7.98%) had no education. Among 219(83.27%) married women, 104(39.54%) women's husbands had secondary-level education. About 114(43.34%) respondents' occupation was unskilled (Table 1).

Table 1: Sociodemographic characteristics of the respondents (N=263)

Variables	Frequency	Percentage
Age		
≤25	79	30.04
25-35	73	27.76
35-45	64	24.33
≥45	47	17.87
Mean±SD	34.40±11.42	
Marital Status		
Married	219	83.27
Unmarried	44	16.73

Religion		
Hindu	214	81.37
Buddhist	45	17.11
Christian	4	1.52
Ethnicity		
Brahmin/Chhetri	108	41.06
Madhesi	4	1.52
Dalit	27	10.26
Adivasi/Janajati	124	47.15
Education		
No education	21	7.98
Basic education	102	38.78
Secondary education	110	41.82
More than secondary	30	11.41
Education (Husband)		
No education	61	23.19
Basic education	73	27.76
Secondary education	104	39.54
More than secondary	25	9.50
Occupation		
Sales and Services	20	7.60
Skilled Manpower	39	14.83
Unskilled Manpower	114	43.34
Agriculture	72	27.38

Table 2 shows that, level of awareness was good on risk factors 161 (61.2%) (Mean±SD: 4.96±1.87, CI: 55.32-67.1), poor on screening and prevention 146 (55.5%) (Mean±SD: 6.11±1.46, CI: 38.48-50.49), good on warning sign 159 (60.5%) (Mean±SD: 4.44±0.08, CI: 54.54-66.36) and poor on overall awareness on breast cancer 132 (50.2%) (Mean±SD: 15.51±2.84, CI: 43.75-55.80).

Table 2: Level of awareness on breast cancer (N=263)

Variables	Frequency	Percent	95% CI	
			Lower CI	Upper CI
Risk factors				
Poor	102	38.80		
Good	161	61.20	55.32	67.10
Mean±SD	4.96±1.87			
Screening and prevention				
Poor	146	55.50		
Good	117	44.50	38.48	50.49
Mean±SD	6.11±1.46			
Warning sign and symptoms				
Poor	104	39.50		
Good	159	60.50	54.54	66.36
Mean±SD	4.44±0.80			
Overall				
Poor	132	50.20		
Good	131	49.80	43.75	55.80
Mean±SD	15.51±2.84			

Significant association was found between overall level of awareness and respondents' education (p=0.039), husband education (p=0.011) and occupation (p=0.046). Higher level of awareness was found on having secondary level of education of the respondents and more than sec. education of the respondent's husband and respondents' occupation of sales and services (Table 3).

Table 3: Association between overall levels of awareness with selected demographic variables (N=263)

Variables	Level of Awareness		Chi square	p-value
	Poor	Good		
Age				
<25	43(54.4%)	36(45.6%)		
25-35	32(43.8%)	41(56.2%)	6.88	0.74
35-45	27(42.2%)	37(57.8%)		
>45	30(63.8%)	17(36.2%)		
Marital Status				
Married	109(49.8%)	110(50.2%)	0.92	0.76
Unmarried	23(52.3%)	21(47.7%)		
Religion				
Hindu	101(47.2%)	113(52.8%)		
Buddhist	29(64.4%)	16(35.6%)	4.425	0.10
Christian	2(50.0%)	2(50.0%)		
Ethnicity				
Brahmin/Chhetri	49(45.4%)	59(54.6%)		
Madhesi	1(25.0%)	3(75.0%)	3.06	0.38
Dalit	15(55.6%)	12(44.4%)		
Adivasi/Janajati	67(54.0%)	57(46.0%)		
Education (Wife)				
No Education(Illiterate)	15(71.4%)	6(28.6%)		
Basic Education(up to class 8)	55(53.9%)	47(47.0%)	6.36	0.03
Secondary Education(9-12 class)	48(43.6%)	62(56.4%)		
More Than Secondary(Bachelor and above)	14(46.7%)	16(53.3%)		
Education (Husband)				
No Education(Illiterate)	12(63.2%)	7(36.8%)		
Basic Education(up to class 8)	41(56.2%)	32(43.8%)	5.81	0.01
Secondary Education(9-12 class)	50(48.1%)	54(51.9%)		
More Than Secondary(Bachelor and above)	8(32.0%)	17(68.0%)		
Occupation				
Clerical	10(55.6%)	8(44.4%)		
Sales and Services	6(30.0%)	14(70.0%)		
Skilled Manpower	20(51.3%)	19(48.7%)	7.87	0.04
Unskilled Manpower	52(45.6%)	62(54.4%)		
Agriculture	44(61.1%)	28(38.9%)		

Majority of the respondents 214(81.4%). know that breast cancer is non communicable disease Regarding the risk factors, majority 218(82.9%) respondents answered that alcohol consumption is a risk factor and 216(82.1%) answered smoking as a risk factors while only 106(40.3%) answered having a first child at a late age is a risk factor for breast cancer. Regarding screening and prevention, majority 251(95.4%) of the respondents answered that breast cancer can be prevented if detected early and

246(93.5%) answered clinical breast examination can help for early detection of breast cancer and 173(65.8%) answered that breast self-examination should be started at the age of 20 years or after onset of menarche. Regarding warning sign and symptoms, majority 252(95.8 %) of the respondents answered that they will you go health facility if there are any sign and symptoms of breast cancer. Likewise, 246(93.5%) answered lumps in the breast and armpit is the warning sign of breast cancer followed by changes in the size, shape and color of the breast 233(88.6%), abnormal nipple discharge and retraction 231(87.8%) and dimpling, puckering of the breast skin 207(78.7%) (Table 4).

Table 4: Awareness regarding breast cancer (N=263)

Variables	Frequency	Percent
Breast cancer is non communicable disease	214(81.4)	81.4
Risk factors		
Family history	143(54.4)	54.4
Having a first child at a late age	106(40.3)	40.3
Obesity	124(47.1)	47.1
Increasing age	138(52.5)	52.5
High fat diet intake	146(55.5)	55.5
Alcohol consumption	218(82.9)	82.9
Smoking	216(82.1)	82.1
Screening and prevention		
Breast cancer screening can be done who have no symptoms of breast cancer.	205(77.9)	77.9
Breast cancer can be prevented if detected early	251(95.4)	95.4
Breast self-examination is important for early detection of breast cancer	243(92.4)	92.4
Breast self-examination should be started at the age of 20 years or after onset of menarche	173(65.8)	65.8
Clinical breast examination can help for early detection of breast cancer	246(93.5)	93.5
Mammogram can help for early detection of breast cancer	221(84.0)	84
Early detection and treatment of breast cancer improve chances of survival	241(91.6)	91.6
Warning signs		
Changes in the size, shape and color of the breast	233(88.6)	88.6
Lumps in the breast and around the armpit	246(93.5)	93.5
Abnormal nipple discharge and retraction	231(87.8)	87.8
Dimpling, puckering of the breast skin	207(78.7)	78.7
They will you go health facility if there are any sign and symptoms of breast cancer	252(95.8)	95.8

More than half of the respondents 164(62.4%) got the information from television and radio followed by 108 (41.1%) from peer group, 88 (33.5%) from awareness program, 41(15.6%) from newspaper and 2(0.8%) from others (Table 5).

Table 5: Respondents' sources of information (N=263)

Variables	Frequency	Percent
Television /Radio	164	62.4
Peer group	108	41.1
News paper	41	15.6
Awareness program	88	33.5
Others	2	0.8

DISCUSSION

Breast cancer is the commonest cancer in women but its prevention is more challenging task. However, spreading the awareness regarding its risk factors, early sign and symptoms and different screening methods of breast cancer among public has been a concern in Nepal. The present study examine the awareness on breast cancer among female at Bharatpur metropolitan, Chitwan, Nepal in which, out of 263 respondents, 30.0% were less than 25 years with mean±SD: 34.40±11.42 and range was 17 to 60 years. Most of the women were married 83.3% and follow Hindu religion 81.4%. Adivasi/Janajati were 47.1%, having secondary education 41.8% and unskilled manpower 43.3%. Whereas, another study[11] demonstrated that most of the respondents were young, mean age was 32.3±10.9, single had college level education, unemployed and having no family history of cancer. This study observed that, overall level of awareness on breast cancer was poor (50.2%) with mean±SD: 15.51±2.84. There was a significant association between overall levels of awareness and education (p=0.039), husband education (p=0.011) and occupation (p=0.046) of the respondents. No association was found between level of awareness with age and marital status of the respondents. Whereas, another study[11] showed that there was significant correlation between the age and knowledge about breast cancer screening program (r=0.15, p<0.05). Likewise, marital status was significantly correlated with their knowledge about breast cancer warning signs (r=-0.16, p<0.05) and highly educated females had more knowledge about breast cancer warning signs than others (F=4.1, p<0.00). Present study showed that, majority of the respondents, 81.4% know that breast cancer is non communicable disease. Level of awareness was good on risk factors (61.2%), and 82.9% respondents answered that alcohol consumption is a risk factor, 82.1% smoking, 54.4% family history, 55.5% fat and only 40.3% answered having a first child at a late age is a risk factor for breast cancer. Contrast finding was found on another study[11] which showed the poor level of knowledge about breast cancer risk factors. Likewise another study[5] also showed that women believed consumption of excess tobacco 45% and alcohol 44% followed by consumption of high fat foods 34% and family history 32%. This study observed that, there was poor level of awareness on screening and prevention that is, 55.5%. Majority (95.4%) of the respondents answered that breast cancer can be prevented if detected early and 93.5% answered clinical breast examination can help for early detection of breast cancer and 65.8% answered that breast self-examination should be started at the age of 20 years or after onset of menarche. Similar finding was found on another study[11] that reveals, participants' knowledge on screening is

inadequate about breast cancer screening program and less than half of the participants reported their knowledge of how to perform breast self-examination. Likewise, level of awareness was good in warning sign of breast cancer (60.5%) and majority 95.8% of the respondents answered that they will you go health facility if there is any sign and symptoms of breast cancer. And 93.5% answered lumps in the breast and armpit is the warning sign of breast cancer followed by changes in the size, shape and color of the breast 88.6%, abnormal nipple discharge and retraction 87.8% and dimpling, puckering of the breast skin 78.7%.

Contrast finding was found on another study[11] that reveals there was poor level of knowledge about warning sign of breast cancer. Likewise, another study[5] showed that lump in the breast was considered as symptoms of breast cancer by three- fourth of women. Interestingly, less than half of the women said abnormal discharge or blood from nipple 48%, change in shape or size of nipple 48%, and change in colour 47% as symptoms of blood cancer. Finally, in this study, majority 62.4% got the information from television and radio while nearly similar finding was found on another study[5] where 53% heard about the breast cancer through television.

CONCLUSIONS

This study provides important baseline information regarding the knowledge on breast cancer. The overall perspectives for breast cancer among women is poor in Bharatpur metropolitan. Awareness of breast cancer was significantly associated by education and occupation. It is urgent to have a national breast cancer program in Nepal, while at local level is necessary to raise awareness on breast cancer. The findings suggest an urgent need for interventions to implement and re-enforce existing cancer awareness and cancer screening programs. Health education campaigns will be needed to elucidate the public on the warning sign, risk factors and prevention of breast cancer. Effective media like television can be used to promote breast cancer awareness.

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AUTHORS CONTRIBUTION

LN did conceptualization, project administration, methodology, original draft preparation, formal analysis, reviewing & editing the manuscript. HPU did the methodology, formal analysis, review & editing the manuscript. CC did the data collection.

REFERENCES

1. Yarbro CH, Wujcik D, Gobel BH, editors. Cancer nursing: Jones & Bartlett Publishers; 2016.
2. Sun YS, Zhao Z, Yang ZN, Xu F, Lu HJ, Zhu ZY, et al. Risk factors and preventions of breast cancer. International Journal of Biological Sciences. 2017;13(11):1387. DOI: 10.7150/ijbs.21635 PMID: 29209143.
3. Jare SN, Shinde S. Prevalence of myofascial dysfunctions in breast cancer survivors. International Journal of Physiotherapy. 2019;6(6):287-91.
4. BPKMCH Annual Report, 2020.
5. Prusty RK, Begum S, Patil A, Naik DD, Pimple S, Mishra G. Knowledge of symptoms and risk factors of breast cancer among women: a community based study in a low socio-economic area of Mumbai, India. BMC women's health. 2020;20:1-2. DOI: 10.1186/s12905-020-00967-x
6. Suleiman AK. Awareness and attitudes regarding breast cancer and breast self-examination among female Jordanian students. Journal of basic and clinical pharmacy. 2014;5(3):74. DOI: 10.4103/0976-0105.139730 PMID: 25278670.
7. Madhukumar S, Thambiran UR, Basavaraju B, Bedadala MR. A study on awareness about breast carcinoma and practice of breast self-examination among basic sciences' college students, Bengaluru. Journal of Family Medicine and Primary Care. 2017;6(3):487. DOI: 10.4103/2249-4863.222026 PMID: 29416994.
8. Akram M, Iqbal M, Daniyal M, Khan AU. Awareness and current knowledge of breast cancer. Biological research. 2017;50:1-23. DOI: 10.1186/s40659-017-0140-9
9. Giri M, Giri M, Thapa RJ, Upreti B, Pariyar B. Breast Cancer in Nepal: Current status and future directions. Biomedical reports. 2018;8(4):325-9. DOI: 10.3892/br.2018.1057
10. Sharma GN, Dave R, Sanadya J, Sharma P, Sharma K. Various types and management of breast cancer: an overview. Journal of advanced pharmaceutical technology & research. 2010;1(2):109. PMID: 22247839.

