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My right is to my work

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Altitude sickness: a review

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Introduction

Nepal is home to the high Himalaya. The lure of the mountains brings thousands of visitors every year to Nepal to trek and climb. Nepal is also possessed of terrain with dizzying gradients and can claim the world's "highest" incidence of mountain sickness, in both senses of the word.

Altitude sickness or mountain illness is the term used to describe the cerebral and pulmonary syndromes that develop after a person is exposed to high altitude. The condition often involves other factors that are difficult to quantify. Exposure to high altitude most commonly results from climbing to a height, with the additional implications of the physical exercise required and the necessity of staging the process as well as climatic and environmental factors. In our context, this group includes recreational tourists to the Nepalese, Indian and Tibetan Himalaya as well as Indian and Pakistani soldiers posted to altitude such as at the world's highest battlefield on the Siachen glacier in the Karakoram. Nepal also hosts high altitude pilgrimages like those of Muktinath, Gosainkund and Damodarkund. It is humbling to see hordes of lowland rustic folk driven by a religious ideal, barely equipped against the elements, ignorant of geography and orography, braving hunger, cold, dehydration and fatigue, in addition to the unknown hazards of altitude sickness.

In India there are high altitude pilgrimages such as Manimahesh, the Kailash route, the Amarnath Yatra and the Chardham Yatras of Badrinath-Kedarnath and Gangotri-Yamunotri with a mix of vehicular or equine transport and walking, and varying degrees of governmental supervision, staging, support and monitoring of pilgrims' health.

Generally, while most victims of altitude sickness are unsuspecting, foolhardy or ill-informed skiers and backpackers in different parts of the world, they also include a subset of mountaineers, experienced and knowledgeable at altitude, yet more highly motivated to surpass their limits, often under commercial and media pressures to maintain schedules and achieve targets even at the expense of personal jeopardy.

But altitude can also be "gained" in hours with no physical exertion and minimal environmental exposure. Whereas the Nepal Himalaya does not boast ski resorts such as in the US to where skiers drive in heated cars and are whisked to altitude by cable cars and ski lifts, there are sedentary tourists flown to viewpoints



such as Shyangboche (3790 m), to view Mount Everest for a day or two, achieving a humanly impossible altitude gain in minutes. And there is increasingly the phenomenon of the jet-set pilgrim air-dashing by helicopter to Kailash-Manasoravar or Muktinath for religious gatherings or worship, not to mention increasing commercial air traffic to Jomosom and Manang.

In the context of Nepal, the vast majority of sufferers are recreational trekkers to the Khumbu and Annapurna regions, only as informed about the hazards of altitude as their guide books. In the Everest area, it is possible to trek from Phortse Tenga (3680 m) to Gokyo (4750 m) in one day (4 to 8 hours walk) gaining 1080 metres. This is usually accomplished only by fit locals. Most trekkers however walk in 4-5 hours from Pheriche (4240 m) to Lobuje (4930 m), despite the recommendation to stay halfway at Dughla as the 700 metre altitude gain is twice the maximum daily recommendation. The ostensible reason for this risk taking is the scarcity of good lodges at Dughla, but on the two occasions the authors have stayed there, the lodges have been comfortably empty, whereas Lobuje has some of the most crowded and unhygienic lodges in Khumbu.

Crossing the Thorung La (5416 m) requires an eight hour walk that involves a one kilometer ascent and a one mile descent, a feat accomplished by nearly all trekkers completing the Annapurna circuit.

There are tourists driving from Kathmandu to Tibet who may start the day at 1300 m and sleep at Nyalam at 3750 m. And at Gosainkund (4460 m), altitude illness attains epidemic proportions during the August pilgrimage fair. In the West most sufferers are tourists driving to ski resorts or high-altitude astronomical observatories, or mountain climbers who should know better, rarely hikers or pilgrims.

Backpacking in the rest of the world barely touches the altitudes that Himalayan treks begin from.

Definitions

Altitude, in the context of illness, is both relative and absolute, and is best defined in terms of the expected physiological response in a healthy inductee from near sea level.

At Intermediate altitude (1500-2500 m) physiological responses to altitude hypoxia are detectable but insignificant with arterial oxygen saturation maintained above 90%. Altitude illness is unlikely, though possible.

High altitude (1500-3500 m) is the height typical of ski resorts in the US or Europe and altitude illness occurs if ascent is rapid.

Very high altitude (3500-5500 m) is the range covered by trekkers in Nepal. Arterial oxygen saturation drops below 90%, marked hypoxemia occurs with exercise and altitude sickness is common.

Extreme altitude (above 5500 m) is the realm of mountaineering. Marked hypoxemia occurs even at rest and successful acclimatization or even long term survival is not possible.

Acclimatization or Acclimation refers to an individual reversible physiological response to the hypobaric hypoxia of altitude whereas Adaptation refers to genetic changes occurring in populations dwelling for generations at altitude.

Spectrum of altitude illness

The medical problems occasioned by ascent to altitude range from bothersome to fatal. Three syndromes are recognized, Acute Mountain Sickness (AMS), High Altitude Cerebral Edema (HACE) and High Altitude Pulmonary Edema (HAPE). The underlying cause is hypobaric hypoxia. The partial pressure of oxygen decreases with altitude due to a decrease in barometric pressure. Thus at Kala Patthar (5545 m) and Thorung La (5416 m), the highest most trekkers reach in Nepal, the partial pressure of oxygen is half that at sea level, whereas on Mount Everest (8850 m) it is a third. The incidence and degree of symptoms of altitude sickness depends upon the rate of ascent, height gained, height at which sleep or rest is taken, as well as the degree of exertion of physical exercise. The one major unquantifiable variant is individual susceptibility. Other individual risk factors include residence below 900 metres ASL, certain preexisting cardiopulmonary diseases and a past history of altitude illness. Older persons seem less susceptible to AMS. Physical fitness is not protective against altitude illness and conditions like HT, DM, mild COPD, pregnancy and coronary artery disease do not appear to increase susceptibility to altitude illness (1).

Comparing incidence figures for disparate geographical situations is not very meaningful as the heights attained, the origin and terminal heights, the rate of ascent and the effort required as well as environmental conditions and the subject parameters all vary. In 1979, Hackett and Rennie reported an incidence of HACE of 1.8% and of HAPE 4.5% at 4,270 m among trekkers in Nepal (2).

In a study of 150 recreational trekkers in Khumbu, the incidence of AMS was 0% at 2500-3000 m, 10% between 3000-4000 m, 15% between 4000-4500 m, 51% between 4500-5000 m, and 34% over 5000 m. (3). The risk of altitude related death is low in tourists and trekkers. The death rate for trekkers in Nepal



from all causes was 0.014% and from altitude illness 0.0036% (4). Indian soldiers had an altitude related death rate of 0.16% (5).

Pathophysiology of acclimatization

Hypoxia is the insult to which acclimatization is the response. The response that the body mounts to combat hypoxia depends upon the rate and degree of hypoxia. The timeframe ranges from minutes to weeks and the scale ranges from metabolic changes at the cellular level to physiological compensatory mechanisms.

Hypoxia triggers the carotid bodies to increase minute ventilation within a few minutes of entry to altitude. This results in increased alveolar pO₂ and a lowered alveolar pCO₂ which results in a respiratory alkalosis which in turn acts on the respiratory centers in the brain to decrease the increased ventilation. The kidneys excrete bicarbonate to correct the alkalosis and allow a further augmentation of ventilation. Ventilatory acclimation takes from 3 to 5 days at a constant altitude and comes into play again when further height is gained.

Increased sympathetic activity mediates circulatory changes that augment tissue oxygen delivery within minutes. This is of the form of initial increase in resting heart rate, and cardiac output and mildly increased blood pressure. The pulmonary circulation undergoes vasoconstriction to improve ventilation /perfusion matching and gas exchange.

Initially hemoconcentration results from enhanced diuresis and fluid shifts and this increases the oxygen bearing capacity of blood. Over weeks erythropoietin increases RBC production which increases the hemoglobin in real terms. Also the oxyhemoglobin dissociation curve shifts to the left because of alkalosis and this facilitates loading of hemoglobin with oxygen in the pulmonary capillaries.

Sleep is often disturbed with periodic breathing (Cheyne Stokes respiration) persisting despite improved sleep patterns over days.

Acute Mountain Sickness

The Lake Louise Consensus group 1991 defined AMS as headache associated with any one of the following:

gastrointestinal symptoms (nausea, anorexia or vomiting),

fatigue or lassitude,

insomnia or

dizziness,

in an unacclimatized person who has recently arrived at an altitude in excess of 2500m (6). Symptom onset is usually within 6 to 12 hours though they can appear in under an hour. There are no specific findings unless progression to HACE or HAPE occurs and the diagnosis thereof is therefore subjective. Resolution occurs over one to three days if no further ascent occurs. Lake Louise scoring can be used to quantify AMS symptoms but should be considered an epidemiological tool rather than a yardstick for individual therapy. Headache is the first symptom, often frontal and throbbing. Oliguria occurs in contrast to the diuresis that marks successful acclimatization and therefore, dehydration or alcohol hangover may mimic AMS.

If symptoms appear after 3 days of altitude entry and respond to fluids and rest, if headache is absent, or there is minimal improvement on descent, with dexamethasone or with oxygen, another diagnosis should be entertained (7).

The exact mechanism of AMS is still moot, but it is accepted that the responses to hypoxia cause capillary leakage and edema. The debate is whether mild AMS or altitude headache are also due to cerebral edema. MRI studies have shown brain swelling at altitude in both subjects with and without AMS possibly due to increased cerebral blood flow but edema was seen only in severe AMS and HACE. Ultrasonographic measures of optic nerve sheath diameter (a correlate of intracranial pressure) show increase in AMS and HACE cases. The edema is probably multifactorial: cytokine mediated increased capillary permeability in addition to impaired auto-regulation and increased capillary pressures consequent to cerebral vasodilatation. Variations in individual susceptibility to AMS are probably due to a reduced ventilatory drive in response to hypoxia or the ratio of CSF to brain volume which determines the ability to compensate for edema (8,9).

High Altitude Cerebral Edema

High Altitude Cerebral Edema is defined as ataxia or altered conscious occurring in a person suffering from AMS or HAPE or both in a patient not suffering from AMS. HACE is the progression of AMS, a phenomenon which is accelerated by the hypoxemia caused by HAPE. Drowsiness, stupor, incoordination, papilledema, retinal hemorrhages and occasionally cranial



nerve palsies may occur progressing to fatal brain herniation.

The Lake Louise definition considers HACE, “endstage AMS”

HACE is less common than HAPE. Symptoms usually begin at night after days at altitude. The commonest history in HACE is of ascent despite symptoms of AMS.

High Altitude Pulmonary Edema

In the setting of recent altitude gain High Altitude Pulmonary Edema is defined as at least two each of the following list:

Symptoms: resting dyspnea, cough, weakness or decreased exercise performance, and chest tightness or congestion.

Signs: rales or wheeze in at least one lung field, central cyanosis, tachypnea or tachycardia.

Symptoms occurring 2-3 days after altitude entry include, dyspnea on exercise progressing to dyspnea at rest, dry cough, poor exercise tolerance, weakness, severe dyspnea, frank pulmonary edema, coma and death. Tachycardia, tachypnea, pyrexia below 101°F, cyanosis, basal crepitations and edema occur. Pink frothy or bloody sputum and respiratory distress occur late in the disease. Half of those with HAPE have AMS and 14% have HACE as well.

HAPE is a not secondary to left ventricular failure; it is a non-cardiogenic pulmonary edema resulting from alveolar capillary leakage. For years it was thought that the fluid was transudative with low protein, but BAL fluid analysis has shown high levels of protein in HAPE sufferers which indicates either alveolar clearance of water or endothelial disruption. Inflammatory markers are also seen which raises the possibility of a primary or secondary role in triggering the leak or lowering the threshold for leak. Hypoxia too reduces the ionic pump for sodium and water clearance but the levels required are probably very low and this may be critical once edema sets in.

As a result of hypoxia, minute ventilation increases. There is pulmonary arterial vasoconstriction which causes circulatory stresses, shear forces, increased permeability and consequent leakage. Increased antidiuretic hormone contributes to fluid retention. Since paO_2 is the major



determinant of pulmonary vasoconstriction, heterogeneity of paO_2 in the lungs results in patchy vasoconstriction and areas with lesser hypoxic pulmonary vascular response will bear the brunt of the insult. SPECT studies show that HAPE resistant subjects have a more homogenous blood flow.

Cold is also a risk factor as it increases PAP by sympathetic stimulation.

Lowlanders exposed to high altitude hypoxia undergo pulmonary vasoconstriction and secondary increase in pulmonary arterial pressure (PAP). This excessive pulmonary vasoconstriction is one of the major causes of HAPE and vasodilator drugs that lower PAP can prevent and treat HAPE. Nifedipine 10 mg PO then 20 mg SR BD or other calcium channel blockers are effective in treating HAPE and other high altitude pulmonary hypertension. Inhaled nitric oxide (NO) also decreases PAP. HAPE susceptible subjects have low levels of exhaled NO during hypoxia and decreased NO synthesis may be a factor in HAPE. NO is a vasodilator elaborated by pulmonary vascular endothelium. Local phosphodiesterase reduces its action and its effect is enhanced by phosphodiesterase inhibitors. Both sildenafil, a 5-PDE inhibitor, and tadalafil decrease hypoxia induced PAP and reverse pulmonary artery hypertension as effectively as inhaled NO (9,10,11).

Management

Prevention: Slow gradual ascent is the golden rule for prevention with adequate rest stops built into the itinerary. Not more than 300-600 m a day with an additional rest day every 1000 m is suggested but this will vary according to individual susceptibility and will have to be tailored by logistical considerations and terrain. If symptoms of AMS, occur additional time is required for acclimatization and if symptoms worsen descent may be required.

Alcohol is best avoided in the first few days of induction to altitude as, in addition to causing respiratory depression and exaggerated sleep hypoxemia, AMS may be mistaken for a hangover. Overhydration does not prevent AMS.

Acetazolamide or dexamethasone prophylaxis is indicated for planned ascent of over 3000 m in a day such as flying Kathmandu-Lhasa, New Delhi-Leh, or driving from Nepal to Tibet, or those with a past episode of AMS.

Treatment: For AMS, rest without further height gain will result in relief of symptoms in 1-2 days. Simple analgesics and antiemetics may be needed



failing which descent of 500 -1000 m will dramatically alleviate symptoms.

Oxygen rapidly alleviates symptoms of AMS. Aspirin or ibuprofen is effective against headache. For insomnia Acetazolamide and supplementary oxygen are effective. Sedative hypnotics are best avoided; zolpidem may be used as it seems to cause no ventilatory depression in simulated altitude studies (12).

Acetazolamide, by accelerating physiological acclimatization, both prevents and treats AMS, often dramatically. It also decreases hypoxemia during sleep by decreasing periodic breathing. Its mechanism of action is ill-understood but its efficacy is undoubted; as a carbonic anhydrase inhibitor it causes a bicarbonate diuresis and the metabolic acidosis that results counteracts the respiratory alkalosis caused by the hyperventilatory response. CSF production is also decreased. Side effects include tingling and paraesthesias of the extremities, diuresis and dysguesia to carbonated beverages. Indeed the tingling is so unmistakable as to make double-blinded studies imprecise. The latter two side-effects are of little importance. It is contraindicated in pregnancy and in those allergic to sulfa drugs though reactions are uncommon and mild.

250 mg BD is the traditionally recommended dose, starting a day before entering altitude and continuing for a couple of days or even during the entire stay if more height gain is anticipated. Both 250 mg TID and 125 mg BD have been evaluated but the optimum dose is still undetermined. Basnyat et al. have shown 125 BD to be as effective with a lower incidence of side-effects (13). Dumont et al. in a meta analysis concluded that 750 mg daily was effective in preventing AMS while lower doses were not (14). Carlsten et al. suggest that the dosing of acetazolamide for AMS prevention in nonmountaineering tourists at altitudes below 3700 m should not be lowered below 250 mg twice daily (15).

Acetazolamide does not have a rebound effect and can be taken episodically eg 125 mg PO HS for periodic breathing. Moreover, it does not mask symptoms of AMS nor does it interfere with normal acclimatization. Despite widespread myths to the contrary, anyone feeling better with acetazolamide is, in fact, better, and if he abruptly stops the drug his body will revert to the physiological rate of acclimatization with no ill effects.

Dexamethasone 2-4 mg QID is an alternative in those sensitive to sulfa drugs and it is not the first choice because of its side effects.

Ginkgo biloba is an herbal derivative, a traditional far-eastern panacea, and was initially shown to be a promising OTC alternative but this has not been held out by later studies. Neither does combination with acetazolamide confer any benefit (16, 17). It has not outdone placebos in efficacy but is still touted and recommended by faddist naturopaths often mis-spelling it as "gingko". Spironolactone has shown conflicting efficacy and frusemide, codeine or nifedipine have no role in prevention of AMS (14).