11. Radi SM. Breast cancer awareness among Saudi females in Jeddah. Asian pacific Journal of cancer prevention. 2013;14(7):4307-12. DOI: 10.7314/apjcp.2013.14.7.4307

12. Thapa S, Awale S, Shrestha S. Awareness of Breast Cancer, Attitude and Practice towards its Screening among Female Support Staff. Journal of Karnali Academy of Health Sciences. 2021;4(1).

Tzanakis score as a diagnostic tool for an acute appendicitis: An institution-based retrospective study

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ABSTRACT

Introduction: Acute appendicitis is the most common pathology encountered among the patients with acute abdominal pain. Nowadays, different scoring systems are used to diagnose acute appendicitis. One of them is Tzanakis scoring, which is a combination of clinical examination, ultrasonography, and laboratory markers of inflammatory markers. Hence, this study was done to assess the diagnostic accuracy of Tzanakis scoring system in diagnosing acute appendicitis and compare its accuracy with histopathological examination. **Methods:** A retrospective observational study of all cases of acute appendicitis was conducted from July 2018 to June 2019 at the Department of Surgery, Western Regional Hospital. Out of 403 patients who had undergone appendicectomy during the period of one year, the necessary documents of 83 patients could not be collected. Hence, 320 patients were included in our study. The ethical approval was taken from the Institutional Review Committee (Ref. No. 14. 2077/078). Total Tzanakis score of all patients who underwent appendicectomy during this period was calculated and compared with histopathology report. Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy were calculated. **Results:** The sensitivity, specificity of Tzanakis score of all 320 patients who underwent appendicectomy was 84% and 71% respectively. The diagnostic accuracy was 84% with positive predictive value 98% and negative predictive value 17%. **Conclusions:** The Tzanakis scoring system is simple, effective and easy to be applicable for the diagnosis of acute appendicitis.

Keywords: Acute appendicitis, diagnostic accuracy, sensitivity, specificity, Tzanakis score.

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INTRODUCTION

Amongst several causes of acute abdomen, acute appendicitis is the most common.[1] A life table model suggests that the lifetime risk of appendicitis is 16.33% for males and 16.34% for females, and that the lifetime risk of appendicectomy is 9.89% for males and 9.61% for females.[2] A history of migrating abdominal pain, classically beginning in the periumbilical region and shifting to McBurney's point, combined with leukocytosis and other associated symptoms such as anorexia remains the best diagnostic clue.[3] The symptoms of acute appendicitis often overlap with the symptoms of many other acute abdominal conditions making its diagnosis very difficult.[1] Clinical examination is helpful in diagnosis of acute appendicitis in only 70 to 87% of the cases.[4] About 20% to 33% of patients with suspected acute appendicitis have atypical findings making clinical diagnosis difficult which requires plasma markers and imaging techniques.[5,6] Due to this overlap of symptoms, the rate of negative appendectomy has been reported to range from 20% to 40%.[7]

Different scoring systems are in use for diagnosis of acute appendicitis. Tzanakis scoring system is a combination of clinical examination, ultrasonography (USG) and inflammatory markers. This scoring system has been reported to be 95.4% sensitive, 97.4% specific and 96.5% accurate in diagnosing acute appendicitis.[8]

This study was done to assess the diagnostic accuracy of the Tzanakis scoring system in diagnosing acute appendicitis and compare its accuracy with histopathological examination (HPE).

METHODS

A retrospective observational study was conducted on all the patients who were admitted with the clinical diagnosis of acute appendicitis and underwent laparoscopic or open appendicectomy at Department of Surgery, Western Regional Hospital, Pokhara Academy of Health Sciences. The study was conducted from July 2018 to June 2019. Ethical approval from the Institutional Review Committee (Ref. No. 14. 2077/078) was taken prior to the study.

Total 403 patients had undergone appendicectomy during the period of one year at our department. All needful documents could not be collected for 83 patients. Hence, 320 patients were included in our study. Tzanakis scoring system is a combination of clinical examination, ultrasonography (USG) and inflammatory markers. There are only four variables with a total of 15 points: these are presence of right lower abdominal tenderness (4 points), rebound tenderness (3 points), presence of white blood cells greater than 12000/mm^3 in the complete blood count (2 points), and positive ultrasound scan finding for appendicitis (6 points). A score of either eight or more is considered acute appendicitis requiring surgical treatment. The demographic data, clinical findings, laboratory data, ultrasound findings and histopathology reports of those patients who underwent appendicectomy were collected from the record department of Western Regional Hospital, Pokhara Academy of Health Sciences and entered into a structured proforma. Those patients with incomplete documents were excluded.

All the data collected were tabulated on Microsoft excel. All the data were analyzed, calculated and evaluated. All the patients were divided according to the age group and gender. Total Tzanakis score was calculated in each patient and divided into different groups. Number of patients positive for each variable of Tzanakis score was calculated. Comparison between the score and histopathological diagnosis was done. Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy were calculated.

RESULTS

Out of 320 patients included in the study, 184(57.5%) were male and 136(42.5%) were female, with ages ranging from 5 to 78 years and a mean age of 31.77±15.6. The most common age group suffering from acute appendicitis was from the second decade (n=86), followed by the third decade (n=78), as shown in Figure 1.

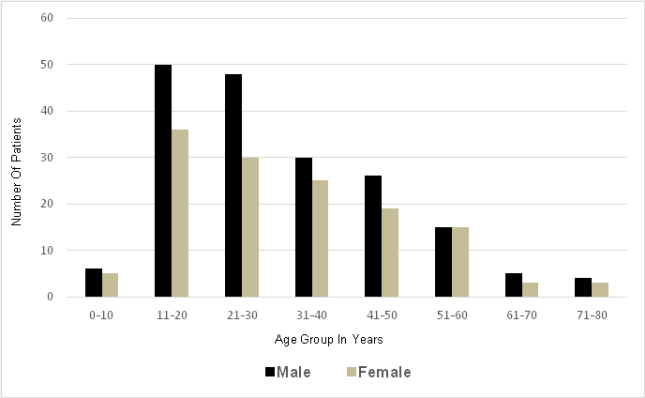

Figure 1: Total number of patients according to age group and gender

Clinically, 292(82.5%) patients had tenderness and 240(75%) had rebound tenderness at the right lower quadrant. Total Leukocytosis (TLC) >12000/mm^3 was present in 236(73.75%) patients and ultrasound finding positive was present in 164(51.25%) patients. Two sixty-four (82.5%) patients had Tzanakis score ≥8, 56(17.5%) had <8 with a mean score 10.09±2.99; none of the patients had a score less than 3 (Table 1).

Table 1: Tzanakis score-wise distribution of patients

Tzanakis score	Frequency	Percentage (%)
0-3	0	0
4-6	24	7.5
7-9	152	47.5
10-12	44	13.75
13-15	100	31.25

Histopathologically, 306(95.62%) patients had acute appendicitis and 14(4.37%) came out to be negative. Among 264 patients who had Tzanakis score more than eight, four patients had HPE report negative. And out of 56 patients who had Tzanakis score less than eight, 46 patients had positive histopathological reports (Table 2).

Table 2: Cross tabulation of HPE and Tzanakis score

Tzanakis score	HPE diagnosis		Total
	Positive	Negative	
Positive	260	4	264
Negative	46	10	56
Total	306	14	320

The sensitivity and specificity of Tzanakis score in our study are 84% and 71% respectively. Overall diagnostic accuracy is 84% with positive predictive value of 98% and negative predictive value of 17% (Table 3).

Table 3: Diagnostic indices for Tzanakis score

Index	Score (%)
Sensitivity	84
Specificity	71
Positive predictive value	98
Negative predictive value	17
Diagnostic accuracy	84

DISCUSSION

Even though acute appendicitis is one of the most common surgical conditions encountered in clinical practice, sometimes it is a challenging task for the surgeon to diagnose it.[9] Radiological investigations, including USG, computed tomography (CT), and magnetic resonance imaging (MRI) help in the diagnosis of acute appendicitis but alone are not confirmatory.[10] To solve this issue many surgeons and physicians try different scoring systems to make diagnosis more accurate. Different scoring systems e.g., The Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA), Alvarado, Ohman, Tzanakis score are established to help decision making in uncertain cases.[1] Fear of negative appendicectomy and appendicular perforation always exist if diagnosis is delayed and so the morbidity and mortality.[9] A higher negative appendectomy rate of 15% to 25% has been accepted in the past in the cost of preventing appendicular perforation.[11] Negative appendicectomy is not devoid of complications, though the mortality is low, it can be associated with the mortality of 10 to 15%. Negative appendicectomy is associated with significant hospital stay. Hence, negative appendicectomy should be lowered as low as possible.[11]

Gallego et al. reported that the incidence of appendicitis in the second and fourth decade of life was 52%.[12] In our study, the highest incidence 86(26.87%) was present in the second decade followed by third decade 78(24.37%). Male predominance was found, with a male to female ratio in our study of 1.37:1 with a mean age of 31.77±15.6, which is comparable to other studies, but the ratio ranges from 1.2:1 to 2.6:1, like Sigdel et al. reported a ratio of 2.6:1.[13-15]

Along with clinical examination, various laboratory parameters of inflammation (TLC, C-reactive protein), USG, CT and laparoscopy are used to establish an accurate diagnosis of acute appendicitis. Numerous scoring systems have been developed to aid in preoperative diagnosis of acute appendicitis viz. Alvarado and modified Alvarado score is being used worldwide. The Tzanakis scoring system has been found to be superior to the previously formulated scoring systems.[9,15,17] The sensitivity, specificity, positive predictive value and negative predictive value in our study are 84%, 71%, 98% and 17% while the overall diagnostic accuracy is 84% which are almost comparable to the study by Lakshminarasimhaiah et al.[9] However, some variations in the values could be attributed to the fact that the calculation of Tzanakis scoring system is operator and machine dependent. Therefore, there could be the intra-examiner variability. Similarly, USG, in experienced hands has a high accuracy in diagnosing appendicitis and hence reducing negative appendectomy rate

Out of 320 patients, 264(82.5%) patients had Tzanakis score ≥8, and 56(17.5%) patients had score <8. Among 264 patients, four had negative histopathology reports for acute appendicitis and out of 56 patients who had score <8, 46 patients had positive histopathology reports for acute appendicitis. Negative appendicectomy in our study is 4.37% which is slightly less than the study done by Sigdel et al.[15] which is 6% and significant less than many other studies.[7,13,16]

This study has evaluated retrospectively the strength of the Tzanakis scoring system for the diagnosis of acute appendicitis. However, further prospective and comparative studies with other scoring systems would help to further evaluate and compare strength of various scoring systems in preoperative diagnosis of acute appendicitis and hence help clinicians to choose the most reliable scoring system.

CONCLUSIONS

Tzanakis scoring system can be considered as one of the simple, and easy to be applicable systems to diagnose acute appendicitis as it is a combination of clinical examination, ultrasonography and laboratory marker of inflammatory markers with relatively high sensitivity, specificity and diagnostic accuracy.

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AUTHORS' CONTRIBUTION

DS designed the research, performed statistical analysis, and prepared the first draft of the manuscript, DB collected data, and contributed to prepare the first draft, explained and interpreted the data and contributed to prepare the draft of the manuscript. All authors have read and approved the manuscript.

REFERENCES

1. Iqbal MM, Ahmed T, Khan I, Iftikhar A, Shah SH, Magsi AM, et al. Experience of Tzanakis Scoring System for Accurate Diagnosis of Acute Appendicitis in Jinnah Postgraduate Medical Centre, Karachi. 2018;10(1):40-43.
2. Lee JH, Park YS, Choi JS. The epidemiology of appendicitis and appendectomy in South Korea: National registry data. J Epidemiol. 2010;20:97–105. DOI: 10.2188/jea.je20090011 PMID: 20023368
3. Lee SL, Ho HS. Acute appendicitis: Is there a difference between children and adults? Am Surg. 2006;72(5):409-13. DOI:10.1177/000313480607200509 PMID: 16719195
4. Rajbhandari AP, Dhakal N, Koirala R, Shrestha ML. Comparison of ultrasonographic diagnosis with 'Tzanakis' Score in acute appendicitis. J Soc Surg Nepal. 2016;19(1):9–12. DOI:10.3126/JSSN.V19I1.24549
5. Schellekens DHSM, Hulsewé KWE, Van Acker BAC, Van Bijnen AA, De Jaegere TMH, Sastrowijoto SH, et al. Evaluation of the diagnostic accuracy of plasma markers for early diagnosis in patients suspected for acute appendicitis. Acad Emerg Med. 2013;20(7):703–10. DOI: 10.1111/acem.12160 PMID: 23859584
6. Baird DLH, Simillis C, Kontovounisios C, Rasheed S, Tekkis PP. Acute appendicitis. BMJ. 2017;357:j1703. DOI: 10.1136/bmj.j1703 PMID:28424152.
7. Soder BL, Dart BW, Stanley JD. Appendicitis-current practices in a tertiary referral center. American Surgeon. 2016;82:E45–6. DOI:10.1177/000313481608200204
8. Tzanakis NE, Efstathiou SP, Danulidis K, Rallis GE, Tsioulos DI, Chatzivasiliou A, et al. A new approach to accurate diagnosis of acute appendicitis. World J Surg. 2005;29(9):1151–6. DOI: 10.1007/s00268-005-7853-6 PMID: 16088420s
9. Lakshminarasimhaiah AKS, Nagaraja ALN, Srinivasaiah M. Evaluation of Tzanakis scoring system in acute appendicitis: A prospective study. Int Surg J. 2017;4(10):3338. DOI:10.18203/2349-2902.isj20174173
10. Mostbeck G, Adam EJ, Nielsen MB, Claudon M, Clevert D, Nicolau C, et al. How to diagnose acute appendicitis: ultrasound first. Insights into Imaging. 2016;17:255–63. DOI:10.1007/s13244-016-0469-6 PMID: 26883138
11. Parker MC, Wilson MS, Menzies D, Sunderland G, Clark DN, Knight AD, et al. The SCAR-3 study: 5-year adhesion-related readmission risk following lower abdominal surgical procedures. Colorectal Disease. 2005;7:551–8. DOI:10.1111/j.1463-1318.2005.00857.x PMID 16232234
12. Kanumba ES, Mabula JB, Rambau P, Chalya PL. Modified Alvarado Scoring System as a diagnostic tool for acute appendicitis at Bugando Medical Centre, Mwanza, Tanzania. BMC Surg. 2011;11:1–5. DOI:10.1186/1471-2482-11-4 PMID 21329493
13. Mallik AA, Mir MF, Khurshid SU, Imtiaz W, Riyaz D. Modified Alvarado Score Versus Tzanakis Score for diagnosing acute appendicitis in changing clinical practice. International Journal of Clinical and Experimental Medical Sciences. 2016;2(5):90-93. DOI:10.11648/j.ijcems.20160205.13
14. Shashikala V, Hegde H, Victor AJ. Comparative study of Tzanakis score vs Alvarado score in the effective diagnosis of acute appendicitis. Int J Biomed Adv Res. 2016; 7(9): 418-420. DOI:10.7439/ijbar
15. Sigdel G, Lakhey PJ, Mishra PR. Tzanakis score vs Alvarado score in acute appendicitis. J Nepal Med Assoc. 2010;49(2):96–9. DOI:10.31729/jnma.105
16. Stewart RM. Negative Appendectomy Rate. Surg Infect (Larchmt). 2003;4(2):4–9.
17. Korkut M, Bedel C, Karancı Y, Avcı A, Duyan M. Accuracy of Alvarado, Eskelinen, Ohmann, RIPASA and Tzanakis Scores in Diagnosis of Acute Appendicitis; a Cross-sectional Study. Arch Acad Emerg Med. 2020 Mar 13;8(1):e20. PMID: 32259117.

Localizing tip of conus medullaris in hospital visiting adults using MRI

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ABSTRACT

Introduction: Generally, the spinal cord ends at the level between the first and second lumbar vertebrae. There are many studies published globally, yet no article has been published concerning this title in our settings. The objective of this study was to determine the tip level of conus medullaris by the Magnetic Resonance Imaging (MRI) in living humans in Nepalese population. **Methods:** Images of the MRI done between August 2019 to June 2021 were accessed through the database of the radiology department for defining the level of conus medullaris. The termination level of conus medullaris was rescored in relation to the upper, mid, and lower third of the adjacent vertebrae and the intervertebral disc. Input data was processed in Microsoft Excel which was later analyzed by SPSS 20.0. **Results:** Of the total, 202 study population, a higher number of spinal cords terminated at lower one-third of L1 vertebrae, accounting for 51 (females 26 and males 25) followed by L1-L2 intervertebral disc comprising only 35 (males 19; females 16). No significant differences in number existed between the two sexes having conus medullaris termination at both levels. Most of the cases who were in the age group of 40-49 years old, termination of CM was noted in L1 with the most common shape being the central type C, accounting for 38% (78/202). **Conclusions:** The conus medullaris was terminated mostly at lower one third of L1 vertebral body in our settings with no gender difference.

Keywords: Conus medullaris, magnetic resonance imaging, spinal cord, termination.

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INTRODUCTION

The spinal cord is a sensitive and important structure in human as it is the extension of the central nervous system (CNS) that begins from the area of medulla oblongata at the brain stem and ends in the lower back in a tapering form like a cone called as conus medullaris (CM). It has been observed that by birth, the level of CM termination is found at the level of L2 vertebral body or above.[1] There are various articles published regarding the termination of CM with respect to the vertebral level in live human beings and cadaveric.[2-3] Several studies revealed that the CM mostly terminates at the intervertebral level of L1/L2, yet there are other studies which elicited wide variety of termination from mid T11 to mid-L3.[4-5] It is clinically important to recognize the level of CM termination especially during the spinal anesthesia and during the diagnostic procedure like lumbar puncture. Damage to the spinal cord happens when the CM termination level is not well identified.[6] Nevertheless, there are no data published from our settings and environment. This reflects clear gap of knowledge about the termination point of conus medullaris in the Nepalese people which have different body habitus.

Filling this gap of knowledge by finding termination point of CM among Nepalese through cadaveric study could be expensive and invasive whereas magnetic resonance imaging (MRI) can make the study less expensive, more feasible and non-invasive. Already, ample

of study using MRI have been done in different population to find the level of CM and result have been satisfactory. Therefore, this study aimed to find the level of termination of conus medullaris among adult Nepalese through the MRI scanning of lumbar spine. Outcome of this study when published will be helpful for the diagnostic and treatment procedures in the institution of the study and will be reference for the clinicians.

METHODS

This was a retrospective study conducted in Pokhara Academy of Health Science (PoAHS) in Pokhara after obtaining ethical clearance from Institutional Review Committee (Ref. No. 73/078). MRI images of the last two years from August 2019 to June 2021 was accessed from the database of the Radiology department. Since there was no previous study with defined prevalence of termination of CM among Nepalese people, we referred other previous paper conducted in other Asian countries and in Nigeria which all had sample size of less than 200. Previous studies at similar sites in other countries found the prevalence to be 15% which gives us estimate of sample size to be about 196, while previous studies conducted in Nigeria, Korea, and Saudi Arabia used sample size 187, 177 and 179 respectively.[5,7,8] Therefore, we confined our sample size at 202.

MRI scans were reviewed by the consultant radiologists having more than five years of experience on MR spine reporting. Images of adult patients with no sign of congenital anomaly, trauma, tumor, or other form of gross anatomical variation were selected for the study. The images of patient file with the history of sciatica or low back pain were included in the study if it did not have any anatomical abnormalities. Patients with the history of low back pain (LBP), sciatica were enrolled in the study whereas patient with the history of trauma, vertebral fractures were excluded. All the MR Images were scanned by Philips 1.5 Tesla instrument (Digital Broadband Philips Multiva) with slice thickness of 5 mm in sagittal and 4 mm in transverse plane. The T1, T2 and Fat-saturated sequences of the images were viewed by OsiriX MD v.10.0.2 DICOM viewer software. All scans were obtained while patient lying in the supine position. The termination of the conus medullaris was identified on sagittal plane and a line perpendicular to the long axis of the cord was drawn to identify its relation to the vertebrae level. This level was recorded as upper (U), mid (M) and lower third (L) of the vertebra or the intervertebral disc as per Saifuddin et al.[10] The shape of the conus medullaris and level of the vertebra on sagittal T2 weighted images are visualized. The shape of the conus medullaris in the MR spinal images were recorded as type A, type B and type C.[7] Type C is ventrally deviated, type B is central and type A is dorsally deviated conus tip. (Figure 1). Descriptive analysis was done to calculate the level of CM terminations (CMt) and the types.

Figure 1: Demonstrates the different shapes of tip of conus categorized as Type A, B and C; and the level of CMt with respect to vertebral bodies and intervertebral discs on T2 weighted sagittal Image

RESULTS

Of the total, 202 patients (103 females and males 99) with the mean age of 47.88 years and the range of age was between 11 and 83 years. The distribution of termination of conus medullaris was found to range from T12 to upper third level of L3 vertebrae (Figure 1). The most common termination level was L1 lower one third comprising 51 cases (26 females, 25 males) accounting for 25.24% which is then followed by L1-L2 disc interval accounting for 17.32% (16 females and 19 males). The least common termination level was noted at T12 upper one third and L2-L3 disc interval accounting just for 0.49%. (Figure 2)

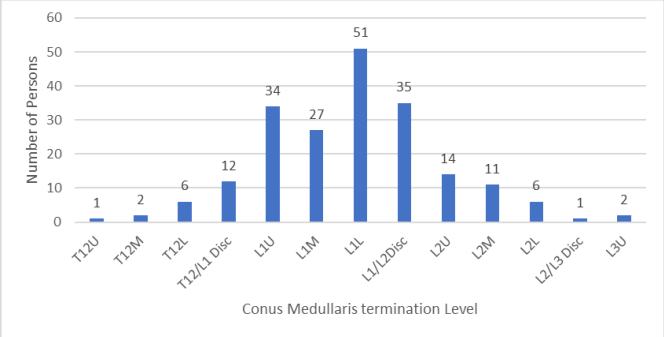

Figure 2: Distribution of CM termination level

It was found that most common shape of the tip of conus is central type accounting for 38% (78/202) followed by ventral (C) 37% and dorsal type (A) which accounts for 25 %.

DISCUSSION

MRI is the novel modality in the examination of spine. The high resolution and clarity in the images outweigh the study of conus medullaris by MRI compared to cadaveric study. [11]

Various studies concluded that the termination of CM lies between the levels of T12-L1 upto the level of L2 and L3.[9,10]

In the present study, there is slight dominance of female population comprising of 51% female and 49% male which is quite similar to the study conducted by Binokay et al.[11] where female population comprised of 85% of the sample size. The probable reason for number of females being greater than males is that females go a long distance to fetch water and bring that on their back in hilly areas of Pokhara resulting backache and they show up for MRI scan. Nevertheless, there was no significance in the cord termination between the genders and the most common age group included for this study was 40-49 years with varying level of cord termination.

Similarly, our study revealed that the termination of spinal cord was found at the level of upper third of T12 vertebrae to upper third of L3 vertebrae, which was quite similar to other study conducted by Saifuddin et al.[12] in 1998 and Mbaba et al.[5] in 2020, where termination of CMt was located between mid-third of T12 and upper third of L3.

The information on the level of CMt differs between anatomy and neurology textbooks and the literature. Mean levels of CMt were stated to be at the level of L1 vertebra in the 39th edition of Gray's Anatomy[13] and Gray's Clinical Neuroanatomy[14] which is consistent to this study where 51% of the total cases had CMt at the level of lower third of L1 vertebrae. The normal anatomical variation may be the reason of variations in result among the literature. However, we claim our result to be valid because it agrees with the reference book and most importantly this is the first article done for Nepalese population. However, multi-centric study with larger sample size will verify it further.

Similarly, with respect to the conus shape, centrally located conus tip (type B) was most common in our study accounting for 38%, which is quite similar to other study conducted by Myung-Sang et al.[7] in 2019, according to him type B conus tip was the most common in Korean Population accounting for 39.6% in his study. It is believed that type C conus experiences least bruises followed by type B and type C conus is bruised the most.[15,16]

CONCLUSIONS

The average level of termination of conus medullaris in this study population is at the level of lower one third of L1 vertebral body. There was no gender influencing factor for termination of spinal cord and we also believe that the differences in the shape of the conus are attributable to anatomical variations. A large sample size study is recommended to suggest the exact variations and level of conus medullaris in Nepalese population.

CONFLICTS OF INTEREST: None declared

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AUTHORS CONTRIBUTION

MT did conceptualization, definition of intellectual content, literature search, clinical studies, manuscript preparation, editing and review; SSP did the designing of the study, data acquisition, analysis and statistical analysis; MKS defined the intellectual content, did the clinical studies, and reviewed the manuscript; RP did the literature search, data analysis, statistical analysis and manuscript preparation; BBT did data acquisition, analysis, and statistical analysis manuscript preparation; SB did conceptualization, designing, definition of intellectual content, manuscript preparation, editing and review.