Whereas mild AMS does not require descent, a subtle change in mental status or ataxia mandates it. Oxygen



and dexamethasone 8mg then 4mg QID are indicated. Both acetazolamide and dexamethasone are effective but the latter is possibly more effective in the treatment and acts faster, 2-4 hrs as against 12-24 hours for acetazolamide. Having different mechanisms of action a combination of the two may be more effective. Dexamethasone prevents AMS but does not improve acclimatization, and rebound AMS may occur if discontinued at altitude. Dexamethasone is the drug of choice for HACE. Diuretics are not indicated as the ensuing orthostatic hypotension may render descent difficult. Simulated descent in portable hyperbaric chambers is effective and most organized treks to high altitude in Nepal carry one. A Gamow or PAC bag will help temporize but descent should follow. Descent may not always be possible depending on personal or group targets, resources, weather and topography.

HAPE treatment: Both descent and oxygen will reduce the pulmonary artery pressure resulting from hypoxic vasoconstriction. Early descent is the most effective method and other treatments should not be allowed to compromise or delay descent. Oxygen is rarely available in sufficient quantities and 10mg nifedipine followed by 20 mg SR QID shows improvement even without descent but early rapid descent should in no case be avoided or even unnecessarily delayed. Hyperbaric bags can simulate descent and treat HACE effectively. The patient should be kept upright and warm. The exertion of descent can worsen HAPE. Nifedipine or frusemide can drop blood pressure, making self descent difficult.

Nifedipine and 5-Phosphodiesterase inhibitors lower pulmonary arterial pressure and prevent HAPE in susceptibles. Salmeterol, by its action on ion channels promotes alveolar fluid clearance too helps prevent HAPE.

Sildenafil decreases pulmonary hypertension induced by acute exposure to hypoxia and may be useful for the modulation of PAP. Further studies are needed to determine whether subjects will benefit from such a treatment and under what environmental conditions, as well as to assess the effects of sildenafil on exercise capacity at altitude (18).

Conclusion:

In conclusion, here are a few tenets to think about and implement:

Illness at altitude is altitude illness unless incontrovertibly proved otherwise.

A headache at altitude is never “normal”.



Never take a headache higher.

Climb high only if you plan to sleep low.

It is OK to get altitude sickness; it is not OK to die from altitude sickness.

Every altitude illness death is preventable.

On average, three lives are lost to altitude illness each year in Nepal, nearly all occurring in persons who ascended further despite symptoms.

Many deaths at altitude ascribed to accidents such as falls or errors of judgment are the results of the debilitating or incapacitating effects of altitude illness.

More than knowledge, a greater willingness to admit to symptoms and a greater readiness to act wisely will save more lives in the mountains.

A disproportionately large number of physicians die of altitude illness.

A trekking group is under greater pressures to achieve targets, and individuals ignore or conceal early symptoms of AMS so as “not to let the others down”.

A group should be paced by its slowest member.

Individual trekkers almost never die of altitude sickness.

Descend at night if necessary: daylight doesn't help altitude illness, neither does “a good night's sleep”.

Descent should always be accompanied.

The ability to acclimatize is not a function of physical fitness.

The superfit are physically capable of climbing fast enough to kill themselves.

All locals are not highlanders, some, especially porters, are lowlanders ignorant of conditions at altitude.

The rest of the world hikes up to altitudes that Himalayan trekking begins from.

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Special study modules in Nepalese medical education – an idea whose time has come?

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Summary:

The knowledge explosion has put tremendous pressure on the student of medicine. Nepalese medical schools have a heterogeneous student body with students from Nepal, India, Sri Lanka and other countries. A few seats are reserved for Nepalese students studying on government scholarship. Despite the increasing number of students, lack of doctors in the rural areas of Nepal remains a major problem.

The concept of a core curriculum and elective modules is gaining support the world over. The core curriculum which can be defined in various ways is a public statement from the institution that details the essential competencies their graduates must achieve. The student must have the freedom to choose special study modules (SSMs) based on his/her aptitude or interest. The heterogeneous nature of the student population could be a problem in defining a core. The importance of a particular topic in the medical decision making process, the commonness of the problem and the extent to which one can generalize from this problem to others in medicine are important considerations.

SSMs aim to promote a constant questioning and self-critical approach to medicine. SSMs can reflect the precious individuality of each medical school and can become a significant factor in choice of a medical school. Subjects like information technology, history of medicine, conflict and medicine, complementary medicine can be considered for SSMs. The core should constitute about 70% of the undergraduate course with the remaining being devoted to SSMs. SSMs should be assessed rigorously. A senior faculty member should be responsible for organizing and managing the SSMs. There are many advantages in introducing a core and SSM in Nepal. There are also many challenges and problems. This concept should be given serious consideration by medical educators. Medical education and the medical profession are going through a period of rapid change. Curriculum planners have to make place for newer subjects like bioinformatics, palliative care, health informatics and at the same time not neglect traditional subjects like anatomy, physiology, biochemistry among others. The knowledge explosion has created tremendous pressure on the student of medicine and also on medical educators and medical schools.

Medical education in Nepal:

In Nepal as in other countries of South Asia, students enter medical school after twelve years of schooling. The subjects of Physics, Chemistry and Biology are mandatory in the last two years of schooling. Thus medical students are exclusively from a science background. In the west, recently students with liberal arts backgrounds are also beginning to be admitted to medical school. Nepalese medical schools admit Nepalese students mainly on the basis of their performance in entrance examinations. These examinations mainly concentrate on factual knowledge of the science subjects. Students from India, Sri Lanka and other countries come to Nepal to study undergraduate medical (MBBS) courses¹ and 'medical education tourism' is earning the country a substantial



amount of foreign exchange.² Nepalese medical schools can also try to attract students from ASEAN countries, the middle east and Africa.³ Twinning programs are becoming increasingly common and can be an option for Nepalese medical schools.³

A heterogeneous student body:

Nepalese medical schools have a heterogeneous student body and the degree of heterogeneity is expected to increase in future. The Nepalese students as future doctors are expected to serve the population of Nepal. The majority of the population of Nepal lives in rural areas and providing health care to this segment of the population is an important priority and a constant challenge. Creating generalists is of importance and a MD program in Family Medicine is running successfully. Family doctors are an important resource for Nepal and can play a major role in delivering healthcare services.⁴ Unequal distribution of doctors is a problem and in rural areas there may be as few as one doctor per 100000 population.⁵

In Nepalese medical schools there are Nepalese nationals studying on scholarship, Nepalese self-financing students, Indian and Sri Lankan self-financing students, and students from other countries. The Government of Nepal has recently made two years of rural service mandatory for students who have studied on government scholarship. The Nepalese self-financing students usually either work in private hospitals in cities or emigrate to developed nations. The Indian students may work as managers of their family owned medical establishments, work in private hospitals or emigrate to western countries. The Sri Lankan health care system is well developed and in the author's personal experience a large proportion of doctors remain within Sri Lanka. Students from Western countries who had studied in Nepal have to clear licensing examinations to be able to practice in their home countries. Thus the basic requirements for the various categories of students are different.

The concept of a core curriculum and electives or special study modules (SSM) is gaining currency the world over. Tomorrow's doctors published by the General Medical Council (GMC) of the United Kingdom was among the first attempts to define a core curriculum.⁶ The concept of a core curriculum is common in British medical schools and is being increasingly adopted in other countries.

A core curriculum:

There are various perceptions regarding what constitutes a 'core'. Core can be the essential aspects of all subjects and disciplines.⁷ This closely corresponds to the concept of 'must know' areas prevalent in our setting. The core can also be defined as essential competencies for practice e.g. communicating with a patient with HIV/AIDS, managing a patient with diarrhea and dehydration etc. Core can also be defined as transferable areas of study relevant to many disciplines: generic competences such as communication skills, problem solving etc.⁷

The core curriculum is a public statement from the institution that details the essential competencies their graduates must achieve. The University or the national regulatory body should agree on the contents of the core curriculum and at the same time each medical school should have the freedom to bring out the special ethos, values and aspirations their institution stands for. In the Nepalese context, the Nepal Medical Council (NMC) or the various universities (Tribhuvan, Kathmandu, BP Koirala Institute of Health Sciences) can define the core curriculum but individual medical schools enjoy the freedom to bring out their special flavor of medical education. This system also emphasizes problem-based learning in small groups and constructivism in which new knowledge is constructed on a foundation of core knowledge acquired previously.



The student has the freedom to choose SSMs based on his/her aptitude or interest. Flexibility is the key component and below-average students can take longer to complete the course while the above-average ones can finish faster or have the option of doing more advanced SSMs.

Determination of core:

The concept of core closely corresponds to the 'must know' areas in medical education. The various stakeholders in medical education are the public, the government, the medical professionals, the students and the teachers. In Nepal, the NMC, the universities, the medical associations, teachers and students should all be involved in drawing up a core curriculum. The heterogeneous nature of medical students and the various countries they come from could be a major problem. The core should reflect the knowledge, attitude and skills which the university or council aims to foster in new graduates. The importance of a particular topic in the medical decision making process, the commonness of the problem and the extent to which one can generalize from this problem to others in medicine are important considerations.⁷ The core curriculum should be revised from time to time with material and concepts not just being added but also removed.

The 'wise men' approach, Delphi techniques, critical incident studies, and analysis of current practice and job analyses of health care professionals have been used to determine the core content of an educational programme.

Options, special study modules, student selected components:

SSMs offer the student the choice of topics which excites his/her imagination.⁷ They offer the student an opportunity to augment the topics learnt in the core curriculum. According to the GMC's Tomorrow's doctors it aims to promote a constant questioning and self-critical approach to medicine. Students are allowed to express their own individuality and research skills. Self-directed learning skills, problem solving skills and presentation of own work is emphasized.⁸ Students can study in detail subjects of their own interest beyond the requirements of the formal medical curriculum. SSMs can reflect the precious individuality of each medical school and can become a significant factor in the choice of a medical school. Different interests and different career aspirations can be addressed through SSMs.

Subjects offered in SSMs:

The subject can be an extension of the core. An example could be sports medicine after a study of the upper and lower extremities.⁷ Topics like information technology, conflict and medicine, history of medicine, ayurvedic medicine can be taken up in SSMs. Topics not directly related to medicine like business management, foreign language could also be offered.⁷ In Nepal with the multitude of dialects and languages, certain of these can be offered to students. The options available with the medical school and the overall learning outcomes which the school aims to foster should be two important guiding principles.

At Queen's University, Belfast, United Kingdom (UK), a SSM in medical informatics was offered to the students.⁹ In Southampton, a complementary and alternative medicine (CAM) SSM resulted in significant changes in students belief in medicine and approach to patients.¹⁰ The University of California, Davis School of Medicine in the United States (US) offers a variety of SSMs ranging from cardiac arrest, resuscitation and reperfusion, interdisciplinary medicine in pain care, Culture, medicine and society, and Comparative health



care to Are you ready for the future of medicine.¹¹ In the US a sexual health elective created by medical students was effective in addressing gaps in the areas of abortion and sexual health.¹² The East Tennessee State University offers students the Appalachian preceptorship which is a four week summer elective in the rural areas of southern Appalachia.¹³ It provides students an understanding of the interface between culture and medicine. The Karolinska Institute in Sweden offers 17 weeks of electives to students and they have the option to choose from medical humanities subjects for their electives.¹⁴ The University of McMaster in Canada offers students summer research electives in rural health care.¹⁵

Scheduling of core and SSMs:

In the UK, the core curriculum and the SSM are both compulsory and should occupy around 70% and 30% of the undergraduate course respectively. Medical Schools are free to decide on the number and duration of SSMs.¹⁶ There are four main approaches to implement core and electives. The first is the integrated approach. The SSM is related to the core and is integrated with the core teaching of the subject. However, it may be difficult to protect the time duration allotted to the SSM from encroachment by the core.⁷ In the concurrent approach the core and the SSM run concurrently. The subject areas may or may not be related to each other. A possible problem is that the student may find it difficult to balance contrasting subjects of study. In the intermittent approach the SSM blocks are allotted intermittently at various stages of the curriculum. The major advantage is protected time for the SSMs in the curriculum. In the sequential approach a core block is followed by a SSM block.⁷ The advantage is again the protected time for the SSM in the curriculum.

Assessment modalities:

In the core the student is expected to attain a high standard of knowledge, attitude and/or skills. In the SSMs, the school should be able to decide the method of assessment they want to follow. A pass/fail system or grading system can be considered. The method of assessment will be strongly influenced by the subject content of the SSM and the required knowledge, attitude or skill which the student is expected to possess at the completion of the SSM. External examiners will have an important role to play in maintaining standards.⁷

Three basic types of SSMs:

The three basic types are individual research projects, taught modules and specialist clinical attachments. The summer research elective offered by McMaster University¹⁵ is basically an individual research project. The SSM offered by Queens University in Belfast⁹ is a taught experience while the Appalachian preceptorship¹³ is a clinical attachment. There may be a certain degree of overlap and certain programs may use elements of the three basic types. In the UK, some medical schools offer a healthy mix of the three types while others concentrate almost exclusively on individual research projects.¹⁶ Individual research projects have been said to appeal more to the academically inclined students¹⁷ while the mixed approach is better at satisfying the educational needs of a more diverse body of students.¹⁸

SSMs in the Nepalese context:

In Nepal and South Asia there has been very little emphasis on SSMs and the concept of a core subject area



and electives has not been studied in detail. The curriculum is basically the same for each student though a few voluntary modules have been conducted from time to time. The author had conducted a voluntary medical humanities module for interested medical students and faculty members at the Manipal College of Medical Sciences, Pokhara, Nepal.¹⁹

The core must be defined keeping in mind the needs of students from Nepal, India, Sri Lanka and other South Asian countries. Students from these countries must be trained to work in health posts and primary health centers in rural areas after graduation. In addition to technical skills, managerial and community leadership skills should also be taught to medical graduates. Medical graduates also appear in various examinations like the postgraduate entrance examinations of their countries, PLAB, USMLE etc. Can training modules for these examinations be included as a SSM? This would be a departure from SSM as defined in the west.

South Asia has a number of languages and language courses can be considered for SSMs. This will help the future doctors better communicate with their patients. The history of various regions and nations, cultural influences on health seeking behavior can all be subjects for SSMs. Community diagnosis refers to the identification and quantification of the health problems in a community in terms of mortality and morbidity rates and ratios and identification of their correlates for the purpose of defining those individuals or groups at risk or those in need of health care.²⁰ Community diagnosis programs (CDP) were originally started at the Institute of Medicine and are at present carried out in various medical schools of Nepal. CDP can remain as a core but the various research projects resulting from it can be considered for SSMs. Students can investigate in detail various aspects of the community depending on their interest and inclination. Medical humanities are becoming an important area of the curriculum in many countries. Many medical schools in the west offer a number of elective courses in the humanities.²¹ Certain schools have a core subject area in the humanities but students can choose electives according to their interest. A number of subject areas are suitable for the SSMs. Each medical school can offer SSMs depending on the school's objectives, resources and vision and mission. The author has come across a report of a medical school in Malaysia offering a core curriculum and special study modules.²²

Challenges and possible problems in starting SSMs in Nepal:

A lot of effort is required to define the core area of the curriculum. The core should be frequently revised and redefined depending on advances in medical knowledge. Topics should not just be added but irrelevant and obsolete areas should be removed. Objectives of and methods of assessment should be well defined. Innovative methods of assessment and a greater emphasis on formative assessment should be considered.

The choice of SSMs which each medical school can offer to its students depends on factors mentioned previously. Each medical school should have at least one senior staff member organizing and coordinating the SSMs.⁷ Students should be guided and counselled regarding the choice of SSMs. The number of SSM slots available should be greater than the number of slots required by students.⁷ The duration of the SSM should be flexible to a certain extent. Stringent assessment of the SSM often using external examiners should be followed. Organizing the SSMs may sometimes require an interdisciplinary effort and sometimes may also require experts from outside the medical curriculum.

Certain SSMs can be organized for medical students in combination with students of other faculties e.g. liberal arts, management where feasible. However in Nepal, medical schools with a few exceptions are stand alone entities without linkages to other faculties.

Through this article the author aims to initiate a debate and exchange of ideas on this important topic which has strong implications for the future of medical education in Nepal. A well defined core and a broad choice of electives or SSMs will have an important role to play in making Nepal an attractive destination for medical



education.

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Review article

An Overview of Soil Transmitted Helminth Infections (STH)

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Introduction:

The soil-transmitted helminths (STHs) are a group of parasitic nematodes causing human infection through contact with parasite eggs or larvae that thrive in the warm and moist soil of the world's tropical and subtropical countries¹. More than a billion people are infected with at least one species, of particular worldwide importance are the roundworms (*Ascaris lumbricoides*), whipworms (*Trichuris trichiura*) and hookworms (*Necator americanus* or *Ancylostoma duodenale*)^{2,3}. They are considered together because it is common for a single individual, especially a child living in a less developed country, to be chronically infected with all three worms. Such children have malnutrition, growth and intellectual retardation, and cognitive and educational deficits^{3,4}.

Over the past 5 years, the worldwide community has begun to recognize the importance of these infections after revised estimates showed that their combined disease burden might be as great as those of malaria or tuberculosis⁵. Studies have also highlighted the profound effect of soil-transmitted helminth infection on school performance and attendance and future economic productivity. Such infections might also increase host susceptibility to other important illnesses such as malaria, tuberculosis, and HIV infection^{6,7}.

WHO has estimated that *Ascaris lumbricoides*, hookworm, and *Trichuris trichiura* infect 1.4 billion, 1.3 billion and 1 billion people respectively worldwide⁸. Children being the major victim of the infection, most of the researches in intestinal infections are concerned with pediatric age group. However, these infections have been found to be common even among the elderly people. Gastrointestinal problems have been reported as the most common health problems of elderly people and a leading cause of death⁴.

Factors responsible for prevalence of STH

The distribution of parasitic infections is determined by several factors, i.e., environment, food habit, cultural tradition, social status, economic situation and others. Each parasite has its own natural and social habitat, and favorable environment is a prerequisite for its transmission. For example, STH are highly prevalent in poor agricultural societies, where human feces are used as a fertilizer^{1,9,10}. In other words, the prevalence of a



parasitic infection is a consequence of both natural and cultural factors.

Due to limited resources in most developing countries, it is difficult to prioritize STH control and other health problems a high priority. This seems to be the true reason for sustained prevalence and worm burdens of STH in developing countries. Owing to poor sanitary and other living conditions of majority of the people in developing countries like Nepal, the elderly members could be the major victim of these infections. Moreover, the physical disability and less effective self care during old age lead to insufficient sanitary practice and poor personal hygiene which make elderly people more susceptible to gastrointestinal infections⁴.

Adverse effects of STH

The soil-transmitted helminths are one of the world's most important causes of physical and intellectual growth retardation³. The principal public health significance of STH infection lies on their chronic effects on health and nutrition. In addition to interferences in digestion and absorption of foods, *Ascaris lumbricoides* has been observed to decrease micronutrients and vitamin A absorption, probably by causing a structural abnormality of the mucosa in the small intestine. Hookworm infection is a recognized major contributor to gastrointestinal blood loss, iron and energy deficiencies, protein and zinc deficiencies and these thereby causing malnutrition and anaemia which are most profound in women at childbearing age. Some 44 million pregnancies are currently complicated by maternal hookworm infections, placing both mothers and children at higher risk of death during pregnancy and delivery¹¹. In the same way, *Trichiuris trichiura* is now established to be associated with blood loss, malnutrition, and immunological disturbances¹².

STH infections rarely cause death. Instead, the burden of disease (shown in Table 1) is related less to mortality than to the chronic and insidious effects on the hosts' health and nutritional status³.

Table 1. Disease burden of soil transmitted helminth infections worldwide⁵.

Major Worldwide Helminth Pathogens	Disease	Estimated Population Infected (millions)
<i>Ascaris lumbricoides</i>	Roundworm infection	807–1221
<i>Trichuris trichiura</i>	Whipworm infection	604–795
<i>Necator americanus</i> and <i>Ancylostoma duodenale</i>	Hookworm infection	576–740
<i>Strongyloides stercoralis</i>	Threadworm infection	4–28% of children
<i>Enterobius vermicularis</i>	Pinworm infection	30–100
<i>Toxocara canis</i> and <i>Toxocara cati</i>	Visceral and ocular larva migrans	2–80% of children



Controlling STH

There are three major methods for intervention of STH infestation, which include anti-helminthic drug treatment, sanitation, and health education³.

Anti-helminthic Drug Treatment

Anti-helminthic drug treatment (“deworming”) is aimed at reducing morbidity by decreasing the worm burden. Repeated chemotherapy at regular intervals (periodic deworming) in high-risk groups can ensure that the levels of infection are kept below those associated with morbidity and will frequently result in immediate improvement in child health and development. For ascariasis and trichuriasis, for which intensity peaks among school-age children, frequent and periodic deworming may reduce transmission over time. However, obstacles that diminish the effectiveness of periodic deworming are: the low efficacy of single-dose mebendazole and albendazole for the treatment of hookworm and trichurias due to high rates of post treatment reinfection for STHs in areas of high endemicity and diminished efficacy with frequent and repeated use possibly because of anti-helminthic resistance.

Improved Sanitation

Improved sanitation is aimed at controlling transmission by reducing soil and water contamination. Sanitation is the only definitive intervention to eliminate STH infections but should cover a high percentage of population to be effective.

Health Education

Health education is aimed at reducing transmission and reinfection by encouraging healthy behaviors. For STH infections, the aim is to reduce contamination of soil and water by promoting the use of latrines and hygienic behavior. Without a change in defecation habits, periodic deworming cannot attain a stable reduction in transmission. Health education can be provided simply and economically and presents no contraindications or risks. With this perspective, it is reasonable to include this component in all helminth control programs.

Others

Moreover, a newly discovered hookworm vaccine consisting of the recombinant larval antigen ASP2 is effective in animal models (dogs and hamsters) and has shown a protective association in immuno-epidemiologic studies. The *Na ASP-2* hookworm vaccine is now undergoing clinical development in human beings¹³.

Conclusion:

Large-scale deworming is necessary to reduce the worldwide morbidity of these infections, but without improved water supplies and sanitation this approach cannot be relied on sustainable reductions in parasite frequency or intensity of infection. The infrastructure for deworming of children in schools along with the introduction of new anti-helminthic vaccines and other control tools is expected^{3,5}. Such strategies could result in substantial reductions in the worldwide disease burden in the years to come³.

Strong public support is essential to eradicate STH. In order to attain this, the public must realize that STH control is an essential cornerstone for development for a worm-free country. Secondly, experiences have identified that mass chemotherapy with proper anti-helminthic is essential. Anti-helminthics should be inexpensive and convenient to use for repeated treatments, and should effectively reduce not only morbidity but also the ability of helminths to reinfect. In a society with a prevalence of higher than 30%, a blanket mass



treatment is recommended rather than a targeted treatment¹. The UN agencies have appropriately recognized the health and educational effect of these infections in children, and have taken steps to distribute anti-helminthic drugs in schools and to undertake chemotherapy programmes on an unprecedented scale⁵. Thirdly, overseas financial supports greatly help in deworming activities of a developing country at its launching stage. In this respect, developed countries or world organizations have to play pivotal roles to help and encourage developing countries¹.

In conclusion, soil-transmitted helminthic infections in people will remain a worldwide public health threat as long as poverty persists in the developing world. STH control must be synergistic with a country's development. In order to achieve the goal, public consent on high priority of STH control is definite and essential.

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Perception of Teachers and Administrators of Health Sector on Accreditation in Medical Education in Bangladesh

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Abstract

Hypothesis: Uniform perception of teachers and administrators can be expected after orientation workshops on accreditation in medical education of different medical colleges and concerned organizations.

Methodology: 59 respondents participated in this quasi-experimental study. A series of one-day long orientation workshops as an intervention on the basic concepts of accreditation in medical education were conducted. After the presentation, group work on guidelines for accreditation by WHO and on proposed mechanism of accreditation in Bangladesh was held and an open discussion was also held on it. Before the conclusion of the workshop, the participants were given a self-administered structured questionnaire to respond.

Result: Study revealed that all respondents (100%) were in favor of establishing national accreditation committee for medical education with the involvement of representatives of all concerned organizations to assess the input, process and output of health professions institutes of Bangladesh after a certain years. Study also revealed that 47 (80%) respondents opined to publish the reports and utilize the reports for grading the institutes, for affiliation, allocation of funds, for incentives and accord or refuse accreditation. National credentialing examination for new medical graduates was strongly suggested.

Conclusion: Orientation workshops on accreditation in medical education played positive role in convincing a large group of teachers and administrators. To maintain qualities and standards of health professions education establishing national accreditation commission was recommended.





Introduction :

“Accreditation is a voluntary peer-review process designed to attest the educational quality of new and established educational programmes” (EMRO-WHO 2005, p.3). Accreditation improves the quality of education and health care. It serves the interests of the public. It assures general competencies in preparation for graduate medical doctors. It establishes a foundation for life-long learning. Indirectly limits the number and size of medical schools (Wilson EA 2004, p.1).

The demand for medical schools in the South-East Asia regions is huge both in government and private sectors (WFME-WHO 2004, p.12). On the other hand world wide many medical schools have been founded for profit purpose without adequate academic, institutional and financial resources, and clinical settings (Karle H 2002, p.2) Considering this issues much earlier WHO (1991, p.1) developed an agenda for medical education in the earth which consist of 3 components. These are: (i) Setting standard and developing tools for assessment; (ii) Strategies for changes; and (iii) Follow-up through world wide monitoring.

In some countries the accreditation authorities are government (e.g. India, Pakistan, Nepal, Malaysia) agencies and in some countries it is independent (e.g. Bangladesh, Australia, United Kingdom, United States) . In some countries the accreditation is mandatory (e.g. Bangladesh, Australia, United Kingdom, United States) and in some countries it is voluntary (e.g. Switzerland, Philippines, Voluntary, Saudi Arabia). (FAIMER 2008)

For accreditation of basic medical education we should use specific standards. Standards must be clearly defined and be meaningful, appropriate, relevant, measurable, achievable and accepted by the users. They must have implications for practice, recognise diversity and foster adequate development. (WFME 2003, p.9). A guidelines state that for accreditation of basic medical education the process should include the following stages: (i).Institutional self-evaluation of the medical school; (ii).External evaluation based on the report of self-evaluation and a site visit; (iii).Final report by the review team containing recommendations regarding the decision on accreditation; and (iv).Decision on accreditation (WHO/WFME 2005 p.3).

A proper functioning accrediting body should be independent. It should be empowered to promote the required regulations and be given the means and capability to obtain the technical resources. (WHO-WFME 2004, p.16). There is a trilogy on standards which cover sequentially three phages of medical education. These are: (i) Undergraduate Medical Education; (ii) Postgraduate Training; and (iii) Continuing Medical Education (CME) / Continuing Professional Development (CPD). (Henry Walton 2003, p.1). According to Liaison Committee on Medical Education (LCME 2007, p1-35) there are five broad areas of accreditation standards. These are: (i) Institutional Setting; (ii) Educational Program; (iii) Medical Students; (iv) Faculty; (v) Educational Resources.. The WFME (2003, p.10) has recommends the following nine broad areas of global standards in basic medical education. The areas cover: Mission and Objectives, Educational Programme, Assessment of Students, Students, Academic Staff/Faculty, Educational Resources, Programme Evaluation, Governance and Administration, and Continuous Renewal.

Standards for basic medical education varies among countries. It varies due to differences in teaching tradition, culture, socio-economic conditions, the health and disease spectrum, and different forms of health care delivery systems. Such differences can also occur within individual countries. (WFME 20037.) As the scientific basis of medicine is universal a core committee of Institute for International Medical Education (IIME, 1999) grouped the Global Minimum Essential Requirements in Medical Education under seven, broad educational outcome-competence domains. These are: (i) Professional Values, Attitudes, Behavior and Ethics; (ii) Scientific Foundation of Medicine; (iii) Clinical Skills; (iv) Communication skills; (v) Population Health and Health Systems; (vi) Management of Information; and (vii) Critical thinking and research.



In Bangladesh there is no complete formal accreditation system till now. But affiliating agencies are there like Ministry of Health & Family Welfare (MOH&FW), Director General of Health Services (DGHS), Universities, Deans, Bangladesh Medical & Dental Council (BM&DC), Centre for Medical Education (CME) under the direct guidance of Director Medical Education (DME), DGHS. There is a standard inspection form which is filled up by the concerned institute and one day visit is conducted by nominated members. The report prepared by them ultimately determines whether the institute will be affiliated or needs for improvement. For better performance of the medical institutes, country should establish National Accreditation Committee to develop standards (instruments) for accreditation in medical education. This should focus on educational objectives, curriculum, teaching - learning strategies, skills graduates should possess, community orientation, local health system structure, evaluation of not only knowledge but also of skill & attitude.

Rationale:

It is urgently felt that for effective medical education in the country regular inspection and evaluation should be ensured by the National Accreditation Committee. Through judicial approach a transparent comprehensive report on the medical institutes should be prepared by the inspection team. This report should be disseminated. It should be utilized for ranking the institutes, affiliation, certification, allocation of funds, incentives, innovation & improvement in educational programs.

Accreditation process should be accountable, adaptable, analytical, consistent, consultative, continuous, customized, discriminating, effective, empirical, predictive, thorough & value-added. It is very time demanding issue to assess the teachers, administrators and policy maker's views about accreditation in medical education –as a system, as a process. If they have lack of clear conception, it will be very difficult to develop an accreditation system in Bangladesh. Because this concept of accreditation in medical education is a new thing to most of them. Assessing their views is an appropriate task. It will help in future policy making and planning about accreditation system in medical education in Bangladesh.

Methodology:

As an intervention of quasi-experimental study a series of one-day long four orientation workshops were held at CME & DGHS, Dhaka. from April to June 2007 on the basic concepts of accreditation. A total of 59 teachers and administrators from government & non government medical institutes and concerned organisations participated in four workshops. Among them there were assistant professors, associate professors, professors of different subjects of different medical colleges. Administrators were assistant directors, senior assistant secretary, registrar of BMDC, deputy directors, vice principals, principals, directors of different concerned organizations. At the beginning presentation was made on “Accreditation in medical education for social accountability”. It was then followed by group work on guidelines for accreditation by WHO and on proposed mechanism of accreditation in Bangladesh. Afterwards, group work following open discussion was held in order to clarify any question or confusion. Before concluding participants were given a self-administered structured questionnaire to respond, from which the overall impact of the orientation workshops on accreditation as an intervention was revealed. Data were entered in SPSS and analyzed.

Results:

Various categories of responses came out in regard to the outcome of the orientation workshops on accreditation in medical education as an intervention.

Out of 59 respondents there were 12 Principal /Director, 16 Professor, 9 Vice Principal /Register, 11 Associate



Professor/ Deputy directors, and 11 Assistant Professor/ Assistant Director /Senior Assistant Secretary.

All 59 (100%) respondents agreed that there should be a system of accreditation in medical education in Bangladesh.

Table:1 Distribution of the respondents' opinion regarding which organisation to be a member of national accreditation committee

n=59

Name of the Organisations	Frequency	Percent
Representative of MOH&FW	43	72.88
Representative of DGHS	42	71.19
Representative of BM&DC	56	94.92
Representative of DME	41	69.41
Representative of Deans	50	84.75
Representative of BMA	29	49.12
Representative of Universities	36	61.02
Representative of CME	50	84.75

The respondents gave their opinion that members of the national accreditation committee should be from MOH&FW (73%), DGHS (71%), BM&DC (95%), DME (69%), Deans (85%), BMA(49%), universities (61%) and CME (85%) (Table:1).

Table:2. Distribution of respondents' opinion regarding office/ institute which can act as secretariat of national accreditation committee.

n=57

Proposed secretariat accreditation committee	Frequency	Percent
BMDC	15	26.32
DME	16	28.07
CME	26	45.61

Of 59 respondents 57 participated in selection secretariat of national accreditation committee. Of them majority (46%) favored CME, although some opined BM&DC (26%) and DME (28%)(Table:2).

Table:3. Distribution of the respondents' opinion regarding the areas which should be assessed by national accreditation committee.

n=59

Areas to be assessed	Frequency	Percent
Organisation & Administration	49	83.05
Faculty & Staff	56	94.92
Curriculum & Degrees	52	88.12
Experimentation & Evaluation	42	71.19
Physical, Clinical, Library & Financial resources	51	86.44
Student affairs	45	76.27
Quality Assurance Scheme	52	88.12



कर्मण्येवाधिकारस्ते
My right is to my work

Regarding the opinion on which areas should be assessed by the accreditation body, majority agreed to some common issue. These are organization & administration (83%), faculty & staff (95%), curriculum & degrees (88%), experimentation & evaluation (71%), physical, clinical, library & financial resources (86%), students' affairs (76%) and quality assurance scheme (88%) (Table-3).

Table:4. Distribution of the respondents' opinion regarding time of interval after which accreditation committee should visit medical institutes.

n=53

Years of interval	Frequency	Percent
One year	15	28.3
Two years	26	49.0
Three years	8	15.1
Four years	2	3.8
Five years	2	3.8

The respondents chose options of interval after which the accreditation committee should visit the medical institutes. Six (6) out of 59 did not respond this question. Majority (49%) favored that it should be every two years. Others felt one year (28%), three years (15%), four years (4%) and five years (4%) interval may be suitable (Table:4).

Out of 59 respondents 47 (80%) thought the reports of the visits should be published publicly through director medical education and 12 (20%) respondents thought it to be unnecessary.

Table:5. Distribution of the respondents' opinion regarding the utilization of the reports of visits.

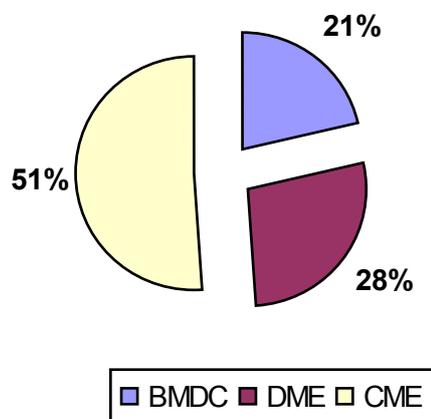
n=59

Category of response	Frequency	Percent
For ranking of colleges	42	71.19
For affiliation & Certification	44	74.58
For allocation of fund	29	49.15
For incentives or disincentives	34	57.63
For innovation & improvement in educational program	47	79.66

Regarding utilization of reports of the visits of accreditation committee respondents also differ in their views. Majority (80%) viewed that it should be used for innovation & improvement in educational program. Some were also in favor of using it for affiliation & certification (75%), for ranking of colleges (71%), for incentives or disincentives (58%) and for allocation of funds (49%) (Table:5).