REFERENCES

1. Kalindemirtaş M, Orhan M, Bahşi A, Bahşi İ. Examination of the Level of Conus Medullaris Termination Using Magnetic Resonance Imaging. Eur J Ther 2021;27(2):123-34. DOI: 10.5152/eurjther.2021.20086
2. Kim JT, Bahk JH, Sung J. Influence of age and sex on the position of the conus medullaris and Tuffier's line in adults. Anesthesiology. 2003;99:1359–63. DOI: 10.1097/00000542-200312000-00018 PMID: 14639149
3. Boonpirak N, Apinhasmit W. Length and caudal level termination of the spinal cord in Thai adults. Acta Anat (Basel). 1994;149:74–8. DOI: 10.1159/000147558 PMID: 8184662.
4. Soleiman J, Demaerel P, Rocher S, Maes F, Marchal G. Magnetic resonance imaging study of the level of termination of the conus medullaris and the thecal sac: influence of age and gender. Spine. 2005;30:1875-80. DOI:10.1097/01.brs.0000174116.74775.2e PMID: 16103859.
5. Mbaba AN, Ogolodom MP, Abam R, Ijeruh OY, Okpaleke MS, Maduka BU, et al. Magnetic Resonance Imaging Localization of the Vertebral Level of Termination of the Spinal Cord in Adults in Port Harcourt, Rivers State, Nigeria. Arch Med. 2020;12(2):5. DOI: 10.36648/1989-5216.12.2.306
6. Lin N, Bebawy JF, Hua L, Wang BG. Is spinal anaesthesia at L2–L3 interspace safe in disorders of the vertebral

column? A magnetic resonance imaging study, BJA: British Journal of Anaesthesia. 2010;105(6):857–62. DOI: 10.1093/bja/aeq246

7. Moon MS, Jeong JH, Kim SJ, Kim MS, Choi WR. Magnetic Resonance Imaging Observations of the Conus Medullaris in a Korean Population. Asian Spine J. 2019;13(2):313-7. DOI: 10.31616/asj.2018.0118 PMID: 30567421.
8. Hiware SD, Vallaba Doss CA, Alola HA, Alshahrani MM, Alamri AA, Aljohani MH, et al. Morphometry of Conus Medullaris in the Saudi Population and Its Clinical Importance. Cureus. 2022;14(12):e32279. DOI: 10.7759/cureus.32279 PMID: 36505957.
9. Ko H-Y. Cauda equina injuries. In Management and Rehabilitation of Spinal Cord Injuries. Singapore: Springer, 2019:197-204. DOI: 10.1038/s41393-020-0463-1 PMID: 32371940.
10. Kingwell SP, Curt A, Dvorak MF. Factors affecting neurological outcome in traumatic conus medullaris and cauda equina injuries. Neurosurg Focus. 2008;25(5):E7. DOI: 10.3171/FOC.2008.25.11.E7 PMID: 18980481.
11. Binokay MD, Akgul E, Bicakci K, Soyupak S, Aksungur E, Sertdemir Y. Determining the Level of the Dural Sac Tip: Magnetic Resonance Imaging in an Adult Population. Acta Radiologica. 2006;47:397-400. DOI: 10.1080/02841850600557158 PMID: 16739700.
12. Saifuddin A, Burnett SJ, White J. The variation of position of the conus medullaris in an adult population: a magnetic resonance imaging study. Spine (Phila Pa 1976). 1998; 23(13):1452–6. DOI: 10.1097/00007632-199807010-00005 PMID: 9670396.
13. Gray H, Standring S, Ellis H, Berkovitz BKB. Gray's anatomy: the anatomical basis of clinical practice. 39th ed. Edinburgh; New York: Elsevier Churchill Livingstone; 2005.
14. Mancall EL, Brock DG. Gray's Clinical Neuroanatomy E-Book. Amsterdam: Elsevier Health Sciences; 2011.
15. Reynolds F. Damage to the conus medullaris following spinal anaesthesia. Anaesthesia. 2001;56(3):238-47. DOI: 10.1046/j.1365-2044.2001.01422-2.x PMID: 11251431.
16. Aldrete JA. Neurologic deficits and arachnoiditis following neuroaxial anesthesia. Acta Anaesthesiol Scand. 2003;47(1):3-12. DOI: 10.1034/j.1399-6576.2003.470102.x PMID: 12492790.

Visual outcome of standard treatment of sarcoid uveitis at a tertiary eye center in Nepal

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ABSTRACT

Introduction: Sarcoidosis is a less-studied disease in Nepal, both as a systemic as well as ocular disease. We aimed to describe the visual outcome of standard therapy of sarcoid uveitis in Nepal. **Methods:** Observational study through Electronic Medical recording system of Tilganga Institute of Ophthalmology from December 2017 to March 2020. Patients diagnosed by IWOS criteria, treated with standard protocol and with minimum six-month follow up were included. The clinical parameters evaluated were type of uveitis, anatomical location and IWOS category. Treatment related factors evaluated were need for immunosuppressants, anti-glaucoma medication and cataract surgery. Visual outcome at six months was the major outcome evaluated, considering two lines of improvement or worsening as significant. Vision limiting complications assessed were cystoid macular edema, complicated cataract and secondary glaucoma. Visual outcome was stratified based on demography, anatomical involvement, uveitis subtype, IWOS category and need for immunomodulators. **Results**: Forty-six eyes of 25 patients were included. Based on IWOS criteria, presumed ocular sarcoidosis had best visual outcome with 93.33% improvement. Males had better post-treatment vision (90% vs. 76.9%). 20-40 years age group had best improvement (96.5%) and anterior uveitis had best visual outcome (100%). A single immunomodulator could not be recommended based on this study. 18(39%) eyes had raised IOP, 4(8.6%) had secondary angle closure glaucoma, 4(8.6%) had hypotony, 1(2.1%) eye underwent cataract surgery and 1(2.1%) eye had cystoid macular edema. **Conclusions:** Sarcoid uveitis has good visual outcome. High degree of suspicion, early diagnosis and prompt treatment aids in diagnosis and limits vision-limiting complications.

Keywords: Complications, sarcoidosis, treatment, uveitis, visual outcome.

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INTRODUCTION

Sarcoidosis is a chronic granulomatous inflammatory disorder that may affect any organ system but most commonly the lungs and hilar lymph nodes. Sarcoidosis as a disease has worldwide distribution.[1] The intrathoracic involvement of sarcoidosis is very similar to that of tuberculosis, which has a high incidence and prevalence in Nepal.[2] Although initially described by Hutchinson in the year 1869, it still remains a diagnostic and therapeutic challenge and there is no single clinical characteristic that is able to differentiate it from all other alternative diagnoses. The presence of non-caseating granulomas in the lung or affected organ as seen on biopsy of the tissue is considered definitive in the diagnosis of sarcoidosis but this may appear to be too invasive in most cases.[1]

The eye has been found to be involved in 20-70% of cases of systemic sarcoidosis, depending upon the geographical area of study.[3-6] Ocular sarcoidosis was found to occur in up to 70% of total sarcoidosis cases in a study done in Japan while other areas of the world showed a lesser frequency of ocular sarcoidosis. Uveitis has been the most common presentation of ocular sarcoidosis and the posterior segment was found to be involved in 28-33% cases.[3-6] Due to variability in the

clinical presentation and due to the fact the tissue biopsy is not always possible, it is many a times difficult to ascertain the diagnosis of ocular sarcoidosis. Hence, various clinical criteria have been laid down in different time frames. The most accepted criteria is that of International workshop on Sarcoidosis (IWOS) in 2009.[7] Although pulmonary sarcoidosis has been reported to be common in Nepal by a study done by pulmonologists,[8] various studies have shown that sarcoidosis is the cause of only 1.2-1.7% of the total uveitis cases.[9,10] All previous studies have shown panuveitis to be the most common presentation of ocular sarcoidosis in Nepal.[9-11] In terms of percentages, the most recent study showed ocular sarcoidosis presented with bilateral disease in 82.85% and with isolated anterior uveitis in 23% cases, anterior with intermediate uveitis in 29% cases and isolated posterior uveitis in 7%. Panuveitis was the presenting pattern in 39% cases.[11]

Hence, research on the same study population has been pending regarding the outcome of standard therapy in sarcoid uveitis in Nepal. This study was done to assess the outcome of standard treatment regimen in cases of sarcoidosis in terms of vision and the occurrence of vision limiting complications like cataract, glaucoma and macular edema.

METHODS

Observational study done at Tilganga Institute of Ophthalmology, uveitis out-patient department. This site was selected based on convenience and the presence of uveitis specialists with experience in the diagnosis and treatment of sarcoid uveitis. The duration of the study was two and half years from December 2017 to March 2020 and findings were recorded through the Electronic Medical Record (EMR) system of the Institute. The classification of uveitis was done according to the Standardization of Uveitis Nomenclature system (SUN classification).[12] All cases of suspected sarcoid uveitis fulfilling IWOS criteria of definite, presumed, probable or possible ocular sarcoidosis and having a minimum of six months of follow-up were included in the study. Although a total of 35 cases diagnosed with sarcoid uveitis were found in the study period, only 25 patients had a minimum six month follow-up and hence were included in the study.

Demographic factors of gender and age were noted. Age was grouped as <20 years of age, 20 to 40, 40 to 60 and >60 years of age. However, no patients were of >60 years age group and hence, later this group was removed. The Snellen's visual acuity was noted at presentation and at the final follow up at six months for the purpose of the study. Ocular features evaluated were the anatomical site of involvement (anterior, intermediate, posterior, or panuveitis), type of inflammation (granulomatous or non-granulomatous), intraocular pressure (IOP) by Goldmann applanation tonometry and presence or absence of complications. Complications evaluated were rise in intraocular pressure (>21mm Hg), established secondary angle closure glaucoma as determined by glaucoma specialist, hypotony (persistent IOP <8 mm Hg with vision loss due to hypotony maculopathy) and cystoid macular edema. Presence of cystoid macular edema was recorded based on clinical findings as well as OCT (Optical Coherence Imaging)- Zeiss stratus OCT 3000 with macular scan (3x3).

Standard treatment regimen for the treatment of anterior uveitis included use of topical prednisolone acetate 1% at a frequency depending upon the degree of anterior segment inflammation, along with cycloplegic-mydriatic (homatropine 1% in most of the cases and atropine sulfate 1% in certain selected cases requiring stronger mydriatic-cycloplegic action). These topical medications were tapered depending on the response to therapy as well as intraocular pressure. If necessary, IOP lowering agents were used, preference being given to topical dorzolamide as it has the least side effect profile, followed by beta-blockers (timolol/brimolol) and later alpha agonists (brimonidine) or a combination of the same.

Intermediate uveitis, in unilateral cases, was treated with proper counseling and giving patients the option of sub-tenon triamcinolone acetonide 20 mg for unilateral involvement or oral prednisolone starting at a dose of 1 mg/kg/day and tapered down by 10 mg per week after one to two weeks depending on clinical response. In bilateral intermediate uveitis cases, oral prednisolone was prescribed in the same dose regimen.

In cases of posterior uveitis, active disease was treated with oral prednisolone at the above mentioned dosage regimen. These included cases of retinitis, choroiditis, retinal vasculitis and disc granulomas. In cases of retinal vasculitis with vascular non-perfusion of retina, sectoral laser was given to the affected area with diode laser applying moderate burns to the retina, 300 micron spot size, for a duration of 200 milliseconds at intervals of 200 milliseconds. In non-responding cases or cases with steroid dependence, immunomodulators were started after consultation with pulmonologist in cases with pulmonary sarcoidosis and rheumatologist in cases of sarcoidosis affecting joints, skin and other organ systems. Preference was given to oral methotrexate due to the easy dosage schedule and easy availability and cost effectivity. Dosing

was started at 7.5 mg once a week and gradual tapering up following monitoring of complete haemogram and liver function tests was done. If case of methotrexate failure or development of intolerable side-effects, azathioprine was advised starting at a dose of 1 mg/kg/day. In severe non responsive cases, adalimumab was advised which was administered and monitored by rheumatologist. No other immunomodulator was prescribed from the ophthalmology side.

The expected complications of uveitis were development of cataract, rise in intraocular pressure and cystoid macular edema. Rise in intraocular pressure was managed as stated above. If topical therapy was not sufficient, oral medication was given with acetazolamide 250 mg thrice a day. For patients not responding to medical treatment, surgical treatment with trabeculectomy was performed by glaucoma specialist. In patients with visually significant cataract, if the eye had been quiet for three months with no medication or on less than 7.5 mg oral steroid per day or on once daily dosing of topical prednisolone acetate 1%, phacoemulsification was done for cataract extraction. If necessary, iris hooks were used for release of posterior synechiae and to expand the pupil. The post-operative regimen included intensive topical prednisolone acetate 1% (starting at half hourly dosage) and tapered weekly according to the degree of inflammation. For patients with cystoid macular edema, treatment was based on OCT finding and degree of edema. Then posterior subtenon injection of triamcinolone acetate 20 mg was given with 26 or 27G needle from the superotemporal approach for cystoid macular edema unless there was a contraindication, in which case therapy was started with topical NSAIDS.

The collected data were cleaned and coded in Microsoft Excel. Data was transported to Statistical Package for Social Science (SPSS) V.20 for analysis. For categorical variable, Fisher Exact test was used wherever applicable. The p-value less than 0.05 was considered as statistically significant. Ethical approval for the study was attained from the Institutional Review Committee (IRC) of Tilganga Institute of Ophthalmology (Ref. No. 16/2020). Confidentiality of data was maintained.

RESULTS

A total of 35 patients with sarcoid uveitis, including all four categories of the IWOS criteria. Of these, only 25(71.4%) patients had a follow up of six months or more and were included in this study. Twenty-one patients had bilateral disease and four eyes were of patients with unilateral disease.

Visual outcome comparing the first and final follow up visits revealed improvement in 38 eyes of a total of 46, stable in five eyes and worsening in three eyes.