Discussion:

Though MOH&FW, DGHS, BM&DC, Universities, CME conduct different aspects of accreditation even there is no formal system of accreditation in medical education in Bangladesh. Establishing accreditation systems is very essential considering the global context for maintaining qualities & standards of medical education.



The issue 'accreditation' in medical education is also a concern for administrators and policymakers. Directors of DGHS, principals, professors, vice principals, Associate Professors and Assistant professors of different medical colleges, representatives of MOH&FW & BM&DC were invited in the workshop as they are the present administrators and policymakers of medical education in Bangladesh. The result indicates that the participants were well informed and motivated regarding the need of accreditation. There should be organized system of accreditation in medical education in Bangladesh.

It was found that the respondents differ to some extent (49-95%) about the issue of membership from different organizations (e.g. BM&DC, CME, Deans, MOH&FW, DGHS, Director Medical Education, Universities and /or BMA). As national accreditation committee it would be a high powerful body, competent members should be included from the organizations having sound background in order to make it functional.

The respondents did not differed (71-95%) regarding the areas that national accreditation committee should assess such as organization & administration, faculty & staff, curriculum & degrees, experimentation & evaluation, physical, clinical, library & financial resources, students affairs and quality assurance scheme. It is well known that input, process and output, these three compartments have key role for smooth, effective and efficient functioning of an institute. This finding signifies the need of assessing different compartments of an institute by the national accreditation committee.

The respondents gave varied opinion regarding time interval. They favored the interval as (1-5 years) but majorities (49%) were in favor of two years interval.

This study revealed that majority of the respondents (80%) feel that reports of the visits should be published publicly through director medical education. On the other hand a few number (20%) of respondents were against the publicity. They were afraid of public reaction which might diminish the image of the institutions. Medical institutes will be graded as per their performances. The under achievers will suffer financially and may fail to overcome their setback. It would be more rational to publish in the concerned administrative arena which will ultimately enhance accountability and improve performance as a whole.

The respondents differed (49-80%) with the opinion that the reports of the visits of national accreditation committee can be utilized for ranking of colleges, for affiliation & certification, for allocation of fund, for incentives or disincentives and for innovation & improvement in educational program. As this body will be a very important and powerful body. Its report should be given due importance for decision making.



कर्मण्येवाधिकारस्ते
My right is to my work

Majority (46%) selected CME and some selected BM&DC (26%) and DME (28%) as secretariat of national accreditation committee. As BM&DC is the highest recognizing organization so, it can act as secretariat. Office of the Director Medical Education is the operational & administrative wing of medical education; it can also act as secretariat. CME which is the only postgraduate institute of medical education. It is working as the secretariat of national quality assurance scheme. CME is also providing technical supports for the development of the medical education, curriculum. Therefore, the group thought CME can be a place as secretariat of national accreditation committee. The secretariat should be coordinate the job without hampering the normal activities of different organizations. But ultimately it can be decided by national accreditation committee as their convenience.

Recommendations:

A national accreditation committee should be established. Accreditation committee should be independent, well equipped with manpower & logistics. It should be empowered properly for maintaining the quality and standards of health professions education of Bangladesh. The committee will look after and check regularly the quality & standards of different health professions institutes. Input, process and output level should be checked through visits usually two yearly and also by assessing output respectively. Report of the inspections of national accreditation committee should be published within administrative arena. Those reports of accreditation committee can be utilised for ranking of the institutes, affiliation & certification, incentives, accord or refuse accreditation etc. There should be a national credentialing examination for all the medical graduates to get registration for practice. BM&DC can conduct this examination twice a year with the involvement of all concerned authorities. Similar system may be developed for Nursing Council, State Medical Faculty, Pharmacy Council for maintaining quality and standards for nursing, paramedics, pharmacy education. Multi-sectoral collaboration is needed among CME, DGHS, MOH&FW, BM&DC, Deans of universities and other related organizations. A new act in regards to accreditation committee is also needed for effective functioning and for maintaining quality and standard of health professions education in Bangladesh.

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Functional Outcome of Supracondylar Fractures of Pediatric humerus by two K wire fixation through lateral approach

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Abstract:

Hypothesis: Functional outcome of supracondylar fractures of pediatric humerus by two K wire fixation through lateral approach is acceptable.

Methodology: Prospective clinical observational study from Oct 2004 to Feb 2006. Minimum sixteen weeks followup. Age between 1-13 years both inclusive. FLYNN cosmetic and functional grading.

Result: 35 patients included in study. 3 lost to followup. Differences in carrying angle, Bauman's angle and range of motion were all statistically insignificant. FLYNN criteris rated Excellent (34.6%) Good (40.4%) and Poor (25%)

Conclusion: Acceptable and statistically indifferent to other methods in terms of functional outcome for supracondylar fractures of pediatric humerus fixed by result as uncompered two K wire fixation through lateral method is easily achieved.

Key words: Supracondylar fracture hmerus, fixation, outcome.

Ethical consideration:

Prior to start of the study, formal ethical approval was obtained from IRB, NAMS and National Health Research Council (NHRC). The aim and objectives of the study along with its procedure, risks, benefits and the protocol were explained in easily understandable Nepali language to the parents or the nearest relative attendants at the time of enrollment of each case. Informed written consent was obtained from the main attendant at the same time.

Introduction:

Supracondylar fractures of the pediatric humerus is one of the most commonly encountered cause for acute orthopedic consultations. Many options have been put forward for the management of this cpondition, clearly indicating that none is perfect. This is an attempt to evaluate the results of a procedure that can be easily duplicable in hospitals with no fluoroscope in the OR and with very pleasing and easily hideable scar.

Methodology:

This study was carried out at the Department of Orthopedics, Bir Hospital, NAMS, during the period of October, 2004 to February, 2006. Total 35 patients were collected for study initially, but three patients were lost after second follow up. Only thirty two patients could be followed for minimum sixteen weeks up to fourth follow up. Hence, only those thirty two cases were included in the final data analysis.



Inclusion criteria: a) Age 1-13 years b) Displaced supracondylar humeral fractures c) Unstable supracondylar fractures of the following types, Extension fractures of Gartland type II and III d) Failed closed reduction of the above types of the fracture, e) Flexion type of the supracondylar fractures f) Both closed fractures & Open Fractures Gustillo & Anderson type I & II. g) Less than five days old injury.

Exclusion Criteria: a) Cases of supracondylar fractures of age below one year and above 13 yrs b) Stable supracondylar fractures of Gartland type I c) Fracture with infected wounds d) Open fractures with Gustillo type III wounds.

First Follow up: The patients were followed up regularly as per the schedule. Sutures were removed on about 10th post-operative day on first follow up visit. Condition of the wound and the pin track was assessed. **Second Follow up:** Second follow up was done after 4 weeks. Repeat X-rays of the operated elbow were taken at second follow up visit. The Baumann angle and the anterior humeral line were re-assessed to detect any loss of reduction. Clinical union was judged by the absence of pain at the fracture site and radiological union was judged by the presence of bridging callus across the fracture site. Once clinical & radiological union was assured, pins and plasters were taken out during 2nd follow up. Immediate range of the elbow movement (ROM) was recorded. Gentle active physiotherapy of the elbow was started thereafter and proper instructions were given to the patient and the attendant for proper physiotherapy at home **Third follow up:** It was done at 10th post operative week. ROM of the elbow was again recorded. The progress of recovery of any previous nerve injury was also recorded. **The fourth follow up:** The fourth visit was the final follow up for most of the cases. It was done at 16th postoperative week. The final ROM of the elbow was recorded. The Carrying Angle (C A) of the elbow was also recorded. Similarly, the ROM & Carrying angle of the opposite uninjured elbow were also recorded. Fresh X-rays of both elbows were ordered and reviewed for proper union and remodeling of the fracture. Baumann's angle was calculated on both sides for comparative study. ROM of the ipsilateral wrist was also recorded at final follow up.

Data was entered into computer in SPSS Program. Comparison of qualitative variables was done by Z-proportion test and that of quantitative variables was done by "t" test. The significance ('p' value) was set below 0.05.

Results:

Grading of results, was done as by Flynn *et al*¹ in terms of cosmetic and functional factors:

Rating	Cosmetic factor CA loss (in degrees)	Functional factor Motion loss (in degrees)
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A. Satisfactory

Excellent	0-5	0-5
Good	5-10	5-10
Fair	10-15	10-15

B. Unsatisfactory

Poor	>15	>15
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In our study, age of the patient ranged from 5-12 years. The mean age of the patients was 8.8 ± 2.1 years. The age incidence closely resembles to 6.7 years of Kaye. E. Wilkin's² study obtained from a pool of compilation of 61 series totaling 7212 supracondylar fractures. The average age in Satya Nand's series was 7.84 years³ and this study matches more closely with that of Satya Nand's. Post operative complications were analyzed in only 32 cases. Five cases were found having different types of complications. The anterior humero-capitellar line was drawn in all post operative lateral view x-rays. In more than 65% cases the line passed either through the middle or the posterior part of the capitellum. 25 cases (n=32) developed complete union on the basis of clinical and radiographic criteria in four weeks while 7 cases united little late by 5th week. In second follow-up, the available mean range of elbow motion was $37.91^\circ \pm 14.85^\circ$ with range 16-80 degrees. Similarly, in third follow-up, the mean available range of motion was $96.60 \pm 14.80^\circ$ with range 58-125°. In fourth follow-up, mean range of the achieved ROM was $133.44^\circ \pm 5.24$ SD. The range varied between 122-145°, while the mean of the loss of range of elbow motion as compared to the normal side was $6.41^\circ \pm 3.61^\circ$ SD. The Carrying Angle was measured in both injured and normal elbow at fourth follow up. Most of the cases were recorded having carrying Angle 6° to 10°. The range was between 2° to 14° with mean value 7.6 with SD ± 2.6 . One girl was measured having CA of 14°. The ultimate mean loss of carrying angle was $3.81^\circ \pm 2.25^\circ$ SD. The minimum and maximum loss of the Carrying Angle ranged 0° to 9°. Three of the patients developed significant loss of the carrying angle 8 or 9° (ref. case number 10, 20 & 24) due to subsequent loss of reduction because of poor quality of fixation. Other cases had some minor variation in CA which might be due to arm positioning as well as measurement variability or due to insignificant loss of initial reduction. Similarly, the mean loss of the Baumann's angle at fourth follow up as compared to the immediate postoperative Baumann angle was 1.8° (p= 0.091) which is statistically insignificant (normal p-value= 0.05).

Carrying Angle (CA):

The C A was measured in all cases at final follow up visit in both normal and the injured elbow. The differences in carrying Angle were recorded.

Table 1: Range of Carrying angle

Carrying angle of elbow (n=32)	Minimum (in degrees)	Maximum(in degrees)	Mean	Std. Deviation	p-value
Normal elbow	8	14	11.3	1.5	<0.0001
Injured elbow	2	14	7.6	2.6	
Diff. betw ⁿ normal and inj elbow	0	9	3.8	2.2	

Measurement of Baumann Angle (B A):

Baumann Angle measured in immediate post operative x-rays was recorded around 75° with mean value 74.3 with SD ± 3.1 . B Angle as measured at last follow up x-ray was found more or less similar to the initial findings with little variation. The mean value was recorded 76.1 ± 5.1 . Similarly, the B Angle of the normal elbow was also recorded with mean value 74.1 ± 2.1 . The p-value was derived between the mean values of initial and final B Angles. The p-value was 0.091 which is statistically insignificant. Similarly, p-values were derived between initial & normal and between final & normal elbow B Angle. The p-values were 0.864 and 0.063 respectively, both of these being statistically insignificant in this study.



Table 2: Mean of Baumann's angle.

B-A(in degrees)	Normal Elbow B-A	Injured Elbow initial B-A	Injured Elbow final B-A	p-value betw ⁿ final & initial	p-value between normal & initial	p-value between normal and final
Mean	74.1	74.3	76.1	0.091	0.864	0.063
S.D	2.7	3.1	5.1			

Range of Motion (ROM):

The range of motion of the injured elbow as recorded at 2nd follow up immediately after removal of the pins and plaster was found very limited with mean value 37.91°. The range of motion gradually increased and it was recorded between 58 to 125 degrees with mean value 96.16°. The ROM further improved by the last follow up. At fourth follow up (16th week) it measured between 122 to 145 degrees very close to the ROM values in corresponding normal elbows. The mean value was 133.44° ± 5.2 Mean ROM of the normal elbow was recorded 139.84° ± 3.5. The p value between fourth and the normal reading was calculated to be 0.001 (<0.05) which is statistically significant in this study. **Table 3: Range and Mean of motion.**

ROM (n=32)	Minimum (in degrees)	Maximum (in degrees)	Mean	S.D.	p value
Normal elbow	130	145	139.8	3.5	<0.0001
Injured elbow ROM 4 th FU	122	145	133.4	5.2	

The result of the study was assessed on the basis of Flynn's grading criteria. The result was assessed on the basis of cosmetics (loss of Carrying Angle) and function (loss of ROM) collectively. On final grading out of 32 cases, 11(34.4%), 13(40.6%) and 8(25%) were rated as excellent, good and fair result respectively. The overall result including all the three groups were rated Satisfactory and none of the cases had poor or unsatisfactory result.

Grading of the result on basis of loss of Cosmetic (CA) and Function (ROM) collectively as mentioned in Flynn's criteria at fourth follow up:

Table 4: Outcome of the Observations.

Rating	Final Flynn's grading	
	Frequency	Percent
Satisfactory:		
Excellent	11	34.4
Good	13	40.6
Fair	8	25.0



Unsatisfactory		
Poor	0	-
Total	32	100.0

Discussion:

Achieving a good reduction through lateral approach especially in posterolateral displacements is always a problem. This is easily overcome by a small secondary medial incision. Prevention of cubitus varus or valgus deformity by obtaining near accurate reduction is necessary. Baumann's angle is the most frequently cited method of assessing fracture reduction. It correlates well with final Carrying angle without changing significantly from the time of initial reduction to final follow up, if fixed properly. A change of 5° in Baumann's angle corresponds with 2° change in Carrying angle. Williamsson *et al* found that an average of 72° (64-81°) could be considered a normal Baumann's angle and that as long as Baumann's angle doesn't exceed 81°, cubitus varus wouldn't occur⁴

The final outcome of the study was graded using FLYNN's criteria; which accounts for both loss of elbow ROM as compared to the normal side and loss of the Carrying Angle in comparison with normal side. Initially the elbow ROM was evaluated at third follow up around 10th week and compared with the normal side. By that time none of the cases achieved satisfactory grading. Reassessment of the cases was done at fourth follow at 16th week and significant recovery in the range of motion was recorded by that time. At fourth follow up eleven cases (34.4%) were recorded having overall "excellent" result considering both the factors. When the results were considered on functional and cosmetic basis separately; "excellent" result was found in eleven (34.4%) and twenty four (75%) cases respectively. Similarly, thirteen (40.6%) and eight (25%) cases had overall "good" result; while eight (25%) cases were recorded having "fair" result on functional basis alone. The combined number of cases falling in above three groups, altogether 32 (100%) were rated having "satisfactory" result based upon both functional and cosmetic criteria together. None of the case ended up with "poor" and "unsatisfactory" result. The possible factors leading to fair results may be per operative incomplete reduction and insecure fixation. The result can be even better if the cases are operated in time and little extra effort is applied to achieve proper reduction and secure fixation during operation. Repeated manipulations even in difficult fractures and lack of proper physiotherapy on part of the patient may be another possible cause of those fair results. Long term follow up may show further improvement in the grading of the satisfactory group as the time passes by; because loss in ROM rather than loss of Carrying angle has been the prime cause of substandard result. In a similar study, Boyd *et al*⁵ used two lateral percutaneous k-wires for fixation of 71 displaced supracondylar fractures. By using Flynn's criteria, they achieved satisfactory results in 70 (98.59%) cases. By using 'Z' proportion test, the result was compared with that of ours which was found statistically not significant ($p=0.32 > 0.05$). Our final result is also comparable to the result of C Yildirim¹ who had 34(91.89%) "Satisfactory" result with closed reduction and percutaneous crossed pin fixation in a similar series of 34 displaced supracondylar fractures. When our result was compared with this result by 'Z' proportion test, it was found statistically insignificant ($p= 0.09 > 0.05$). Our results were compared with another study of open reduction and pin fixation in different configuration done by Srivastava S in 42 displaced supracondylar humeral fractures⁶. Out of 42 cases 41(97.62%) had satisfactory result which is also comparable to our result of the similar nature of the study but with only lateral entry pin fixation($p= 0.32 > 0.05$).



Conclusion:

More than 90% good to excellent result can be obtained with open reduction and internal fixation of displaced supracondylar humeral fractures through lateral approach provided certain technical problems like near anatomic reduction, wide placement of the pins and good purchase in the opposite cortex by pins are kept in mind during operation.. In this way, chances of post operative ulnar nerve neuritis are totally ruled out besides getting adequate satisfactory results.

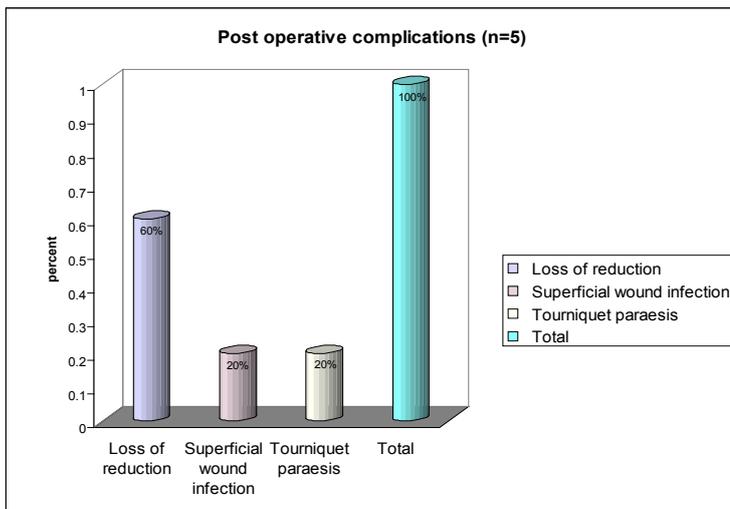


Figure 1: post operative complications

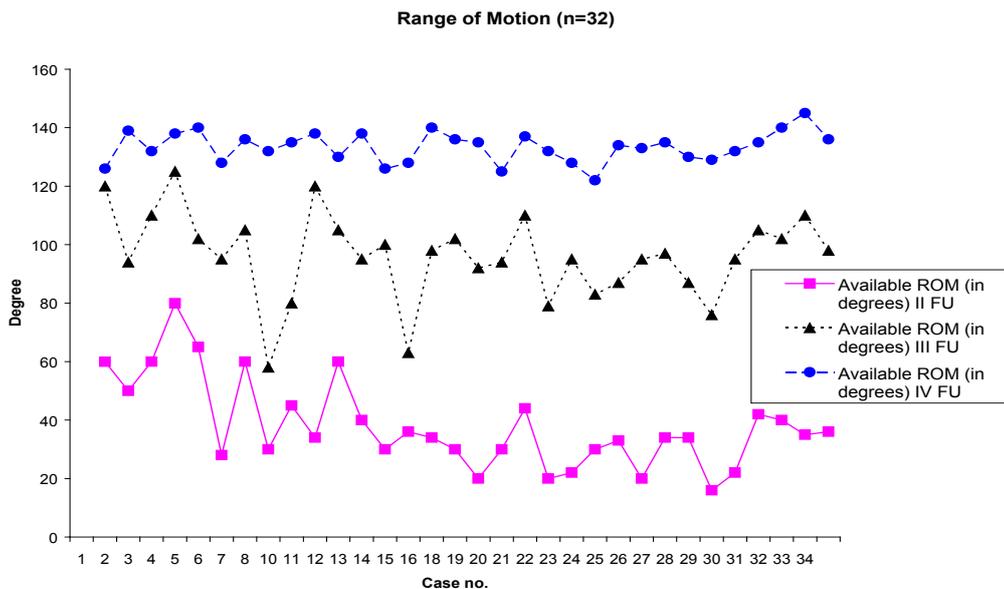


Figure 5: Available ROM

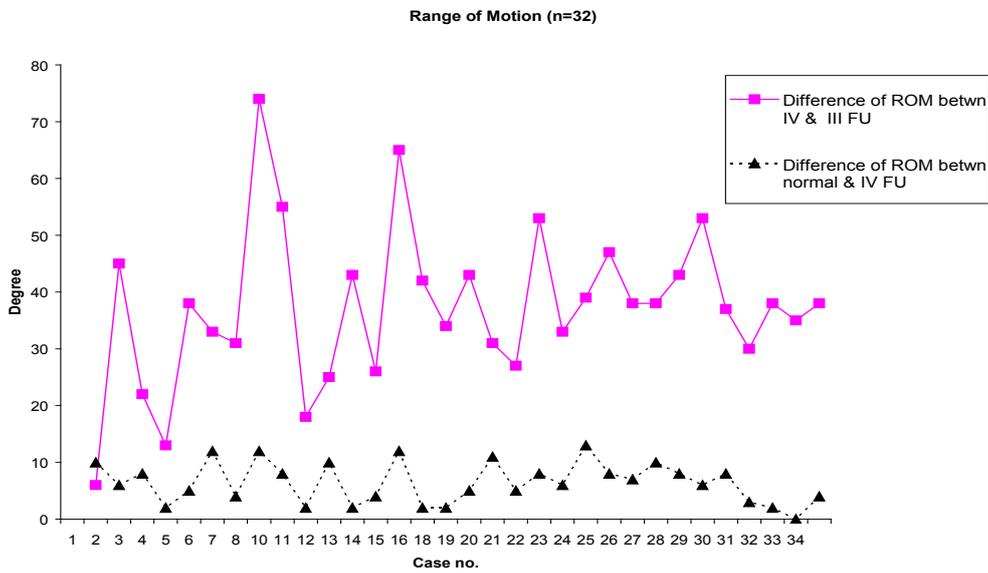


Figure 6: Difference in ROM.

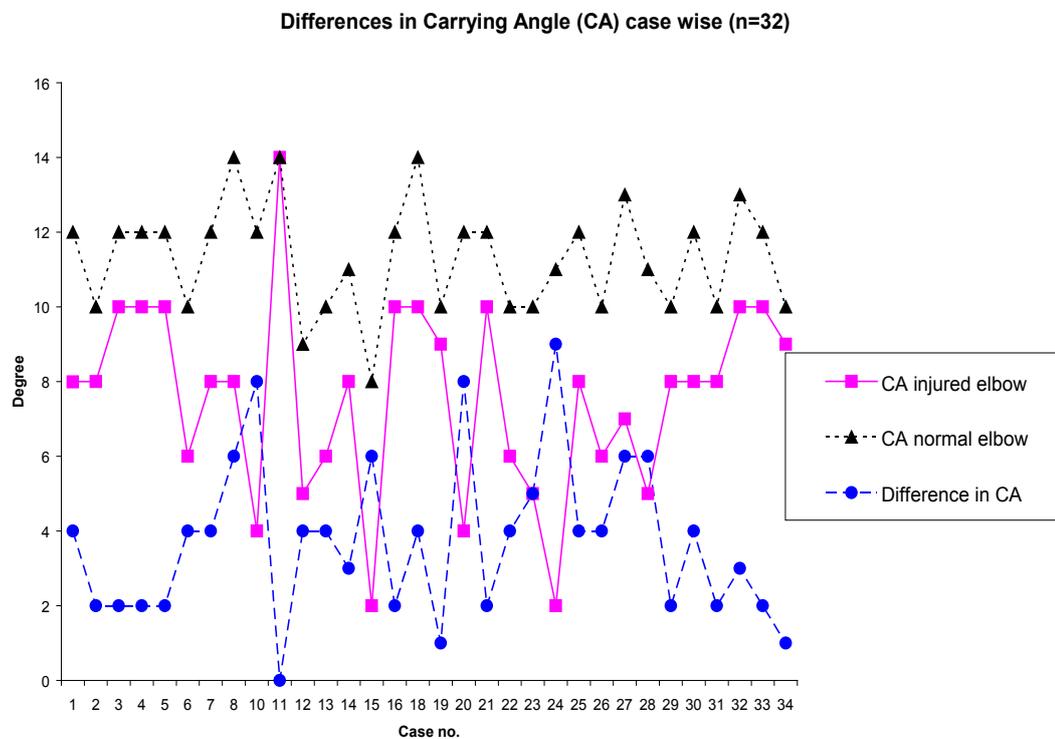


Figure 2: Differences in Carrying Angle (CA) case wise:

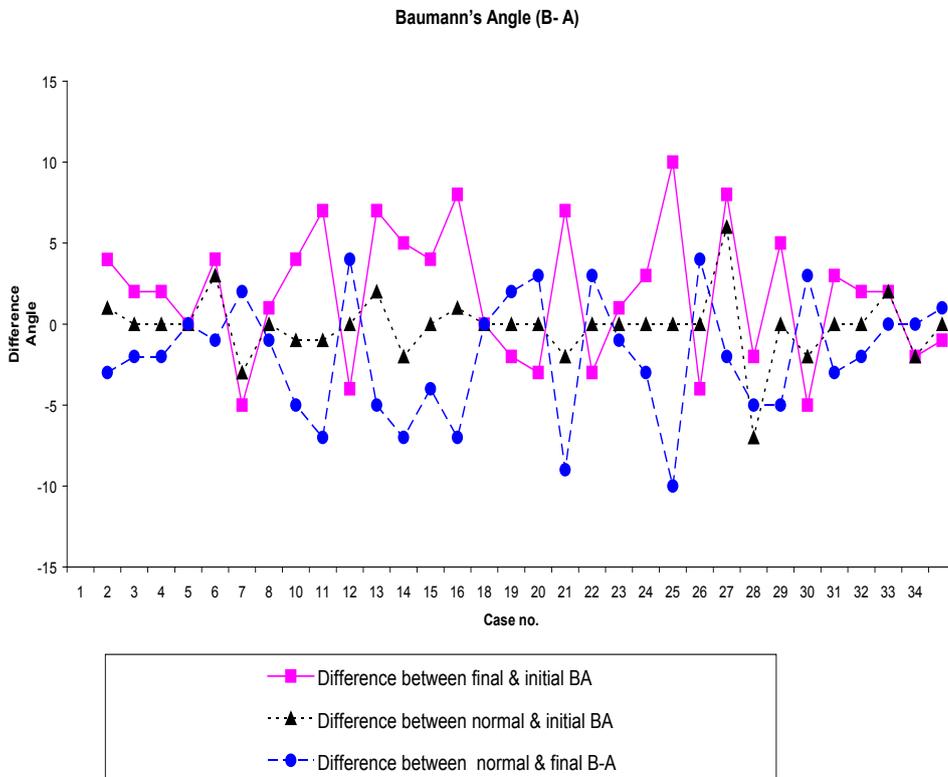
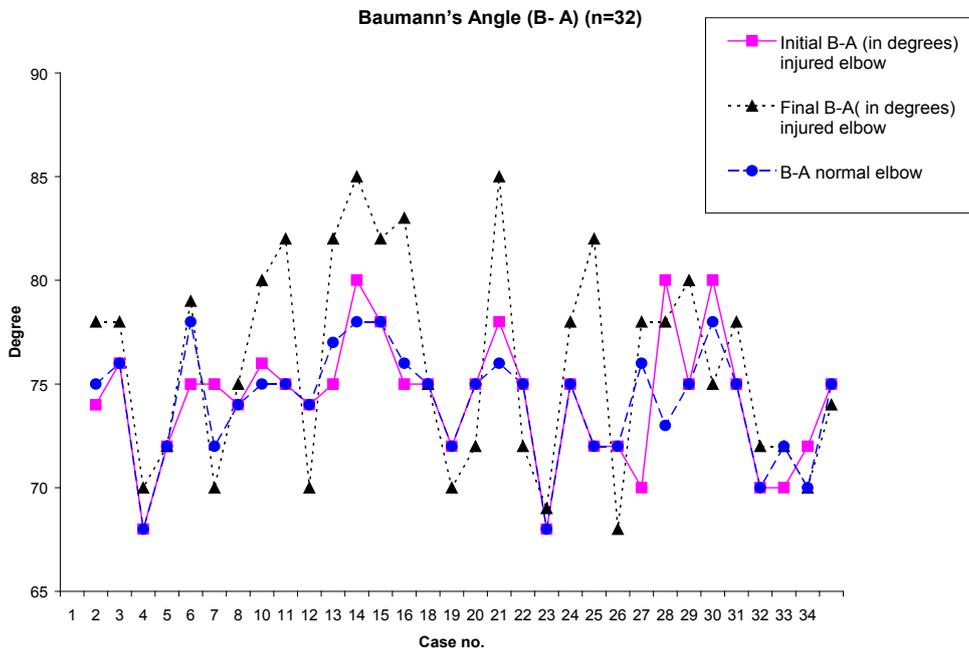


Figure 4: Difference in Baumann's Angle



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Can Visual Discomfort Influence on Muscle Pain and Muscle Load for Visual Display Unit (VDU) Workers?

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Abstract. In three different prospective epidemiological studies, correlation between visual discomfort and average pain intensity in the neck and shoulder, were $0.30 < r < 0.72$ for VDU workers. In the first study, correlation between visual discomfort and pain in the neck and shoulder was $0.30 < r < 0.40$. In the second study, visual discomfort was related to neck pain, ($r=0.40$, $p=0.003$). In the third study, visual discomfort correlated to neck pain ($r=0.69$, $p=0.000$) and shoulder pain ($r=0.72$, $p=0.000$). In order to study more in detail the correlation between visual stress and muscle load, a laboratory study was carried out. Visual stress was induced by the size of characters on the screen (8 points and 12 points Times New Roman) and the luminance levels in the surroundings of the screen (between 1500 and 2300 cd/m^2) versus (between 70 and 100 cd/m^2). The results showed that the smallest characters 8 points and the highest luminance levels had no significant influence on the muscle load in neck and shoulder regions. However, the productivity was significant lower when using the 8 points characters compared with 12 points. There was also a tendency to an increase in the number of errors made.

Keywords: VDU workplaces. Lighting conditions, Visual conditions, Visual discomfort, Musculoskeletal illness, Eye blinking.

1 Introduction

Visual discomfort has a high prevalence for VDU workers [1]. Eye discomfort is related to VDU work according to Bergqvist and Knave. They found that symptoms of gritty feeling or redness of the eye as well as sensitivity to light were associated with VDU work [2]. Bergqvist et al. documented also a positive dose-response association between eye discomfort and VDU use [3]. Furthermore, Sjøgren and Elfstrøm found that the frequency of eye discomfort was related to working time at the VDU [4]. Both lighting conditions and optometric corrections are documented to be important to reduce visual discomfort [5]. Glare has significant correlations to eye focusing problems and tired eyes [6]. In a laboratory study by Sheedy and Bailey, glare from a luminarie in the upper visual field was examined. Subjective rating of light discomfort was strongly related to the luminance level of the glare source. Further, the glare magnitude was significantly related to asthenopic symptoms

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($p=0.004$) and musculoskeletal symptoms ($p=0.017$) [7]. Horgen et al. has shown that optometric corrections reduced visual discomfort and musculoskeletal pain in VDU workers [8]. More details regarding VDU work and health consequences for such work are given by Aarås et al. [8]. Punnet and Bergqvist reported very frequently pain in the musculoskeletal system for VDU workers [9]. Static muscle load, high frequency of repetitive movements and high force requirements of these movements seem to be predictors for onset of musculoskeletal discomfort [10]. Duration of repetitive movements of the upper arm was found to be associated with neck and shoulder symptoms [10]. Up till now, few studies have examined relationship between visual discomfort and musculoskeletal pain.

2 Epidemiological Studies

The aims of these studies were to investigate the correlation between visual discomfort and pain in the upper part of the body. Longitudinal epidemiological studies were performed to evaluate the aims [5, 11].

2.1 The First Study

This was a prospective epidemiological study where VDU workers were followed for a period of six years. Visual discomfort showed a relationship with pain intensity in the neck and shoulder ($0.30 < r < 0.40$) [12]. The level of discomfort/pain was assessed on a Visual Analogue Scale (VAS). Visual discomfort was 29.9 (21.7–38.09) and shoulder pain 23 (15.3–30.7) as group mean with 95 % Confidence Interval (CI). Zero was no pain 100 indicated extreme or unbearable pain. However, such studies have a lot of confounding factors such as organizational and psychosocial factors. For all psychosocial factors, there was no statistical intervention effect or time effect and no interactions between time and intervention were found.

2.2 The Second Prospective Field Study

This study was a multidisciplinary multinational ergonomic study MEPS (musculoskeletal-eyestrain – psychosocial – stress). The objective of the study was to examine the effects of various kinds of ergonomic interventions including corrective lenses on a combination of musculoskeletal, postural, and psychosocial outcomes among VDU workers. In this study, visual discomfort was related to neck pain, $r=0.40$, $p=0.003$; regression coefficient 0.37 with CI of 0.18-0.57. Neck pain was also related to burning and itching of the eye ($p=0.004$). Headache was related to visual discomfort, ($r=0.34$, $p=0.01$) [13].

2.3 The Third Epidemiological Study

This is the same study as described in 2.1, where the follow up period covers from 6 to 13 years. The results showed a significant correlation between visual discomfort and neck pain ($r=0.64$, $p=0.000$) as well as shoulder pain ($r=0.056$, $p=0.001$). For the forearm this correlation was weaker, but still significant ($r=0.35$, $p=0.04$). In a multivariable regression model when lighting and glare were excluded, visual discomfort explained 53 % of the average of the neck and shoulder pain [14].

3 Laboratory Study

The aims of the study was to evaluate how the luminance levels of the surroundings of VDU and the size of the characters on the screen effect the muscle load, the accommodation and the fixation pattern during VDU work [15].