Of total, 25 patients, 9(36%) patients had definitive ocular sarcoidosis, 8(32%) had presumed ocular sarcoidosis, and 8(32%) had probable ocular sarcoidosis based on IWOS criteria. There were no patients in the study group that had possible ocular sarcoidosis. (Figure 1 and 2)

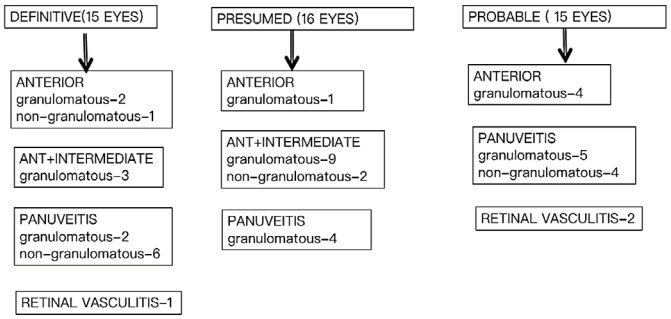

Figure 1: Anatomical involvement according to IWOS criteria

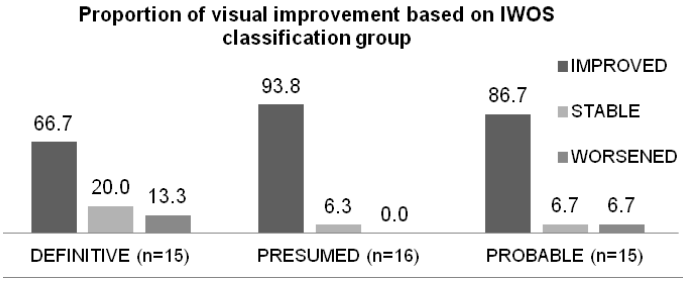

Figure 2: Visual improvement based on IWOS criteria

In terms of gender, 13 females were included in this study, all with bilateral disease, accounting for 26 eyes. 18 eyes had granulomatous disease with 4 having isolated anterior uveitis, while nine had granulomatous panuveitis. Among the females, only eight eyes had non-granulomatous disease of which all had panuveitis. Twenty eyes of 12 males were included in this study, with 66.67%) cases being bilateral. Of these 11 eyes had granulomatous disease with three eyes having isolated anterior uveitis, two having anterior with intermediate uveitis and six having panuveitis. Nine eyes had non-granulomatous disease with one eye having isolated anterior uveitis, three having anterior with intermediate uveitis, two having panuveitis and three eyes having isolated retinal vasculitis.

About 77% of the female patients (20 of 26 eyes affected) had improved visual status whereas 90% of the male patients (18 of 20 eyes affected) had improved visual status.

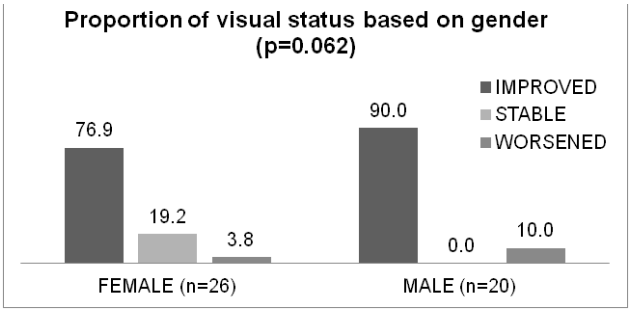

Figure 3: Visual improvement based on gender

Visual outcome is statistically similar gender wise (p=0.06).

Figure 4 shows the visual outcome by age group in the study population on the basis of type of uveitis, of seven eyes presenting with granulomatous anterior uveitis, all (100%) had visual improvement and one eye with non-granulomatous anterior uveitis had improved. Thus, 100% of cases with anterior uveitis had visual improvement. Of 14 eyes with anterior with intermediate uveitis, there were 12 eyes with granulomatous disease of which 11(91.7%) improved and one eye (8.3%) had stable vision and of two eyes with non-granulomatous disease both improved (100%). Thus 92.8% (13 of 14 eyes) of all sarcoid anterior with intermediate uveitis eyes had visual improvement. Of 21 eyes with panuveitis, there were 11 eyes with granulomatous disease of which eight eyes (72.7%) improved and one eye (9.1%) had stable vision and two eyes(18.2%) had worsened vision. 10 eyes had presented with non-granulomatous panuveitis of which 6(60%) had improved vision, 3(30%) had stable vision and 1(10%) had worsened vision. Three eyes had presented with isolated retinal vasculitis of which all improved (100%).

Of total 46 eyes, 30 (65%) had granulomatous inflammation, 13 (28%) had non-granulomatous inflammation and 3 (6.5%) eyes had only retinal vasculitis. Of the patients with granulomatous inflammation, 86.7% had visual improvement, 6.7% had stable vision and another 6.7% had worsening of vision. Among th patients with non-granulomatous inflammation (13 eyes), 64.3% had improvement of vision, 21.4% had stable vision and 14.3% had worsening of vision. There was no significant difference in visual outcome based on type of uveitis (p=0.209).

The use of immunomodulators, in accordance with hospital protocol, was limited to cases with non-response to steroids or steroid dependent disease or steroid intolerance or in cases where the pulmonologist or internist prescribed it for systemic disease. Six patients received methotrexate as initial therapy but only three patients had response to methotrexate alone. Other two cases had to stop methotrexate therapy due to duodenal ulceration and impaired liver function tests respectively. Four patients were treated with Azathioprine of which one had non response, was further treated with Adalimumab by the pulmonologist but had refractory disease and developed hypotony and maculopathy. One other patient who had been treated initially with methotrexate and later azathioprine had documented skin sarcoidosis and required hydroxychloroquine from dermatologist side. This patient too, later developed hypotony. The exact response to any single immunosuppressant could not be assessed due to the small number of patients and the need to change therapy due to the side effects and the need to stop therapy.

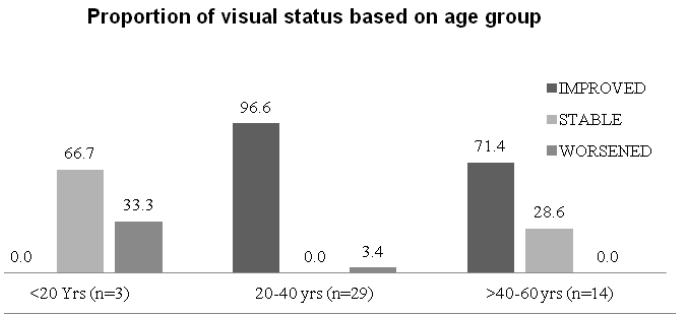

Figure 4: Complications affecting vision according to anatomical involvement

The complications of uveitis seen in sarcoid uveitis were raised IOP (18 eyes-39.13%), secondary angle closure glaucoma (four eyes-8.6%), hypotony (four eyes-8.6%), Band shaped keratopathy (two eyes, 1 patient;4.3%), cystoid macular edema (one eye-2.2%), and vitreous and preretinal hemorrhage (one eye-2.2%). One patient with bilateral disease developed herpes zoster as a complication of oral therapy with steroids. Two eyes with granulomatous anterior with intermediate uveitis developed visually significant cataracts and had cataract extraction with IOL insertion within the span of the study period. Of these, one had significant postoperative cystoid macular edema which was extremely refractory and did not respond to multiple doses of sub-tenon triamcinolone acetate.(Figure 5)

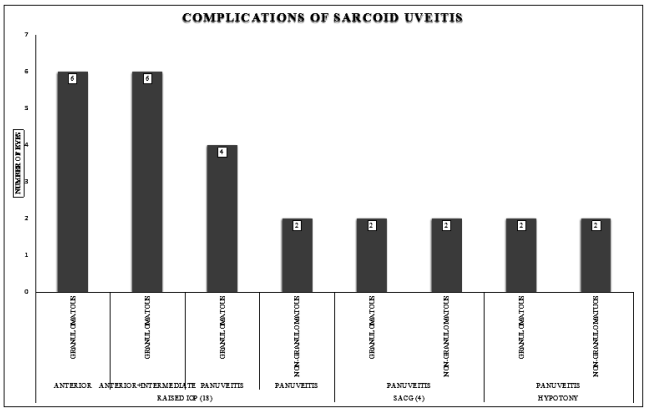

Figure 5: Visual improvement based on age group

DISCUSSION

This study included 46 eyes of 25 patients with sarcoid uveitis diagnosed according to IWOS criteria. Although this number is small, considering the rarity of the disease, it is still a statistically significant number from which some evaluation may be done. A long-term prognostic study of sarcoid uveitis showed that the majority (54%) of the patients retained vision of better than 20/40 in both eyes, and only 4.6% had lost vision less than 20/120 in both eyes, at 10 years after the onset of uveitis in a setting of an ophthalmic referral center.[13] Corroborative to that study, the response to treatment in terms of visual outcome in this study was found to be good. In general, the visual outcome of sarcoid uveitis was good with 28 of 46 eyes (60.86%) having a Snellen's visual acuity of 6/12 or better and 76.08% (35 of 46 eyes) having a vision of better than 6/18. In another study by Dana et al involving 112 eyes of patients with sarcoidosis, 34% of treated eyes and 51% of patients in that study had final visual acuities that were superior to their acuities at presentation.[14].The visual outcome seems to be variable in different studies with not all studies demonstrating a significant improvement. In a study done between 2013 to 2018 at the Kyorin eye center, Tokyo, among eyes of 53 patients with sarcoid uveitis, the best-corrected visual acuity was 1.0 or better (Snellen's equivalent-6/60) in 51% of eyes at presentation, 57% at six months, 50% at 12 months, and 58% at 36 months.[15] In another study done in Taiwan, a total of 122 eyes of 66 patients (13 males and 53 females) with ocular sarcoidosis (OS) were identified. Forty-three eyes (36.1%) and 74 eyes (62.2%) had a final vision of 20/20 and 20/40 or better, respectively.[16]

Isolated anterior uveitis cases in this study typically responded to topical steroids. The exceptions when anterior uveitis cases received systemic steroids were when the other eye needed treatment for posterior involvement or when being treated for systemic sarcoidosis by the treating physician. In a previous study involving 75 patients with proven systemic sarcoidosis, however, there was a slightly poorer visual outcome with 12.5% cases having a poor visual outcome (3/24 anterior uveitis cases).[17] All the cases had chronic anterior uveitis and three had recurrent episodes of inflammation. It was observed in this study that there was high risk of increase in IOP which may be due to both disease as well as topical steroid use as six of total eight eyes (75%) developed raised IOP. This is higher in comparision to generalised chronic anterior uveitis cases where raised IOP was found in 26.0% of eyes with acute uveitis and 46.1% of eyes with chronic uveitis.[18] The visual outcome of standard topical therapy in this study with regards to remission was found remarkable with eight of eight cases having significant improvement in vision at the end of the six-month study period. In previous studies too, the anterior uveitis associated with sarcoidosis have been of chronic type and the diagnostic delay has had toll on the final outcome with band shaped keratopathy being found in 5-10% cases.[19-21] Secondary cataract and glaucoma have been reported in one-third of cases.[5,13,21-23]. Although five of eight eyes (62.5%) in this study developed cataract, none had visually significant cataracts to require surgery during the time frame of the study. Occurrence of cataracts in anterior uveitis in other studies has been reported around 13.6-16.5%.[24,25] No eyes with isolated anterior uveitis developed cystoid macular edema in this study. This is in concordance with other studies that state that anterior uveitis is an unusual cause of macular edema, reported in 9-28%, with the exception of HLA-B27 associated anterior uveitis.[26]

Thirteen eyes presented with anterior with intermediate uveitis and six of these eyes were treated with sub-tenon triamcinolone, others required oral steroids due to bilateral presentation. Two eyes with anterior and intermediate uveitis developed cystoid macular edema (15.38%), one of these had non-response to repeated posterior sub-tenon injections. In other studies, it has been found that intermediate uveitis was the most common uveitis to cause cystoid macular edema, ranging from 20-75%.[27-29] Six eyes (46.15%) with anterior and intermediate uveitis developed a raised IOP and needed anti-glaucoma medication. This is similar to the general occurrence of, raised IOP in chronic uveitis (46.1%).[18] three eyes (25%) had cataract during the follow-up and two underwent cataract surgery. Cataract has been noted as a complication of pars planitis in 57% percent in other studies.[30] By the end of follow-up, of the total 13 cases presenting with anterior and intermediate uveitis, 12 had improvement in visual acuity (92.3%). One eye had no improvement or worsening in vision even after cataract surgery due to non-responsive cystoid macular edema. Previous studies on visual outcome in intermediate uveitis state that moderate visual loss (BCVA20/50->20/200) occurred in 7.1% and severe visual loss (BCVA<20/200) occur in 5.5%.[31]

Posterior uveitis was found as retinal vasculitis in two patients (three eyes-6.5% eyes). One eye had retinitis along with active vasculitis and the other two eyes had active vasculitis with old choroiditis scars. By protocol, these were treated by oral steroids and panretinal photocoagulation. All eyes had a visual acuity of better than 6/12 at the end of follow up (100%). In this study no posterior uveitis cases had cystoid macular edema whereas cystoid macular edema

(CME) has been found to occur in 19-34% in nonspecific posterior uveitis.[28,32] Posterior uveitis associated with proven systemic sarcoidosis has been noted to have a poor visual outcome in a previous study with 75 patients, especially in those eyes with multifocal choroiditis (5/7, 71.4%).[17] It is known that cases with choroiditis of any etiology have poor visual outcomes due to complications of CME and epiretinal membrane (ERM). However, ERM does not alter visual outcomes as significantly as CME does.[33]

Panuveitis was the most common presenting pattern of sarcoid uveitis and was found in 21 of total 46 eyes (45.65%). 14 eyes (66.67%) had improvement in vision, four eyes (19.04%) had stable vision and three of 21(14.28%) had worsening. Besides oral steroids, topical steroids and mydriatics, three eyes (14.28%) required posterior sub-tenon injection of triamcinolone for severe inflammation. Five patients (ten eyes-47.6% eyes)) required the use of immunomodulator for long term control of inflammation. Four patients were prescribed methotrexate and two patients responded to this as monotherapy (50% response rate). Three patients were prescribed azathioprine of whom two patients responded (66.67%response rate). One patient did not respond to either methotrexate or azathioprine and was prescribed adalimumab also but the disease did not respond to either of the three agents and the patient developed hypotony maculopathy. Complications of panuveitis were cataract (12 eyes-57.14%), disc edema (two eyes-9.5%), macular edema (6 eyes-28.57%). In previous studies also, macular edema was found to be the most common complication of ocular sarcoidosis (20–70% of cases). [5,13,22,23] In a previous study involving 75 patients of proven systemic sarcoidosis, patients with panuveitis had an equivocal visual outcome (13/28, 46.4% poor outcome) even after excluding cases with multifocal choroiditis which is known to have a poorer outcome in sarcoidosis.[17]

Stratifying by granulomatous and non-granulomatous uveitis, this study has found that 26 of 30 eyes (86.67%) with granulomatous and 10 of 13 eyes (76.92%) with non-granulomatous sarcoid uveitis have improved visual outcomes.