3.1 The Design and Methods of the Study

The design and the methods of the study are described by Horgen et al. [15]. The experiment was conducted at an optimised VDU workplace. The table was adjustable and constructed to give support for the forearms on the tabletop [16]. The illumination level was approximately 500 lx on the work table. The line of sight to the midpoint of the screen was approximately 15° below horizontal. A constant visual distance from the eye to the midpoint of the screen was set to approximately 60 cm [17, 18]. The “glare” luminaries had each two 40 W fluorescent tubes, with a diffusing screen of opal acrylic sheet 1.25 m x 0.57 m, giving a luminance between 1500-2300 cd/m² (measured across the screen) [15]. These two “glare” luminaries were mounted vertically on the right side of the VDU, at approximately 45° horizontal angle from the sightline to the centre of the screen, simulating windows as they very often appear in a normal work station set up. The work task was interactive work on a 15 inch LCD screen. The test set up is shown in Fig. 1.



Fig. 1. The Workplace, with glare source a 15 inch LCD screen. The test set up is shown in Fig. 1.

To neutralize the influence of the test sequence, a 3 x 3 orthogonal Latin square design trial was used [19]. The lowest luminance level of the surroundings of the screen, (between 70 and 100 cd/m²), and the normal size of the characters on the screen, (12 points New Roman), were defined as baseline. This baseline was recorded for each participant at the start and the end of the trial. The mean of these two measurements was used as a baseline in the statistical analysis [1]. The smallest text size was 8 points Times New Roman. The combination of high luminance/normal character size, high luminance/small character size and low luminance/small character size was tested according to the orthogonal Latin square design.

The postural load on the neck and shoulder muscles was quantified by electromyography (EMG) using the Physiometer. Surface electrodes were used [20]. The load in m. trapezius (descending part) and m. Infraspinatus was used as indicators of load on the neck and shoulder areas. To perform continuous measurement of postural angles, three dual axis inclinometers were used. Angles were measured relative to the vertical by these inclinometers attached to the upper arm, head and back. The angle measurements were mainly used to control the work posture during the VDU work. The EMG and the postural angle methods are described and the methodological limitations discussed [20, 21, 22, 23, 24, 25].

There were five test sessions. Each session lasted 10 minutes of active recording, with a period of rest in between. The reason for 10 minutes active recording for each session is the recommendations by Mathiassen [26], who observed marginal information beyond approximately 10 minutes sampling of EMG of stereotyped



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work. The rest period was about 5 minutes. 16 subjects were needed in order to detect a difference in muscle load between 0.5 to 1 % Maximum Voluntary Contraction (MVC) at a power level of 80 %.

The measurements of eye-tracking and accommodation are described by Horgen et al [15].

3.2 Results

The size of the characters and the glare condition had small influence on the muscle load.

M. trapezius activities did not show significant differences when comparing the mean of the two baseline measurements with muscle activities when working with small characters and glare. This was true both for static ($p=0.21$) and median values ($p=0.07$) [14]. This was opposite what to be expected. For the median muscle load, there was significant higher activity at baseline than when working with small characters with glare ($p=0.008$) and small characters without glare ($p=0.015$). The maximal difference in static m. trapezius activity within subjects between the baseline and the measurements when the subjects were glared and bolded small characters was 1.8 % MVC.

M. infraspinatus was in most cases relatively heavy loaded. There were no significant differences when comparing the static value of the baseline measurement, working with small characters with glare ($p=0.11$) and small characters without glare ($p=0.14$). However, when similar comparison for median muscle load were done, there were significant higher activity at baseline then when working with small characters with glare ($p=0.008$) and small characters without glare ($p=0.015$). The maximal difference for static m. infraspinatus activity within subjects between the baseline measurements and the test of the glare and smaller characters was maximal 3.5 % MVC.

Erector spina lumbar part, at L3 level did not show significant differences between the baseline and the three test situations. This was true for both static and median values ($0.13 < p < 0.96$). The maximal induced stress situation within subjects was 2.75% MVC. Gaze tracking showed that the fixation time within the whole computer screen area was almost 100% of the total testing time [15].

A small transient myopic shift was observed in spite of the rather mature test subjects.

4 Conclusion and Recommendations

Three different prospective epidemiological studies have shown that there is a clear indication of a relationship between visual discomfort and pain in the neck and shoulder. In a laboratory study visual stress had small influence on the muscle load.

Working with small characters and glare did not impose or increased static muscle load for Trapezius, Infraspinatus and Erector spina. M. infraspinatus was relatively heavy loaded during this type of computer work due to high precision-dependence during tracking work. Productivity, in terms of less amount of text processed was significantly reduced when working with 8 points characters. In addition there was a tendency



an increased number of errors when working with glare. A reasonable explanation of the differences in the results between the epidemiological and the laboratory studies may be that in the laboratory study the visual stress in terms of small character and glare reduced the productivity. Reduced productivity may reduce the static muscle load and pain. For presbyopic VDU workers, the character size should be more than 8 points letters. According to a study by Helland et al. [27], glare had a significant correlation to visual discomfort, $r_s=0.35$, $p=0.040$. They showed also that visual discomfort explained 53% of the variance of the neck and shoulder pain in VDU workers.

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Assessment of Level of Awareness of Oral Hygiene Practice among Patients of Kaski District of Nepal.

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Abstract:

The oral health is a health of oral tissue in oral cavity of an individual. Oral health is also important part of health in general. Level of oral health awareness is an indicator of oral health status of people. Level of oral health awareness in Kaski district was found to be very poor. This study underscores the need for further oral health education and awareness efforts to be undertaken.

Key words: Oral Tissues, Oral Health, Level of assessment.

Introduction:

Level of oral health awareness is an indicator of oral health status of the people. Poor level signifies the poor health status and vice versa. There are marked differences in health status between people in different countries as well as between different groups in the same country¹.

This survey tries to obtain information on level of awareness about oral hygiene practice among patients attending to community well being dental care centre, Pokhara. The study was carried out from October 2006 to October 2007.

Methodology:

Total of 112 subjects were randomly selected. Among them 60 were males and 52 were females sexwise; 57 were children of 10-15 years and 55 were adult above 20 years age wise; 58 were urban and 54 were rural people place wise. A pretested and precalibrated questionnaire consisting of 10 questions were formulated in Nepali language. Subjects were asked those questions and based on their reply score 1 and 0 were awarded for "know" and "do not know" answer respectively. The maximum score was 10 and minimum was 0. Some people maintained reservation, and did not give their opinion on certain question for this no score was given. The collected data was entered into the computer for statistical analysis. SPSS version 10 was used for statistical analysis. Student t-test was applied to test for significance.



Results:

(I) Level of awareness in overall population:

Table 1: Distribution of overall subjects in percentage to their response:

S.No	Questions	Know	Do not Know	No answer
1.	One should brush twice daily after food	29%	68%	3%
2.	One should used fluoridated toothpaste for tooth brushing.	10%	89%	1%
3.	One should brush teeth with toothbrush as far as possible.	98%	1%	1%
4.	Sweets ice-cream, coke, chocolates, cadburys have harmful effects on teeth.	23%	72%	5%
5.	One should rinse the mouth vigorously immediately after intake of sweets, food etc.	1%	95%	4%
6.	Inadequate oral hygiene is the main cause for dental disease.	2%	97%	1%
7.	One should massage gum for healthy gum.	0%	97%	3%
8.	One should take balance diet regularly for healthy gum and teeth.	3%	95%	2%
9.	One should visit dentist every six month regularly for routine dental checkup.	0%	98%	2%
10.	Betelnut, supari, tobacco can cause oral cancer.	1%	97%	2%

(II) Level of awareness place wise:

Table No. 2: Distribution of subjects place wise and their mean oral health awareness score.

Place	Mean Score \pm SD	p-value
Urban people(n=58)	6 \pm 1.8	p>0.05
Rural people(n=54)	4 \pm 1.6	

(III) Level of awareness sexwise:

Table No. 3: Distribution of subjects sexwise and their mean oral health awareness score.

Sex	Mean Score \pm SD	p-value
Male(n=60)	6 \pm 1.5	p>0.05
Female(n=52)	5 \pm 1.7	

(IV) Level of awareness age wise:

Table No. 4: Distribution of subjects age wise and their mean oral health awareness score.

Age	Mean Score \pm SD	p-value
Children of 10-14years (n=57)	3 \pm 1.2	p<0.05
Adult above 20years(n=55)	6 \pm 1.9	



Discussion:

As seen in *Table 1* larger no. of subjects have poor level of awareness of oral hygiene practice. 68% people do not know that they should brush twice daily after food, 97% subjects do not know that inadequate oral hygiene is the main cause for dental disease, 97% subjects do not know betelnut, supari, tobacco can cause oral cancer, 95% subjects do not know they should take balance diet regularly for healthy gum and teeth. 97% subjects do not know they should massage gum for gingival health and 96% subjects do not know they should rinse the mouth vigorously immediately after intake of sweets and foods, 89% subjects do not know they should use fluorated toothpaste for tooth brushing, 72% subjects do not know sweet food can have harmful effect on teeth and 98% subjects do not know they should visit dentist every six month regularly routine dental checkup. *Table 2* shows there is no significance in level of awareness between urban and rural people. *Table 3* shows there is no statistical significance in level of awareness between male and female. *Table 4* shows there is statistical significance ($p < 0.05$) in level of awareness between adult above 20 years and children of 10-15 years.

Conclusion:

Health evaluation programme can be conducted for formative or summative purposes. The summative evaluation provides information about and health programme's effectiveness over or defined period of time, with a defined population in one or more setting².

The study shows level of awareness in general population of Kaski district is very poor. To improve the oral health of people first oral health personnel should make vigorous attempt to increase the level of oral hygiene awareness by applying various measures of oral health education. Prevention is better than care, thus oral health education should get top priority from concern people and organization. A chapter of oral health should be included in the curriculum of school levels. Adequate publicity should be done through local F.M Radios, Television Channels are more useful nowadays. Local social health workers should be trained to educate the rural people. One should remember that health is not mainly the issue of doctors, social services and hospitals. It is issue of social justice³.

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कर्मण्येवाधिकारस्ते
My right is to my work

PROFORMA:

Name:

Age:

Sex:

Address:

Questions:

1. Do you know one should brush twice after food?
 - a) Know
 - b) Do not know
2. Do you know one should use fluorated toothpaste for tooth brushing?
 - a) Know
 - b) Do not know
3. Do you know one should brush teeth with toothbrush as far as possible?
 - a) Know
 - b) Do not know
4. Do you know sweets ice-cream, coke, chocolates, cadburys have harmful effects on teeth?
 - a) Know
 - b) Do not know
5. Do you know one should rinse the mouth vigorously immediately after intake of sweets, food etc?
 - a) Know
 - b) Do not know
6. Do you know inadequate oral hygiene is the main cause for dental disease?
 - a) Know
 - b) Do not know
7. Do you know one should massage gum for healthy gum?
 - a) Know
 - b) Do not know
8. Do you know one should take balance diet regularly for healthy gum and teeth?
 - a) Know
 - b) Do not know
9. Do you know one should visit dentist every six month regularly for routine dental checkup?
 - a) Know
 - b) Do not know
10. Do you know betelnut, supari, tobacco can cause oral cancer?
 - a) Know
 - b) Do not know

(Score "1" for the answer "know", Score "0"for answer "do not know")

Clinical predictors of successful thrombolysis with Streptokinase and possible circadian periodicity.

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Abstract:

Hypothesis:

Predictive strength of each predictor of successful thrombolysis is different. There is diurnal variation in the efficacy of streptokinase thrombolysis.

Methodology:

Retrospective study. 34 consecutive patients treated with streptokinase. Retrospectively; success or failure of thrombolysis was determined according to accepted clinical and ECG criteria.

Results: The mean age of the group with successful thrombolysis is quite younger than the group who failed. Inferior wall MI with or without posterior wall, smoker (current or ex-) and hypertensive patients had significant thrombolysis success rate than their counterparts. A definite time peak for successful thrombolysis could be detected at the afternoon and early evening hours (12.00-2100 h); 72% of all successful cases were observed in this time interval compared with 33.3% of all failed cases, while between 21.00– 24.00 h, the percentage of successes was 8% compared with 22.2 % of all failures. **Conclusions:** Dose adjustment for the time of day may be required, with higher doses during morning hours, or preference for primary coronary angioplasty in order to avoid the increase in bleeding complications related to higher doses of thrombolytic agents.

Keywords: Clinical predictors; Circadian periodicity; Thrombolysis; Streptokinase

Introduction:

Acute myocardial infarction (AMI) remains one of the major healthcare problems worldwide and as our population ages; the incidence of myocardial infarction will remain high and is, in fact, expected to increase in women. ¹ Diabetes mellitus is one of the six primary risk factors identified for myocardial infarction, others are dyslipidemia, hypertension, smoking, male gender, and family history of atherosclerotic arterial disease. Modern therapy for AMI involves rapid and effective reperfusion. Numerous studies have demonstrated that



muscle necrosis is a time-dependent process, with brief periods of ischemia causing cell dysfunction, stunning (loss of function but preserved viability), and eventually death.²

Coronary angiography is the gold standard to determine coronary artery patency after reperfusion therapy but it is expensive, invasive and not always available early. Therefore, bedside noninvasive markers are more attractive options. Among these, electrocardiogram (ECG) has good predictive value and sensitivity. It is also easily available and cheap. Sutton et al showed that less than 50% resolution of ST segment elevation in the worst infarct lead had a sensitivity of 81%, specificity of 88% and positive predictive value of 87% to predictless than Thrombolysis In Myocardial Infarct (TIMI) grade 3 flow.³ Clinical variables that determine the efficacy of thrombolytic therapy, however, have been poorly described. This study aims to determine the successful revascularization rate following thrombolysis with streptokinase in AMI using ECG criteria and its association between various independent variables and outcome parameters.

Besides, circadian periodicity has been described for the time of onset of acute myocardial infarction.⁴⁻⁷ The early morning peak seen in transmural infarction, non-Q wave infarction and variant angina parallels the onset of other related phenomena, including sudden cardiac death, thrombotic stroke, transient myocardial ischaemia, silent ischaemia and ST-T changes in mitral valve prolapse.⁸⁻¹⁰ Morning hypercoagulability and hypofibrinolysis with circadian variations in circulating activated factor VII, prothrombin fragment F1+2, plasminogen activator inhibitor-1 and plasmin-plasmin inhibitor complex have been described, as well as other haemostatic and physiological factors, all of which might predispose towards enhanced clotting during morning hours.¹¹⁻¹³ This is probably the reason for the relative resistance to thrombolysis in the early morning that has been shown for both tissue plasminogen activator (t-PA) and urokinase.¹⁴⁻¹⁶ This study is also designed to assess possible diurnal fluctuations in the efficacy of thrombolysis with streptokinase and to see whether they follow the circadian periodicity which has already been described for the abovementioned haemostatic, physiological and ischaemic phenomena.

Methods

This retrospective cohort study involved patients who were admitted to the Intensive Care Unit of Manipal Teaching Hospital, Phoolbari, Nepal with AMI (World Health Organisation criteria). Cohorts were selected from the admission registry of ICU from the year 2006 march to 2008 February. Data was extracted from the patient records using a data extraction form. Exclusion criteria included bundle branch block AMI, non-ST elevation myocardial infarction (NSTEMI), patients who were not given streptokinase due to contraindications to the therapy, previous streptokinase use, streptokinase given in other hospitals, symptom-to-needle time of more than 12 hours.

Streptokinase infusion was given as per protocol at the standard dose of 1.5 MU over 60 min. Infusion was stopped if there was a drop of blood pressure below systolic blood pressure of 90mmHg or if asthmatic attacks developed. The first ECG was recorded prior to starting streptokinase, and the second and third ECG was then recorded immediately after completion of streptokinase infusion and after 2 hours of completion of thrombolysis respectively.

Vertical height of ST segment elevation in the lead with the maximum ST segment elevation (worst infarct lead), before and after streptokinase was measured using a standard ruler in mm. The ST segment was measured 80 ms from J point, which corresponded to the peak of ST elevation. J point was defined as the first turning



point in the ST segment on ECG. Successful thrombolysis with streptokinase was defined $\geq 50\%$ reduction in ST segment elevation after 120 min in the worst infarct lead, and complete relief of chest pain and evidence of reperfusion arrhythmias.

Baseline characteristics between groups were compared with the use of the two-sample t-test. A multivariate regression analysis that included clinical descriptors was performed to determine which factors correlated with success or failure in the various time periods and to evaluate the impact of the time of streptokinase administration parameters on success rate. Statistical data are expressed as Median (range) or Mean (\pm Standard deviation) for continuous variables or as rates (percentage) for categorical variables. The data was entered and analyzed using the SPSS Version 11.

Results:

246 patients diagnosed as acute coronary syndromes were admitted in ICU from the year 2006 march to 2008 February, and 122 (49.6%) patients were diagnosed as ST elevation myocardial infarction. Only 36 patients underwent thrombolysis with streptokinase, were taken as the study subjects. Among them, 2 were excluded (due to new onset left bundle branch block, and un-interpretable ECG as per criteria of successful thrombolysis).

The age distribution of the all the study population is given in Table 1. The most of the patients (13, 38.2%) of age group 61-70 underwent thrombolysis.

Table 1. Age distribution in the study group

Age (years)	Thrombolysis successful (25)		Thrombolysis unsuccessful (9)	
	M	F	M	F
<40	1	0	0	1
41-50	1	2	1	0
51-60	5	2	2	0
61-70	5	6	2	0
>71	1	2	2	1
Total	13	12	7	2

Thrombolysis was determined to have been successful in 25 patients (73.5%), failed in 9 patients (26.5%). The success rate in male (13) and females patients (12) was not significantly different (52% Vs 48%), while the failure rate in male (7) was significantly higher than females (2) patients (77.7% Vs 22.3%). The mean age of the group with successful thrombolysis was 60.28 ± 9.41 years which is quite younger than the group who failed (65.44 ± 10.44 years). The detailed clinical data of study population according to thrombolysis results are given in Table 2.



Table. 2 The clinical data of study population according to thrombolysis results

	Thrombolysis successful (n=25)	Thrombolysis unsuccessful (n=9)
Age (years)	60.28±9.41	65.44±10.44
Male	13 (52.0%)	7 (77.8%)
History of Hypertension	13 (52.0%)	3 (33.3%)
Current/ex- smokers	16 (64.0%)	7 (77.8%)
Alcohol intake	5 (20.0%)	2 (22.2%)
DM	3 (12.0%)	2 (22.2%)
Past CAD history	1 (4.0%)	0 (0.0%)
Average Hospital Stay days	9.35±4.75	7.78±4.11
Mortality	3 (12.0%)	2 (22.2%)
Anterior wall MI	9 (36.0%)	6 (66.6%)
Inferior ± posterior wall MI	16 (64.0%)	2(22.2%)
Other location MI	0 (0.0%)	1(11.1%)

Patients of inferior wall MI with or without posterior wall have significant success rate than of anterior wall MI (64% Vs 36%). Similarly smoker (current or ex-) had significant higher thrombolysis success rate than the non-smoker (64% Vs 36%) and hypertensive patients also had significant success than normotensive patients.

Success and failure of thrombolysis were assessed in either eight intervals of 3 hours or six intervals of 4 hours, starting from midnight, in order to find out whether there are circadian fluctuations in the thrombolytic potency and efficacy of streptokinase. A definite time peak for successful thrombolysis could be detected at the afternoon and early evening hours. When the 24-h day was divided into eight 3-hour intervals from midnight, a peak of success was observed between 12.00–21.00 h; 72% of all successful cases (18 out of 25) were observed in this time interval compared with 33.3% of all failed cases (3 out of 9), while between 21.00– 24.00 h, the percentage of successes was 8% compared with 22.2 % of all failures (Figure 1). When the 24-h day was divided into six 4-hour intervals the results were similar; in the 12.00–20.00 h time interval 60.0% of all successful cases of thrombolysis were observed (Table 3).

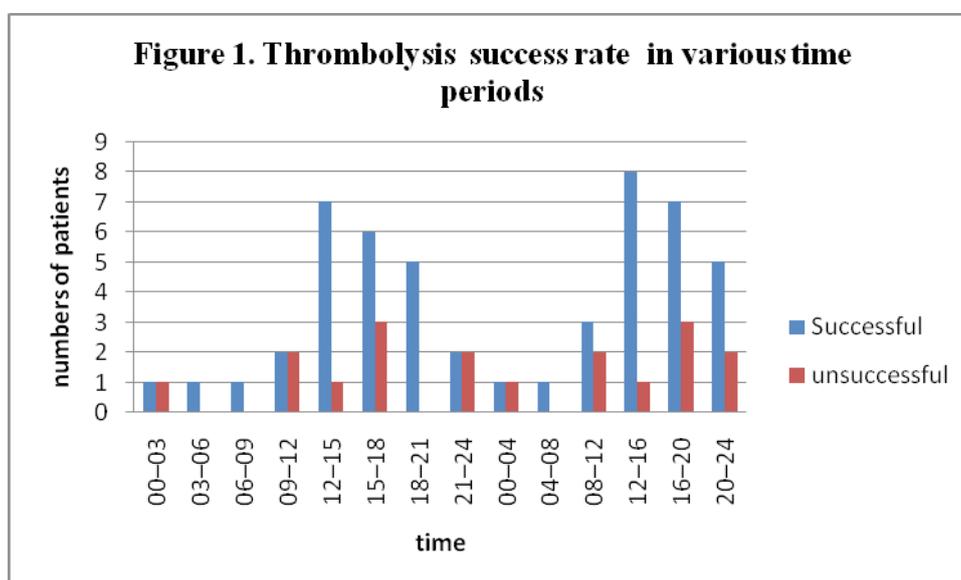
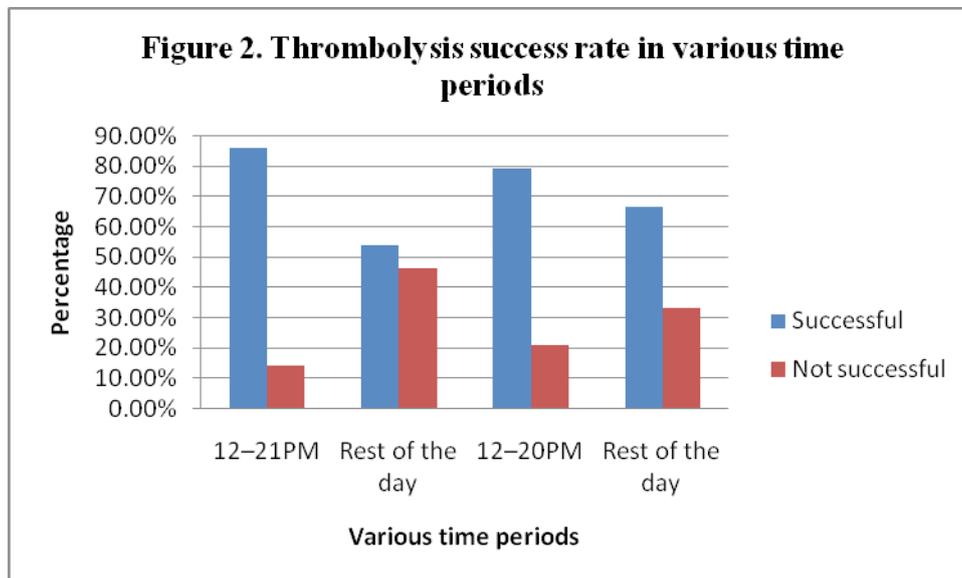


Table 3. Thrombolysis success rate in various time periods

	Successful	unsuccessful
00-03	1(50.0%)	1(50.0%)
03-06	1(100.0%)	0(0.0%)
06-09	1(100.0%)	0(0.0%)
09-12	2(50.0%)	2(50.0%)
12-15	7(87.5%)	1(12.5%)
15-18	6(66.7%)	3(33.5%)
18-21	5(100.0%)	0(0.0%)
21-24	2(50.0%)	2(50.0%)
00-04	1(50.0%)	1(50.0%)
04-08	1(100.0%)	0(0.0%)
08-12	3(60.0%)	2(40.0%)
12-16	8(88.9%)	1(11.1%)
16-20	7(70.0%)	3(30.0%)
20-24	5(71.4%)	2(38.6%)

These findings were even more pronounced when success/failure rates were determined separately for patients treated in each time interval (Figure 2). Among 21 patients treated in the 12.00–21.00 h time interval, successful thrombolysis was determined in 18 patients (85.7%) with 3 failures (14.3%).



In order to find out whether these finding could have been influenced by the most powerful determinant of thrombolysis success, the time elapsed from pain onset to streptokinase administration, this time interval was checked for each 3- and 4-hour time segment of the 12-hour period no significant difference was found between the various time intervals of “pain to needle time”.

Table 4. Thrombolysis results in each 3 – and 4 - hour time periods

Pain to needle time	Successful	unsuccessful
00-03	14 (93.3%)	1(6.7%)
03-06	7(53.8%)	6(46.2%)
06-09	3(75.0%)	1(25.0%)
09-12	1(50.0%)	1 (50.0%)
00-04	15(93.8%)	1(6.2%)
00-08	8(57.1%)	6(42.9%)
08-12	2(50.0%)	2(50.0%)

The percentage of male patients during the time interval of peak success rate (12.00–21.00h) does not differ with the percentage of males in the entire study group (55.56% Vs 52.00%), and it also did not differ from the relative male/female percentages during other time intervals.

Discussion:

Landmark studies, including Global Utilisation of Streptokinase and T-PA for Occluded coronary arteries-1 (GUSTO-1) ¹⁷ and Second International Study of Infarct (ISIS-2) ¹⁸ have shown the convincing benefits of thrombolysis and provided the groundwork for current therapeutic practice. A review by fibrinolytic therapy trialists’ (FTT) group has shown that thrombolysis prevents 20–30 deaths per 1,000 patients with 25% reduction in mortality. ¹⁹ However, 90 minutes arterial patency rate after streptokinase was only achieved in



50%–60%, and TIMI grade 3 flow from angiographical study was only achieved in 30% of the patients.²⁰ Mortality reduction in acute myocardial infarction is dependent upon the efficacy of thrombolytic regimens with regard to reestablishing normal infarct-related artery flow.²¹ Successful reperfusion of initially occluded infarct-related coronary arteries is the result of a complex interplay among clinical, hemodynamic, mechanical and biochemical factors.²² While thrombolysis clearly is effective, it has a number of serious limitations like thrombolysis is ineffective in 20% to 30% of patients with ST-segment elevation.

Thrombolysis was determined to have been successful in 25 patients (73.5%), failed in 9 patients (26.5%) which also agree with lots of studies.¹⁷⁻¹⁹ The success rate in male and females patients was not significantly different (52% Vs 48%), while the failure rate in male was significantly higher than females (77.7% Vs 22.3%). The mean age of the group with successful thrombolysis was quite younger than the group who failed. Patients of inferior wall MI with or without posterior wall have significant success rate than of anterior wall MI (64% Vs 36%). Similarly smoker (current or ex-) had significant higher thrombolysis success rate than the non-smoker (64% Vs 36%) and hypertensive patients also had significant success than normotensive patients.

There are conflicting reports concerning the effect of infarct related artery location on early patency in response to thrombolytic therapy. The TIMI I investigators reported a greater reperfusion rate (TIMI 2 + TIMI 3) in the left anterior descending coronary artery compared to either the right or circumflex coronaries in patients who received double chain t-PA.²³ GUSTO-I trial, with angiographic insights database represents the largest single trial patient population with complete demographic and angiographic data sets thus far utilized to detail important predictors of early infarct-related artery patency. It appears by multivariable analysis that the likelihood of achieving TIMI 3 flow 90-min postthrombolytic therapy in the right or left circumflex coronary artery is approximately 1.3 to 2.1 fold greater than the likelihood of achieving normal reperfusion in the left anterior descending coronary vessel. The location of the infarct segment within the infarct-related artery, that is, proximal or distal, also appears to be of importance and retains significance following adjustment for multiple clinical variables. The reason for the greater likelihood of achieving early normal flow in the right or circumflex vessels and in more proximal infarct segments of these vessels is most likely multifactorial and related, for example, to thrombus burden, plaque burden and possibly collateral flow in the infarct region. But the investigators were unable to determine the effect of collateral flow on early postthrombolytic therapy infarct-related artery patency because our database does not include pretreatment assessment of collateral flow status.²⁴ Anderson et al., reporting for the TEAM-2 Investigators, found a significantly greater reperfusion rate (TIMI 2 + TIMI 3) in the combined right and circumflex coronary arteries compared to the left anterior descending with anistreplase but no difference in vessel-specific patency rates with streptokinase.²⁵ Pacouret et al. and Leizorovicz et al. failed to find any significance of infarct-related artery on patency (TIMI 2 + TIMI 3) rates with either anistreplase or streptokinase even after adjustment for clinical variables.^{26,27}

Smokers may have a more complete fibrinolytic response to thrombolysis, leading to improved vessel recanalization for the same degree of stenosis compared with non-smokers. A detailed analysis of the paradoxical beneficial effects of smoking with regard to mortality in patients receiving thrombolytic therapy for acute myocardial infarction has been reported using the GUSTO-I Angiographic Study database.²⁸ A significant difference was noted in early (90-min) TIMI 3 patency rates between patients with a history of smoking and those who never smoked in favor of those with a smoking history (41% vs. 33%, $p = 0.02$). The TEAM-2 investigators also reported that current smokers have a significantly greater chance of achieving TIMI 3 flow in infarct related arteries 90–240 min following thrombolysis in patients treated with either streptokinase or anistreplase.²⁹ The beneficial effect of smoking remained significant in that study after adjustment for baseline



clinical and angiographic variables and was independent of the infarct-related artery.²⁹ Based on a much larger data set, Barbash et al supports the TEAM-2 findings with regard to early patency and patient smoking status. The physiologic mechanism responsible for this phenomena remains to be explained but may be related to a greater initial thrombus burden and less plaque burden in smokers.²⁹

Success and failure of thrombolysis were assessed in either eight intervals of 3 hours or six intervals of 4 hours, starting from midnight, in order to find out whether there are circadian fluctuations in the thrombolytic potency and efficacy of streptokinase. Thrombolytic therapy with streptokinase has a definite circadian pattern of efficacy, as defined by the clinical criteria, peak creatine kinase levels, time elapsed from thrombolysis initiation to peak creatine kinase, Killip class, time to disappearance of pain, time to 50% recovery of ST segment shift, and presence of reperfusion arrhythmias, as well as TIMI flow grade III in coronary angiography. Efficacy was higher in the afternoon and early evening hours and during these hours it was not related to the time elapsed from pain onset to thrombolysis initiation, gender, individual risk factors, or infarct location. When the 24-h day was divided into eight 3-hour intervals from midnight, a peak of success was observed between 12.00–21.00 h; 72% of all successful cases were observed in this time interval compared with 33.3% of all failed cases, while between 21.00–24.00 h, the percentage of successes was 8% compared with 22.2% of all failures.

These findings are concordant with the relative resistance to thrombolysis with t-PA and urokinase during morning hours and higher success rate during late afternoon/early evening hours reported by Kono¹⁶ E. Goldhammer³⁰ and Kurnik¹⁴ who used the same clinical and angiographic indices for evaluation of diurnal variations in thrombolysis efficacy. E. Goldhammer et. al found that the evidence for better efficacy in the late afternoon/early evening hours is two-fold; firstly, 30.23% of all successful thrombolytic treatments occurred in the 16.00–20.00 h period, and secondly, among patients who were treated during these hours, 86.4% had successful thrombolysis.³⁰ Thus, the circadian variations in thrombolysis efficacy and success rate which have been shown for the most frequently used thrombolytic agents are probably independent of the type of agent used.

Chronic use of low-dose aspirin may lead to a circadian shift of acute myocardial infarction incidence, with a greater reduction during the morning waking hours.³¹ Acute administration just prior to streptokinase administration in our study patients could have potentiated somewhat the overall success rate of streptokinase efficacy but certainly could not have an effect on the relative success/failure rates in each time segment.

The a priori hypothesis for this study defined streptokinase efficacy as the variable being analysed for a circadian pattern, and thus the time of initiation of treatment is the independent variable. These findings may have several clinical implications; dose adjustment of streptokinase according to the time of day may be required, with higher doses during morning hours, or a preference for primary angioplasty in order to avoid the increase in bleeding complications, particularly intracerebral hemorrhage, related to higher doses of thrombolytic agents.



Conclusion:

Successful revascularization rate following thrombolysis with streptokinase in AMI using ECG criteria clearly demonstrate that inferior wall MI with or without posterior wall, smoker (current or ex-) and hypertensive patients had significant thrombolysis success rate than their counterparts. A definite time peak for successful thrombolysis could be detected at the afternoon and early evening hours. These findings may have several clinical implications.

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Use of ampicillin / cloxacillin combination in Nepal: need for intervention

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Ampicillin (an aminopenicillin antibiotic) is one of the most widely prescribed antibiotics used in the treatment of gram-negative bacterial infections and conditions like gonorrhea and other genital infections, urinary tract infection, respiratory tract infection, gastrointestinal infection, as well as meningitis. Similarly, Cloxacillin is used in the treatment of infections caused by penicillinase-producing staphylococci. ¹

Data from Nepal and neighbouring countries suggest a widespread use of the fixed dose combination (FDC) of ampicillin and cloxacillin. Several studies from Nepal identified the (FDC) of ampicillin and cloxacillin to be one of the most commonly used drugs. A study by Lamichhane *et al* from Western Nepal identified FDC of ampicillin and cloxacillin as one of the commonly prescribed drugs.² Similarly another study by Shankar *et al* identified the FDC of ampicillin and cloxacillin was the most commonly prescribed antibiotic accounting for 63 of the 925 drugs prescribed (6.8%).³ Another study from the capital city, Kathmandu also acknowledged extensive use of this combination.⁴

In contrary to its widespread use, we could not find any data regarding justification of this combination. Moreover, worldwide accepted drug information sources like the British National Formulary (BNF), United States Pharmacopoeia Drug Information (USPDI), and American Hospital Formulary Service (AHFS) etc also do not approve this FDC. However, in Nepal this FDC is approved by the Department of Drug Administration (DDA)⁵ and is widely promoted by the companies (foreign and national).

Some of the reasons for considering this FDC irrational are listed below.^{6,7}



1. The preparation of this combination available in the market encompasses both drugs in doses of 250 mg while the effective adult dose for both has been shown to be 500mg. This leads to other ineffective drug dose.