This study corroborates the findings of Dana et al. which stated that the use of steroids in topical periocular or systemic form cause significant improvement in clinical outcomes, of which vision is one. These results had been particularly impressive as those patients receiving systemic steroids almost definitely having had worse disease; hence, one might have expected those treated with systemic steroids to have fared worse.[14] This is noticeable as only five patients of total 21(23.8%) with panuveitis required the use of immunosuppressants for the control of inflammation. Analysis by Dana et al. also suggested that systemic immunosuppressive chemotherapies were associated with visual improvement, but the correlation did not reach nominal statistical significance. This could partially be accounted for by these patients having had a worse disease process from the outset compared with those not treated with these agents, thereby biasing the outcome.[14] In the present study also, only seven patients required the use of immunomodulators (four of these being for systemic involvement) and the use of steroids brought about improvements in most cases. One case of biopsy-positive bilateral granulomatous panuveitis with bone marrow, liver and spleen involvement was found to be non-responsive to all forms immunomodulator therapy and developed recurrent exacerbations and ocular hypotony. This suggests that multiple organ involvement in sarcoidosis may have a poor outcome.

Complications causing lack of improvement in vision have been attributed to various factors in various studies. In various studies on sarcoid uveitis, it was found that vision-threatening complications developed in many patients, including 56-58% in whom cystoid macular edema developed and 25-56% in whom media opacities developed, requiring cataract surgery or vitrectomy or both.[14,34] Other studies have noted additional complications as vision limiting such as hypotony, localized vitreous condensation and recurrences[35] and in cases with chronic sarcoidosis, chronic disease and posterior pole complications of chorioretinitis and optic neuropathy.[36] At univariate analysis, the presence of iris nodules, cystoid macular edema and cataract were clinically significant conditions for a visual outcome of 20/50 or worse in the worst-seeing eye. However, in multivariate analysis, cystoid macular edema (p=0.03) was the only statistically significant predictor associated with unfavorable visual outcome.[34] These findings were also corroborated by separate studies done in Tokyo and Taiwan which found that ocular complications were observed in upto 85%, most commonly cataract (50.8-73%), epiretinal membrane (24%), macular edema (24%) and glaucoma (19-25.4%) and also posterior synechiae(20.5%).[15,16] In this study, the most frequent complication was raised IOP(18 eyes-39.13%) with documented Secondary angle closure glaucoma in four eyes(8.6%). Although hypotony and the consequent hypotony maculopathy was the cause of decreased vision in only four eyes in this study, it was among the most common vision limiting complications. The study most consistent with the findings of the present

study included a large series of 461 eyes with the most important vision limiting complications being cataract, glaucoma, cystoid macular edema (CME), and epiretinal membrane.[37]

Previous data suggest that in general, a longer duration of disease activity and late presentation to ophthalmic care facility, development of cystoid macular edema or glaucoma, presence of intermediate or posterior uveitis, and systemic steroid use in sarcoid uveitis is positively associated with a lack of visual acuity improvement.[14,35] This emphasizes the critical point that effective treatment needs to be initiated in a timely fashion to arrest, and possibly reverse, damage to the eye from ongoing disease.[14] In another study, it was found that the causes of poor visual outcome were diverse, and generalized estimating equations analysis indicated that female and poor initial vision were risk factors.[16] In consideration to a delayed presentation causing poor visual outcome, these findings could not be validated in the present study as 100% cases of anterior uveitis were of insidious onset and chronic duration yet still had visual improvement. Also, in this study, there was notable improvement in patients with chronic uveitis (24/28 eyes- 85.7%) than in those with acute disease (14/18-77.78%). This discrepancy may have been due to a small sample size. The stratification on the basis of anatomical sub-types, granulomatous and non-granulomatous inflammation, age, gender and also IWOS criteria gives a better view of patterns of disease and success of standard treatment regimen. The major age group being the young patients removes potential biases from confounding factors of age-related cataract and age-related macular degeneration. Adequate time frame of at least six months allows for proper assessment of outcome as shorter duration may be affected by compliance issues as well as may mask recurrences.

The small sample size might affect the generalization of effectiveness of therapy. Systemic involvement and drugs primarily prescribed for systemic disease may have altered the course of disease. The lack of access to third line treatment regimen of antibody adalimumab and infliximab may have limited prospective better outcomes. The only surgery considered was cataract surgery further treatment in the forms of surgery for hypotony such as release of cyclitic membranes or glaucoma surgery was not considered which may have further improved visual outcome

CONCLUSIONS

Sarcoid uveitis may present as any and all form of uveitis and must be considered in the differential diagnosis of all uveitis entities. Treated by standard treatment protocols, sarcoid uveitis generally has a favorable visual outcome even when the disease process has an indefinite clinical course. Steroids are the mainstay of treatment either topically, as sub-tenon injection or orally prove to be effective treatment in terms of visual outcome. Early diagnosis, understanding of recurrence patterns and proper control of ocular inflammation may prevent vision-limiting complications.

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AUTHORS CONTRIBUTION

KS and AM did the conceptualisation. KS did the data collection, analysis, methodology. MP did the statistical analysis. KS did the original draft preparation. SS and AM did he editing. AM did the reviewing.

REFERENCES

1. Baughman RP, Lower EE. Sarcoidosis. In: Loscalzo J, Fauci A, Kasper D, Hauser S, Longo D, Jameson J. eds. Harrison's Principles of Internal Medicine, 21e. McGraw Hill; 2022. Available from: https://accessmedicine.mhmedical.com/content.aspx?bookid=3095&sectionid=264534623.
2. Yasir JS, Aniruddha A, Douglas A. Jabs, Quan DN. Sarcoidosis. In: Wilkinson CP, Hinton DR, Sadda SR, Wiedemann P, Schachat AP. Ryan's retina sixth edition. Cleveland USA: Elsevier; 2018.1572-85.
3. Jamilloux Y, Kodjikian L, Broussolle C, Sève P. Sarcoidosis and uveitis. Autoimmun Rev. 2014;13(8):840–9. DOI: 10.1016/j.autrev.2014.04.001. Epub 2014 Apr 3. PMID: 24704868.
4. James DG. Sarcoidosis. In: Wyngaarden JB, Smith LH Jr, editors. Cecil textbook of medicine. 17th ed. Philadelphia: WB Saunders; 1985.

5. Pasadhika S, Rosenbaum JT. Ocular Sarcoidosis. Clin chest Med. 2015;36(4):669-83. DOI: 10.1016/j.ccm.2015.08.009 PMID: 26593141.

6. Shrestha J, Shah D. Systemic association of uveitis in Nepalese population. Journal of Chitwan Medical College, 2017;7(1):35-40. DOI: 10.3126/jcmc.v7i1.17368

7. Herbort CP, Rao N A, Mochizuki M & the members of the Scientific Committee of the First International Workshop on Ocular Sarcoidosis (IWOS) International Criteria for the Diagnosis of Ocular Sarcoidosis: Results of the First International Workshop on Ocular Sarcoidosis (IWOS), Ocular Immunology and Inflammation, 2009;17:160-69. DOI: 10.1080/09273940902818861 PMID: 19585358.

8. Kharel R, Khatri A, Gamal NS, Sharma AK, Shah DN. Patterns of uveitis among nepalese population presenting at a tertiary referral eye care centre in Nepal. New Front Ophthalmol. 2019:5;1-10. DOI: 10.15761/NFO.1000238

9. Pathak V, Pant H, Chokhani R. Sarcoidosis in Nepal: Epidemiology, Clinical Presentation and Ethnic Differences. Journal of College of Medical Sciences-Nepal. 2017;13(3):311-13. DOI: 10.3126/jcmsn.v13i3.18276

10. Manandhar A. Patterns of Uveitis and Scleritis in Nepal: A Tertiary Referral Center Study. Ocul Immunol Inflamm. 2017;25(SUP1):S54-S62. DOI: 10.3109/09273948.2016.1161804 PMID: 27191731.

11. Subedi K, Shrestha S, Manandhar A. Pattern of ocular sarcoidosis at a tertiary eye center in Nepal. Journal of Karnali Academy of Health Sciences Journal of Karnali Academy of Health Sciences. 2021;4(1).

12. Jabs DA, Nussenblatt RB, Rosenbaum JT. Standardization of Uveitis Nomenclature Working G. Standardization of uveitis nomenclature for reporting clinical data. Results of the First International Workshop. Am J Ophthalmol. 2005;140(3):509–16. DOI: 10.1016/j.ajo.2005.03.057

13. Edelsten C, Pearson A, Joynes E, Stanford MR, Graham EM. The ocular and systemic prognosis of patients presenting with sarcoid uveitis. Eye (Lond). 1999;13(Pt 6):748–53. DOI: 10.1038/eye.1999.221 PMID: 10707138.

14. Dana MR, Merayo-Lloves J, Schaumberg DA, Foster CS. Prognosticators for visual outcome in sarcoid uveitis. Ophthalmology. 1996;103(11):1846-53. DOI: 10.1016/s0161-6420(96)30417-x PMID: 8942880.

15. Nagahori K, Keino H, Nakayama M, Watanabe T, Ando Y, Hayashi I, et al. Clinical features and visual outcomes of ocular sarcoidosis at a tertiary referral center in Tokyo. Graefes Arch Clin Exp Ophthalmol. 2022;260(10):3357-63. DOI: 10.1007/s00417-022-05701-x PMID: 35616725.

16. Lai IW, Lin CP, Hsieh YT, Yeh PT. Clinical manifestations and risk factors for poor visual outcomes of ocular sarcoidosis in Taiwan. J Formos Med Assoc. 2022;121(8):1560-6. DOI: 10.1016/j.jfma.2021.12.032 PMID: 35027256.

17. Lobo A, Barton K, Minassian D, du Bois RM, Lightman S. Visual loss in sarcoid-related uveitis. Clin Exp Ophthalmol. 2003;31(4):310-6. DOI: 10.1046/j.1442-9071.2003.00666.x PMID: 12880455.

18. Herbert HM, Viswanathan A, Jackson H, Lightman SL. Risk factors for elevated intraocular pressure in uveitis. J Glaucoma. 2004;13(2):96-9. DOI: 10.1097/00061198-200404000-00003 PMID: 15097253.

19. Crick RP, Hoyle C, Smellie H. The Eyes in Sarcoidosis. Br J Ophthalmol. 1961;45(7):461–81.

20. Matsou A, Tsaousis KT. Management of chronic ocular sarcoidosis: challenges and solutions. Clinical Ophthalmology. 2018;12:519-32. DOI:10.2147/opth.s128949

21. Yang SJ, Salek S, Rosenbaum JT. Ocular sarcoidosis: Current Opinion in Pulmonary Medicine. 2017;23(5):458-67. DOI:10.1097/mcp.0000000000000409

22. Nakahara H, Kaburaki T, Takamoto M, Yoshida A, Okinaga K, Numaga J, et al. Treatments and visual outcomes in patients with ocular sarcoidosis. Invest Ophthalmol Vis Sci. 2013;54(15):5395.

23. Dammacco R, Biswas J, Kivelä TT, Zito FA, Leone P, Mavilio A, et al. Ocular sarcoidosis: clinical experience and recent pathogenetic and therapeutic advancements. Int Ophthalmol. 2020;40(12):3453-67. DOI: 10.1007/s10792-020-01531-0 PMID: 32740881.

24. Bernard R, George NP, Kurt D, Tonetta F, James TR, Grace LC, et al. Incidence of and risk factors for cataract in anterior uveitis. Invest Ophthalmol Vis Sci. 2022;63(7):3550–A0130.

25. Kempen JH, Papaliodis GN, Rosner B, Dreger K, Ying GS, Foster CS, et al. Incidence of Cataract in Eyes with Anterior Uveitis. Invest Ophthalmol Vis Sci. 2020;61(7):2069.

26. Massa H, Pipis SY, Adewoyin T, Vergados A, Patra

S, Panos GD. Macular edema associated with non-infectious uveitis: pathophysiology, etiology, prevalence, impact and management challenges. Clin Ophthalmol. 2019;13:1761-77.

27. Lardenoye CW, van Kooij B, Rothova A. Impact of macular edema on visual acuity in uveitis. Ophthalmology. 2006;113(8):1446-9. DOI: 10.1016/j.ophtha.2006.03.027. PMID: 16877081.

28. Levin MH, Pistilli M, Daniel E, Gangaputra SS, Nussenblatt RB, Rosenbaum JT, et al. Incidence of visual improvement in uveitis cases with visual impairment caused by macular edema. Ophthalmology. 2014;121(2):588-95.e1. DOI: 10.1016/j.ophtha.2013.09.023. Epub 2013 Dec 12 PMID: 24332536.

29. Pivetti-Pezzi P, Accorinti M, La Cava M, Colabelli Gisoldi RA, Abdulaziz MA. Endogenous uveitis: an analysis of 1,417 cases. Ophthalmologica. 1996;210(4):234-8. DOI: 10.1159/000310715 PMID: 8841072.

30. Malinowski SM, Pulido JS, Folk JC. Long-term visual outcome and complications associated with pars planitis. Ophthalmology. 1993;100(6):818-24; discussion 825. DOI: 10.1016/s0161-6420(93)31567-8 PMID: 8510893.

31. Niederer RL, Sharief L, Bar A, Lightman SL, Tomkins-Netzer O. Predictors of long-term visual outcome in intermediate uveitis. Ophthalmology. 2017;124(3):393-8. DOI: 10.1016/j.ophtha.2016.11.013 PMID: 28017424.

32. Sood G, Patel BC. Uveitic Macular Edema. [Updated 2022 Aug 1]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023. Available from: https://www.ncbi.nlm.nih.gov/books/NBK562158/

33. Ossewaarde-van Norel J, Ten Dam-van Loon N, de Boer JH, Rothova A. Long-term visual prognosis of peripheral multifocal chorioretinitis. Am J Ophthalmol. 2015;159(4):690–697. DOI: 10.1016/j.ajo.2015.01.005 PMID: 25595670.

34. Miserocchi E, Modorati G, Di Matteo F, Galli L, Rama P, Bandello F. Visual outcome in ocular sarcoidosis: Retrospective evaluation of risk factors. Eur J Ophthalmol. 2011;21(6):802-10. DOI: 10.5301/EJO.2011.6417 PMID: 21374555.

35. Rothova A, Alberts C, Glasius E, et al. Risk factors for ocular sarcoidosis. Doc Ophthalmol. 1989;72:287-96. DOI: 10.1007/BF00153496 PMID: 2625091.

36. Jabs DA, Johns CJ. Ocular involvement in chronic sarcoidosis. Am J Ophthalmol. 1986;102(3):297-301. DOI: 10.1016/0002-9394(86)90001-2 PMID: 3752193.

37. Allegri P, Olivari S, Rissotto F, Rissotto R. Sarcoid uveitis: An intriguing challenger. medicina (Kaunas). 2022;58(7):898. DOI: 10.3390/medicina58070898 PMID: 35888617.

Fruit and vegetable consumption among young school children in Pokhara, Kaski: A cross-sectional study

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ABSTRACT

Introduction: Low intake of fruit and vegetable (F&V) increased the risk of non-communicable diseases, followed by disability and death. The fact that many diseases in adulthood have their origins in habits formed during childhood is undeniable. Therefore, the study assessed the prevalence of fruit and vegetable consumption among young schoolchildren aged 5 to 9 years. **Methods:** A cross-sectional study was carried out among 352 children from March 8 to September 4, 2020. The multistage sampling method was used to select samples. A face-to-face interview was done with one of the parents at their home. Univariate and bivariate analyses were computed at a 5% level of significance. Ethical approval was obtained from the Nepal Health Research Council. **Results:** Out of 352 children, none of the children met the WHO recommendation of F&V of ≥5 servings per day. Around two percentage (2.30%) of children consumed neither fruits nor vegetables, while only 46(13%) had taken F&V at least three servings per day. Children's higher F&V intake was found to be associated with family monthly income, parents' higher education, the presence of a fruit and vegetable shop nearby, and giving money to children. **Conclusions:** Intake of F&V as compared to the recommendation was very low in the study area. This requires an immediate response including nutrition education for parents, teachers, and decision-makers and increasing easy access to F&V.

Keywords: Fruit and vegetable consumption, Pokhara, young children.

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INTRODUCTION

Fruits and Vegetables (F&V) are important sources of vitamins, minerals, dietary fiber, plant protein, and antioxidants. There is convincing evidence that adequate consumption of fruits and vegetables lowers the risk of chronic non-communicable disease, obesity, diabetes, and different types of cancers.[1] According to World Health Organization (WHO), approximately 16 million (1.0%) disability-adjusted life year (DALY) and 17 million (2.8%) death worldwide are attributable to inadequate consumption of fruits and vegetables.[2] Furthermore, 31% of ischaemic heart disease, 20% of oesophageal cancer, 19% of ischemic stroke, 19% of gastric cancer, and 12% of lung cancer worldwide could be prevented by increasing dietary intake of fruits and vegetables to the recommended minimum of 5 servings daily (or 400 gm) established by the WHO.[3,4] However, the result from a world health survey that compared fruit and vegetable consumption across 52 low- and middle-income countries showed that more than three-fourths population (77.6% of men and 78.4% of women) did not meet the WHO recommendation.[5]

The proportion of fruits and vegetables in a healthy diet for Nepali people, recommended by the Food and Agriculture Organization and Government of Nepal is 40% (25% vegetables, 15% fruits).[6]

In 2017, Nepal's per capita intake of fruits and vegetable were estimated to be 68 g/day and 214 g/day respectively. When combined, an intake of 282g/day is 30% less than the minimum recommendation (400g/day).[7] Similarly, the findings from the WHO step survey Nepal 2019 showed a majority (96.7%) of Nepalese adults aged 16-69 years had insufficient fruits and vegetables daily. Moreover, only 10% of adults reported the correct number of servings for recommended intake of fruits and vegetables.[8]

Early childhood is considered the most critical period in a child's life,[9] as many serious diseases in adulthood have their roots in behaviors initiated during childhood and adolescence.[10] It is crucial for parents to help their children establish healthy eating habits for the best start in their lives that may significantly track into adulthood.[9,11] Moreover, children's adequate fruit and vegetable consumption may be protective against childhood and adult cancer.[12] Very few studies are found to be conducted on F&V consumption in this group of children in Nepal. Therefore, this study aims to find out the prevalence of fruit and vegetable consumption among schoolchildren aged 5 to 9 years in Pokhara, a metropolitan city in Nepal.

METHODS

A cross-sectional study was conducted among children of 5 to 9 years of Pokhara Metropolitan. The more illustration of the study area, study population, study duration, and sampling techniques are available in our previous published article.[13] A structured questionnaire was prepared using questions used in other studies[14,15] Parent's information (age, sex, ethnicity, religion, education level, occupation, types of family, types of home, family monthly income), children's information (age, sex, grade, type of school), environmental factors (fruit and vegetable shop near home, fast food shop near home, taking a child for shopping, giving money to a child, snacks at home after school) were independent variables. F&V consumption (servings per day) was a dependent variable. Parents were asked how frequently their children consumed F&V in a typical week. Ten fruit and vegetable items (apple, orange, grapes, banana, and other fruits; carrot, broccoli, peas, and other vegetables) were stated in the questions to minimize the confusion. The responses were measured as follows: never (0 per day); one to two days a week; three to four days a week; five to six days a week; once a day; twice a day; three or more a day; as was done in the previous study.[14]

Since none of the children met the WHO recommendation of ≥5 servings of F&V per day, at least two servings of vegetables and one serving of fruits per day combined to at least three servings of fruit and vegetables were used as a cut-off point for categorization. In the study, "inadequate" and "adequate consumption" of F&V were defined as less than three servings per day and at least three servings per day, respectively.

Six enumerators have trained adequately. The pretested Nepali questionnaire was used. A house-to-house visit was done to collect data. A face-to-face interview was conducted with one of the parents of children aged 5 to 9 years after taking informed consent. Supervision was done by the team members. The data were entered in Excel and analyzed using Statistical Package for social science (SPSS) version 21. Descriptive statistical tools like frequency, percentage mean, and standard deviation were used to express the result. Chi-square was applied at the significance level of 5% (p-value<0.05)

The study was approved by the ethical review board of the Nepal Health Research Council (Reference number:1892). Written informed consent was taken from the parents. The objective of the study and the statements of confidentiality and autonomy was declared before interviewing them.

RESULTS

A total of 352 children were included in the study. The information on socio-demographic characteristics of respondents, characteristics of children, and proportion of F&V consumptions (combined) have also been shared in our previously published article.[13]

Fruit and vegetable consumption among children

About 2.30% of children consumed neither fruits nor vegetables, while 13.07% did not consume fruits at all. Only 12(3.4%) of children had taken fruit at least two servings per day while 60(16.75%) consumed fruit once a day in the last week preceding the survey.

Nearly one-fifth of the children 65(18.47%) did not consume vegetables at all. Only one child had taken three servings of vegetables daily while nearly half 166(47.15%) had taken vegetables twice a day in the last week preceeding the survey. In our study population, none of the children were consuming recommended five servings of fruit and vegetable combined. Only 46(13%) had taken fruits and vegetables combined at least three servings per day (Table 1).

Table 1: Fruit and vegetable consumption among children (N=352)

Consumption behaviour	Vegetable intake in last 1 week							
Fruits intake in last 1 week	**Never n(%)**	**1-2 days n(%)**	**3-4 days n(%)**	**5-6 days n(%)**	**Once a day n(%)**	**Twice a day n(%)**	**Thrice day n(%)**	**Total n(%)**
Never	8 (2.30)	5 (1.42)	2 (0.56)	4 (1.13)	11 (3.12)	16 (4.54)	0	46 (13.07)
1-2 days	26 (7.37)	7 (1.97)	8 (2.30)	17 (4.82)	31 (8.80)	45 (12.77)	0	134 (38.03)
3-4days	9 (2.55)	4 (1.13)	3 (0.85)	7 (1.97)	5 (1.42)	54 (15.34)	0	82 (23.26)
5-6 days	4 (1.13)	0	3 (0.85)	1 (0.30)	2 (0.56)	8 (2.30)	0	18 (5.14)
Once/ day	17 (4.82)	0	1 (0.30)	4 (1.13)	3 (0.85)	34 (9.65)	1 (0.3)	60 (16.75)
Twice/ day	0	1 (0.30)	0	0	0	9 (2.55)	0	10 (2.85)
Thrice/ day	1 (0.30)	0	1 (0.30)	0	0	0	0	2 (0.60)
Total	65 (18.47)	17 (4.82)	18 (5.16)	33 (9.35)	52 (14.75)	166 (47.15)	1 (0.3)	352 (100)

Children belonging to the upper caste (19.60%) were consuming ≥3 servings of F&V more than Janjati (13.0%) and dalit/non-dalit (3.85%). The difference was statistically significant (p=0.001). Similarly, the education level of the parents had a significant influence on the F&V intake of the children. The proportion of children taking ≥3 servings of F&V was higher among the parents with education level bachelor and above (28.13%) than secondary level (20.71%), or basic/no formal education (4.45%) (p=0.001). The proportion of adequate F&V intake families with monthly income ≥NRs 40000 and < NRs 40,000 were 20.78% and 7.11% respectively, which was statistically significant (p=0.001) (Table 2.1).

Table 2.1: Association between F&V consumption and independent variables (N=352)

Variables	F&V consumptions (servings/day)		Chi-square value	P value
	<3	≥ 3		
Respondents' Age				
20-30	130(86.09)	21 (13.91)	0.16	0.68
>30	176 (87.56)	25(12.44)		
Children's' Age				
5-7	129(87.75)	18(12.25)	0.15	0.69
8-9	177 (86.34)	28 (13.66)		
Gender (of Children)				
Male	162(85.26)	28(14.74)	1.01	0.31
Female	144(88.88)	18(11.12)		
Caste				
Upper Caste	119 (80.40)	29(19.60)	13.33	0.001
Janjati	87(87.00)	13(13.00)		
Dalit/Nondalit	100(96.15)	4(3.85)		
Religion				
Hindu	265(87.45)	38(12.55)	0.53	0.46
Buddhist/ Christian	41(83.67)	8(16.33)		
Parents' Education				
No formal education/ Basic	172(95.55)	8(4.45)	25.37	0.001
Secondary	111(79.28)	29(20.71)		
Bachelor and above	23(71.87)	9(28.13)		
Family monthly income				
< NRs 40,000	157 (92.89)	12 (7.11)	12.81	0.001
≥ NRs 40,000	122(79.22)	32 (20.78)		
Parents' occupation				
Housewife	132(88.00)	18 (12.00)	NA	NA
Farmer	58 (96.66)	2 (3.34)		
Own Business	51(69.86)	22 (30.14)		
Service	31 (91.17)	3(8.83)		
Other	34 (97.14)	1(2.86)		

p-value significant at <0.05

The children who live near a fruit/vegetable shop consume more F&V (presence of shop nearby- 20%; absence of shop nearby- 9.26%). The difference is statistically significant (p-value 0.004). The findings also revealed a significant influence on children's adequate F&V intake of who receives money from their parents (16.46%) and who does not (6.62%) (p-value 0.009). There were no significant differences across other demographic parameters and environmental factors (Table 2.2).

Table 2.2: Association between F&V consumption and independent variables (N=352)

Variables	F&V consumptions (servings/day)		Chi-square value	P-value
	<3	≥ 3		
Family type				
Nuclear	199(86.52)	31(13.48)	0.09	0.75
Joint/Extended	107(87.70)	15(12.30)		
Types of home				
Own Home	17(37.77)	28(62.23)	0.15	0.69
Rented Home	129(87.75)	18(12.25)		
Snacks at home (after school)				
Home cooked	227(86.64)	35(13.36)	0.07	0.78
Fast food/Packed food	79(87.77)	11(12.23)		
Fruits/vegetable shop near home				
Yes	100(80.00)	25(20.00)	8.19	0.004
No	206 (90.74)	21(9.26)		
Fast food shop near home				
Yes	155(86.59)	24(13.41)	0.03	0.84
No	151(87.28)	22(12.72)		
Taking child for shopping				
No	109(86.50)	17(13.50)	0.03	0.86
Yes	197(87.16)	29(12.83)		
Giving money to child				
No	193(83.54)	38(16.46)	6.76	0.009
Yes	113(93.38)	8(6.62)		

p-value significant at <0.05

DISCUSSION

The aim of the present study was to assess the prevalence of daily F&V intake among school-going children aged 5 to 9 years and its associated factors. There was limited research on children, so the comparison of our results and

findings is also made with studies done in the adolescent and adult age groups.

The result of this study is quite alarming. None of the children met the WHO recommendation of ≥ five servings of F&V per day. The WHO NCD-STEP survey 2019[8] and a study conducted in the peri-urban area of Bhaktapur, Nepal[16] both discovered the lower prevalence of F&V consumption among adults: 3.3% and 2.3%, respectively. A cross-sectional study conducted in Pokhara metropolitan city in 2020[17]reported that only ten percent of adults consumed F&V in a quantity recommended by WHO, which is relatively higher than the two previous studies. These findings highlight the serious issue of Nepalese people's unhealthy eating habits. Similarly, a couple of studies from Bangladesh reported only 20% [18] and 13%[19] of the adolescent people met WHO recommendation of F&V consumption. Based on 162 countries, vegetable intake was low globally.[20] This suggests that low F&V consumption has become a global problem.

Since none of the children ate adequate F&V daily, for bivariate analysis, adequate fruit consumption was at least one serving a day and adequate vegetable consumption was at least two servings a day. When combined, adequate F&V intake would be at least three servings a day. The prospective cohort study conducted in 18 countries adopted the same classification and concluded that intake of 3 to 4 servings of F&V a day significantly reduced cardiovascular disease.[21]

This study showed that males were consuming more F&V than females but the difference was not statistically significant. Similar findings were observed from other studies conducted in Nepal,[17] Bangladesh,[18] and United Kingdom[22]. In contrast to our findings, a study that examined gender differences in F&V intake reported that men had a lower intake of F&V than women. A more favourable attitude toward F&V intake was observed among women. These gender differences could be explained by men's lower belief in the importance of F&V intake for health.[23]

A systematic review reported a positive association between Parent's education and F&V intake among adolescents.[11] This study showed children whose parent's education level was bachelor's and above significantly consumed adequate F&V. Similar findings were reported from a study done in Pokhara, Nepal, among an adult population that showed a statistically significant association between participants' education and F&V intake.[17] A cross-sectional study done on American adults came to the conclusion that not only educational attainment, but high income also promotes FV intake.[24] The reason could be that educated parents demand their children to have F&V because they believe good nutrition is important. This proves how crucial education is to achieve good health.

According to this study's findings, having a family income of more than NRs 40,000 and having a fruit/vegetable shop nearby has a statistically significant influence on children's F&V intake. In support of our findings, a few studies examined the relationship between economic status, Accessibility/availability with children's F&V intake. Socioeconomic position, and home availability/ accessibility were all consistently positively associated with F&V intake among young and older children.[11,24,25]

In a large population-based cohort study, home-cooked food was linked to higher dietary quality, with participants consuming 62.3 g more fruit and 97.8 g more vegetables daily.[26] In contrast with this research, our study also showed no differences in F&V consumption among children who were given home-cooked food and packed food or fast food after school. However, children who were given money to spend had a lower proportion of F&V intake (6.62%) than those who were not given money (16.46%).

Our study had some limitations. First, as the information was taken from parents, they may not have truthfully reported children's F&V consumption behaviour. Second, the findings may not be generalized to other areas as children only from Pokhara metropolitan were included. As a face-to-face interview was the method of data collection, interviewer bias also might have occurred. Fourth, as the study used a cross-sectional design, inferences about causality are limited. The focus of this study was on school children. Therefore, the study sampling could have missed a portion of children who have never attended schools, and who might have different F&V intake behaviour.

CONCLUSIONS

None of the children met the WHO recommendation of ≥5 servings of fruit and vegetables a day. Only 13% of children consumed ≥3 servings of vegetables. Parents' education, economic status, the presence of a fruit and vegetable shop nearby, and not giving them money to spend have a significant influence on the consumption of fruit and vegetables. Comprehensive nutrition education targeting parents, school, and the community; and increasing easy access to fruits and vegetables may improve F&V consumption among children.

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AUTHORS CONTRIBUTION

NS designed the research concept, performed statistical analysis, interpretation of result and prepared the first draft of the manuscript. BS contributed on research concept, statistical analysis and prepare the draft of manuscript. SB contributed on draft preparation of the manuscript. All the authors contributed on reviewing the manuscript critically, provided intellectual input and approved the version to be published.

REFERENCES

1. World Health Organization. Health diet. WHO; 2023. Available from: https://www.who.int/initiatives/behealthy/healthy-diet [Assessed 5th March 2023].
2. World Health Organization. Global Health Observatory. Fruit and vegetable intake. WHO; 2023. Available from: https://www.who.int/data/gho/indicator-metadata-registry/imr-details/3417 [Assessed 5th March 2023].
3. World Health Organization. Healthy diet. WHO; 2020. Available from https://www.who.int/news-room/fact-sheets/detail/healthy-diet [Assessed 5th March 2023].
4. Hall JN, Moore S, Harper SB, Lynch JW. Global variability in fruit and vegetable consumption. Am J Prev Med. 2009;36(5):402-9. DOI: 10.1016/j.amepre.2009.01.029 PMID: 19362694.
5. Kabwama SN, Bahendeka SK, Wesonga R, Mutungi G, Guwatudde D. Low consumption of fruits and vegetables among adults in Uganda: findings from a countrywide cross-sectional survey. Archives of Public Health. 2019;77(1):1-8. DOI: 10.1186/s13690-019-0332-6 PMID: 30774951.
6. Shyaula SL, Bajracharya Gan B, KC G, Shakya SM, Subba D. Comprehensive insight in vegetables of Nepal. Nepal Academic of Science and Technology (NAST), Lalitpur, Nepal. 2021. 693. ISBN: 978-9937-0-9153-4. Available from: https://nast.gov.np/documentfile/Comprehensive-Insights-in-Vegetables-Book.pdf [Assessed 5th March 2023].
7. Saavedra Y, Shrestha S. Scoping study on fruits and vegetables: Results from Nepal. Wageningen Economic Research; 2021 Oct. 61. ISBN 9789463950756. Available from: https://research.wur.nl/en/publications/scoping-study-on-fruits-and-vegetables-results-from-nepal [Assessed 5th March 2023].
8. Dhimal M, Bista B, Bhattarai S, Dixit LP, Hyder MKA, Agrawal N, et al. 2020. Report of Non -Disease risk Factors: STEP Survey Nepal 2019. Kathmandu: Nepal Heath Research council. 2019. 327. Available from: https://www.who.int/docs/default-source/nepal-documents/ncds/ncd-steps-survey-2019-compressed.pdf [Assessed 5th March 2023].
9. UNICEF. A journey of love: A parent's role in ensuring the healthiest start in life for their child. Parents are the bridge to a safe and healthy life for their children through positive parenting practices. 2020. Available from: https://www.unicef.org/sudan/stories/journey-love-parents-role-ensuring-healthiest-start-life-their-child [Assessed 5th March 2023].
10. Sivagurunathan C, Umadevi R, Rama R, Gopalakrishnan S. Adolescent health: present status and its related programmes in India. Are we in the right direction? Journal of clinical and diagnostic research: JCDR. 2015;9(3):LE01-LEO6. DOI: 10.7860/JCDR/2015/11199.5649 PMID: 25964884.
11. Pearson N, Biddle SJ, Gorely T. Family correlates of fruit and vegetable consumption in children and adolescents: a systematic review. Public health nutrition. 2009;12(2):267-83. DOI: 10.1017/s1368980008002589 PMID: 18559129.
12. Maynard M, Gunnell D, Emmett P, Frankel S, Smith GD. Fruit, vegetables, and antioxidants in childhood and risk of adult cancer: the Boyd Orr cohort. J Epidemiol Community Health. 2003;57(3):218-25. DOI: 10.1136/jech.57.3.161 PMID: 12594199.
13. Sharma B, Shrestha N, Koirala S, Tiwari BR. Co-occurrence of Screen Time and Eating Behaviors among Young Children Aged 5 to 9 Years. J Nepal Health Res Counc. 2023;20(3):617-22. DOI: 10.33314/jnhrc.v20i3.4055 PMID: 36974847.
14. Chhetri S, Yadav DK. Association of Television Watching on Physical Activity and Obesity among Children in Pokhara, Nepal. Journal of Health and Allied Sciences. 2019;9(1):1-6. DOI: 10.37107/jhas.1
15. Pearson N, Griffiths P, Biddle SJ, Johnston JP, McGeorge S, Haycraft E. Clustering and correlates of screen-time

and eating behaviours among young adolescents. BMC Public Health. 2017;17(1):1-2. DOI: 10.1186/s12889-017-4441-2 PMID: 28569188.

16. Vaidya A, Oli N, Aryal UR, Karki DB, Krettek A. Disparties in fruit and vegetable intake by Socio-demographic characteristics in peri-urban Nepalese adults: findings from the Heart-health Associated Research and Dissemination in the Community (HARDIC) Study, Bhaktapur, Nepal. Journal of Kathmandu Medical College. 2013;2(1):3-11. DOI: 10.3126/jkmc.v2i1.10512

17. Nepali S, Rijal A, Olsen MH, McLachlan CS, Kallestrup P, Neupane D. Factors affecting the fruit and vegetable intake in Nepal and its association with history of self-reported major cardiovascular events. BMC Cardiovasc Disord. 2020;20(1):1-0. DOI: 10.1186/s12872-020-01710-y PMID: 32972356.

18. Salwa M, Subaita F, Choudhury SR, Khalequzzaman M, Al Mamun MA, Bhuiyan MR, Haque MA. Fruit and vegetables consumption among school-going adolescents: Findings from the baseline survey of an intervention program in a semi-urban area of Dhaka, Bangladesh. Plos one. 2021;16(6): e0252297. DOI:10.1371/journal.pone.0252297 PMID: 34101740.

19. Khan A, Uddin R, Islam SM. Clustering patterns of behavioural risk factors for cardiovascular diseases in Bangladeshi adolescents: A population-based study. Health Policy and Technology. 2019;8(4):386-392. DOI: 10.1016/j.hlpt.2019.09.003

20. Kalmpourtzidou A, Eilander A, Talsma EF. Global vegetable intake and supply compared to recommendations: A systematic review. Nutrients. 2020;12(6):1558. DOI: 10.3390/nu12061558 PMID: 32471188.

21. Miller V, Mente A, Dehghan M, Rangarajan S, Zhang X, Swaminathan S, et al. Fruit, vegetable, and legume intake, and cardiovascular disease and deaths in 18 countries (PURE): a prospective cohort study. The Lancet. 2017;390(10107):2037-49. DOI: 10.1016/S0140-6736(17)32253-5 PMID: 28864331.

22. Cockroft J, Durkin M, Masding C, Cade J. Fruit and vegetable intakes in a sample of pre-school children participating in the 'Five for All' project in Bradford. Public Health Nutrition. 2005:8(7):861-69. DOI: 10.1079/PHN2005734 PMID: 16277802.

23. Emanuel AS, McCully SN, Gallagher KM, Updegraff JA. Theory of planned behavior explains gender difference in fruit and vegetable consumption. Appetite. 2012;59(3):693-7. DOI: 10.1016/j.appet.2012.08.007 PMID: 22898607.

24. Assari S, Lankarani MM. Educational Attainment Promotes Fruit and Vegetable Intake for Whites but Not Blacks. J (Basel). 2018;1(1):29-41. DOI: 10.3390/j1010005 PMID: 3184484.

25. Rasmussen M, Krølner R, Klepp KI, Lytle L, Brug J, Bere E, et al. Determinants of fruit and vegetable consumption among children and adolescents: a review of the literature. Part I: quantitative studies. International Journal of behavioral nutrition and physical activity. 2006;3(1):1-19. DOI: 10.1186/1479-5868-3-22 PMID: 16904006.

26. Mills S, Brown H, Wrieden W, White M, Adams J. Frequency of eating home cooked meals and potential benefits for diet and health: cross-sectional analysis of a population-based cohort study. Int J Behav Nutr Phys Act. 2017;14(1):1-11. DOI: 10.1186/s12966-017-0567-y PMID: 28818089.