2. Ampicillin is inactive against staphylococcus similarly cloxacillin is inactive against streptococci. Since the amount of the drug which is actually going to act in any individual patient is halved, efficacy is reduced and chances of selecting resistant strains is increased. For any given infection, one of the components is useless but adds to cost and adverse effects.

3. Both of the combination belongs to same class namely Beta lactamase acting at the same site by same mechanism offering no synergism or additive effects when combined. Moreover combining two antibiotics acting through the same mechanism cannot be justified.

Considering the irrationality behind this combination the Drug and Therapeutic Committee (DTC) of Manipal Teaching Hospital has banned the use of this FDC in the hospital.⁸

Based on this observation, we also suggest the need for evaluating the rationality behind many other combinations that are widely used in the country. Many times these combinations are considered irrational. Combination products not only increases the healthcare costs for consumers but may also give rise to sub therapeutic concentrations leading to serious complications like therapeutic failure and bacterial resistance.⁹ FDCs are acceptable only when the dosage of each ingredient meets the requirements of a defined population group and when the combination has a proven advantage over single compounds administered separately in its therapeutic effects, safety or compliance.¹⁰

We also recommend the DDA to initiate appropriate regulatory initiatives to either ban or prohibit the use of FDCs like ampicillin and cloxacillin any many more. Moreover there should be defined criteria to approve a FDC in the country. If the FDCs are not regulated properly one day the Nepalese pharmaceutical market will become the market of FDCs when the people are deprived of essential medicines.¹¹

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कर्मण्येवाधिकारस्ते
My right is to my work

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Arterial Blood Gas Analysis — a practical and step to step approach for rapid interpretation

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Introduction

An arterial blood gas (ABG) is a blood test that is performed specifically on blood from an artery. The most common puncture site is the radial artery at the wrist, but sometimes the femoral artery in the groin or other sites are used.

The test is used to determine the concentrations of gases like carbon dioxide and oxygen, bicarbonate, as well as the pH of the blood. Many blood gas analyzers will simultaneously determine the concentration of lactate, hemoglobin, several electrolytes, oxyhemoglobin, carboxyhemoglobin and methemoglobin. Thus, it provides more information than pulse oximetry. Its main use is in pulmonology, to determine gas exchange levels in the blood related to lung function, but it is also used in nephrology, and used to evaluate metabolic disorders such as acidosis and alkalosis.

Concepts:

Acid- Base Disorders:

- Primary alteration in H^+ , HCO_3^- , PCO_2 ----- abnormal pH.
- Several mechanisms are there to correct pH.
- Acute phase (min-hours): extra and intra cellular buffer system esp bicarbonate system minimizes pH changes.
- Chronic Phase (hours - days): renal or respiratory compensation partially or completely restores pH towards normal.
- Compensations are limited, doesn't result in over correction of pH.

Normal Laboratories Values

- ABG:
 - pH: 7.35-7.45
 - H^+ : 35-40 nmol/L (neq/L)
 - PCO_2 : 35-45 mmHg
 - HCO_3^- : 22-26 mmol/L
- Serum
 - Na^+ : 135-145 mmol/L
 - K^+ : 3.5-5.5 mmol/L
 - Cl^- : 96-106 mmol/L
 - Total CO_2 : 24-30 mmol/L



Basic Terminology:

Acidemia: $\text{pH} < 7.35$

Alkalemia: $\text{pH} > 7.45$

Acidosis: is the process that will result in acidemia if left unopposed.

Alkalosis: is the process that will result in alkalemia if left unopposed.

Metabolic: refers to a disorder that results from a primary alteration in H^+ or HCO_3^- .

Respiratory: refers to a disorder that results from a primary alteration in PCO_2 due to altered CO_2 elimination.

Acidosis without having acidemia can occur but an acidemia without acidosis can never occur.

Interpreting a Blood Gas Sample

Three key steps:

- A.) Consider the patient's clinical history and physical examinations
- B.) Systematically analyze the results
- C.) Integrate the clinical findings with the interpretation of the data.

A. Patient's clinical history and physical examinations.

<i>Conditions</i>	<i>Possible acid-base disorders</i>
<i>Vomiting</i>	<i>Metabolic alkalosis—loss of gastric acid</i> <i>Metabolic acidosis—if hypovolemia</i>
<i>Severe diarrhea</i>	<i>Metabolic acidosis</i>
<i>Diuretic use</i>	<i>Metabolic alkalosis due to increase loss of H and K from kidney</i>
<i>Hyperventilation</i>	<i>Respiratory alkalosis</i>
<i>Diabetic coma</i>	<i>Metabolic acidosis</i>
<i>Cardiac arrest</i>	<i>Combined respiratory and metabolic acidosis</i>
<i>Overdoses</i>	<i>Most of them give rise to metabolic acidosis but salicylate overdose—respiratory alkalosis and post sedation leads to respiratory acidosis</i>
<i>Chronic antacid ingestion</i>	<i>Metabolic alkalosis</i>
<i>Opiates overdose</i>	<i>Acute respiratory acidosis</i>
<i>Severe blood loss</i>	<i>Metabolic acidosis and secondary to hypoxia may lead to respiratory alkalosis</i>
<i>COPD/ chronic bronchitis</i>	<i>Chronic respiratory acidosis</i>
<i>Pulmonary embolus</i>	<i>Respiratory alkalosis</i>
<i>Hypotension</i>	<i>Metabolic acidosis</i>
<i>Cirrhosis</i>	<i>Respiratory alkalosis</i>
<i>Renal failure</i>	<i>Metabolic acidosis</i>
<i>Sepsis</i>	<i>Respiratory alkalosis, metabolic acidosis</i>
<i>Pregnancy</i>	<i>Respiratory alkalosis</i>

B.) Systematically analyze results



10 sequential rules

Rule #1

- Must know the pH; pH determines whether the primary disorder is an acidosis or an **alkalosis**

Rule #2

- Must know the PaCO₂ and serum HCO₃⁻

Rule #3

- Must be able to establish that the available data (pH, PaCO₂, and HCO₃⁻) are consistent

Are the data consistent? Use the Henderson Equation:

$$[H^+] = 24 \times \frac{PaCO_2}{HCO_3^-}$$

Then, Convert [H⁺] to pH: Subtract calculated [H⁺] from 80; this gives the last two digits of a pH beginning with 7

Eg; calculated [H⁺] of 24 converts to pH of (80-24) ~7.56

Eg; calculated [H⁺] of 53 converts to pH of (80-53) ~7.27

Refer to table 1 in handout for more precise conversion, or if calculated [H⁺] exceeds 80

Table 1. Relationship between [H⁺] & pH

pH	[H ⁺]	pH	[H ⁺]
7.80	16	7.30	50
7.75	18	7.25	56
7.70	20	7.20	63
7.65	22	7.15	71
7.60	25	7.10	79
7.55	28	7.00	89
7.50	32	6.95	100
7.45	35	6.90	112
7.40	40	6.85	141
7.35	45	6.80	159

Table 2. Simple Acid-Base Disorders:

Type of Disorder	pH	PaCO ₂	HCO ₃ ⁻
Metabolic Acidosis	↓	↓	↓
Metabolic Alkalosis	↑	↑	↑
Acute Respiratory Acidosis	↓	↑	↑
Chronic Respiratory Acidosis	↓	↑	↑↑
Acute Respiratory Alkalosis	↑	↓	↓
Chronic Respiratory Alkalosis	↑	↓	↓↓



- The compensatory variable always changes in the ***SAME DIRECTION*** as the primarily deranged variable
- Compensation is always ***more pronounced*** in ***CHRONIC RESPIRATORY*** disorders than in acute respiratory disorders

Rule #4:

- must know if compensation is appropriate
- compensation never overshoots
- Must have known “rules of thumb” to interpret appropriateness of compensation

Rules of Compensation

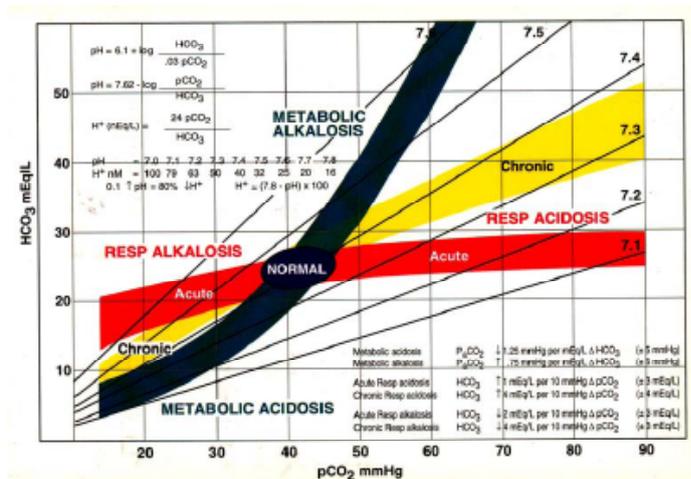
- Metabolic Acidosis: PaCO₂ should fall by 1 to 1.5 mm Hg x the fall in plasma [HCO₃⁻]
- Metabolic Alkalosis: PaCO₂ should rise by 0.25 to 1 mm Hg x the rise in plasma [HCO₃⁻]
- Acute Respiratory Acidosis: Plasma [HCO₃⁻] should rise by ~1mmole/l for each 10 mm Hg increment in PaCO₂
- Chronic Respiratory Acidosis: Plasma [HCO₃⁻] should rise by ~4mmoles/l for each 10 mm Hg increment in PaCO₂
- Acute Respiratory Alkalosis: Plasma [HCO₃⁻] should fall by ~1-3 mmole/l for each 10 mm Hg decrement in PaCO₂, usually not to less than 18 mmoles/l
- Chronic Respiratory Alkalosis: Plasma [HCO₃⁻] should fall by ~2-5 mmole/l for each 10 mm Hg decrement in PaCO₂, usually not to less than 14 mmoles/l (see Table 3)

Table 3. Compensation formulas for simple acid-base disorders

Acid-base disorder	Compensation formula*
Metabolic acidosis	Change in PaCO ₂ = 1.2 x change in HCO ₃
Metabolic alkalosis	Change in PaCO ₂ = 0.6 x change in HCO ₃
Acute respiratory acidosis	Change in HCO ₃ = 0.1 x change in PaCO ₂
Chronic respiratory acidosis	Change in HCO ₃ = 0.35 x change in PaCO ₂
Acute respiratory alkalosis	Change in HCO ₃ = 0.2 x change in PaCO ₂
Chronic respiratory acidosis	Change in HCO ₃ = 0.35 x change in PaCO ₂
Chronic respiratory alkalosis	Change in HCO ₃ = 0.5 x change in PaCO ₂

*A positive or negative change represents an increase or decrease, respectively, from the normal value of 40 mmHg for PaCO₂ or 24 mEq/L for HCO₃

Table 4. Compensation limits



LIMITS

- **Met. alkalosis** $PCO_2 < 55$
- **Resp. alkalosis** $HCO_3^- > 12$
- **Resp. acidosis** $HCO_3^- < 45$
- **Met. acidosis** $PCO_2 > 10 \text{ mmHg}$

Acute/Chronic phase only with respiratory disorders.

Case #1

A 4 year old with chronic renal failure presents to the pedes ER with history of increasing azotemia, weakness, and lethargy. Exam reveals the patient to be modestly hypertensive, and tachypneic. Labs reveal BUN=100mg/dl, and Creatinine=8mg/dl. pH=7.37, $PaCO_2=22$, and $HCO_3^-=12$ mmol/L

Data consistent? $[H^+] = 24 \times \frac{PaCO_2}{HCO_3^-} = 24 \times \frac{22}{12} = 44$

$H^+=44$, equates to pH = 7. $(80-44) = 7.36$; data are thus consistent.

HCO_3^- is decreased--- suggestive acidosis, primary disorder is “metabolic disorder” since $PaCO_2$ and HCO_3^- deranged in a direction consistent with acidosis.

Is compensation appropriate?

HCO_3^- is decreased by 12 mmoles/l

$PaCO_2$ should decrease by 1 to 1.5 times the fall in HCO_3^- , expect $PaCO_2$ to decrease by 12-18 mm Hg or be between 22-28 mm Hg

Since $PaCO_2$ is 22 mm Hg, compensation is appropriate, and **the data are consistent with a simple metabolic acidosis with respiratory compensation**

Rule #5:

- If the data are consistent with a simple disorder, it does not guarantee that a simple disorder exists; need to examine the patient’s history

Rule #6:

- When compensatory responses do not lie within the accepted range, by definition a combined disorder exists.

Case #2:

A 15 year old female presented with progressive weakness over two months. Patient is tachypneic with shallow respiratory effort. $PaCO_2$ 40 mm Hg, HCO_3^- 7, pH 6.88



Are the data internally consistent? $[H^+] = 24 \times \frac{PaCO_2}{HCO_3^-} = 24 \times 40/7 = 140,$

$[H^+] \sim 140$, which equates to a pH ~ 6.85 , so data are internally consistent
pH decreased with HCO_3^- decreased suggestive metabolic acidosis but $PaCO_2$ WNL.

Is compensation appropriate?

Metabolic Acidosis: $PaCO_2$ should fall by 1 to 1.5 mm Hg x the fall in plasma $[HCO_3^-]$

HCO_3^- decreased by 17, so we expect $PaCO_2$ to be decreased by 17-26

$PaCO_2$ WNL; since $PaCO_2$ inappropriately high, there is a **combined metabolic acidosis and respiratory acidosis**

Rule #7:

- **Always calculate the anion gap;** Often it is the only sign of an occult metabolic acidosis

Eg: acidotic patients partially treated with HCO_3^- or acidotic patients with emesis

- **May be the only sign of metabolic acidosis “concealed” by concomitant acid-base disorders**

Anion Gap is calculated based on the concept of electroneutrality; the assumption that the sum of all available cations = the sum of all available anions.

$Na^+ - (Cl^- + HCO_3^-) = \text{Anion Gap} = 10 \text{ to } 12 \text{ mmol/L}$ (Note: unmeasured cations and anions are neglected)

Serum albumin contributes $\sim 1/2$ of the unmeasured anion. 1gm/dl decline in serum albumin decreases the anion gap by 3 mmol/L. Therefore if serum albumin is 2g/dl then anion gap of 12 mmol/l is corrected by $12 + 4.5 \sim 6$ mmol/L. This is an important correction factor in settings of chronic illness or malnourished patients.

Table 5 includes the common cause of anion gap acidosis.

Table 5. Causes of Anion Gap Acidosis	
Endogenous acidosis	<ul style="list-style-type: none"> • Uremia (uncleared organic acids) • Ketoacidosis, Lactic acidosis (increased organic acid production), • Rhabdomyolysis
Exogenous acidosis	<ul style="list-style-type: none"> • ingestions: salicylate, iron; paraldehyde use
Other Ingestions:	<ul style="list-style-type: none"> • Methanol toxicity, Ethylene Glycol toxicity

Case #3:

A 16 Y/male with sickle cell anemia, hemochromatosis, & subsequent cirrhosis, presents with a several day history of emesis. On examination he is hypotensive, orthostatic, and confused.

pH=7.55, $PaCO_2=66$, $HCO_3^-=56$, $Na^+=166$, $K^+=3.0$, $Cl^-=90$

Are the data internally consistent? $[H^+] = 24 \times \frac{PaCO_2}{HCO_3^-} = 24 \times 66/56 = 28$, equates to pH ~ 7.55 ; consistent.

Since the pH, HCO_3^- and $PaCO_2$ deranged in same direction suggestive of metabolic alkalosis--- presumed due to emesis.

Is compensation appropriate?

Metabolic Alkalosis: $PaCO_2$ should rise by 0.25 to 1 mm Hg x the rise in plasma $[HCO_3^-]$

HCO_3^- ↑ed by 32; $PaCO_2$ should ↑ by 8-32, but given $PaCO_2$ ↑ed by 26, so compensation appears

appropriate

Anion gap: $\text{Na}^+ - (\text{Cl}^- + \text{HCO}_3^-) = 20$ i.e., ↑ed anion gap implies metabolic acidosis

Combined metabolic alkalosis & metabolic acidosis therefore present

Case #4:

A 3 year old with history of drug ingestion on examination found to be stuporous and tachypneic. $\text{pH}=7.53$, $\text{PaCO}_2=12$; $\text{Na}^+=140$, $\text{K}^+=3.0$, $\text{Cl}^-=106$, $\text{HCO}_3^-=10$

Are the data internally consistent? $[\text{H}^+] = 24 \times \frac{\text{PaCO}_2}{\text{HCO}_3^-} = 24 \times 12/10 = 29$; $\text{pH}=7.51$, consistent
 PaCO_2 and HCO_3^- are deranged in same direction suggestive of respiratory alkalosis.

Is compensation appropriate?

Acute respiratory alkalosis: Plasma $[\text{HCO}_3^-]$ should fall by ~1-3 mmole/l for each 10 mm Hg decrement in PaCO_2 , usually not to less than 18 mmole/l i.e., PaCO_2 ↓ed by ~30 mm Hg; HCO_3^- should fall by 3-9 mmole/l; given HCO_3^- is 10 mmol/L--- HCO_3^- ↓ is too great, so **superimposed metabolic acidosis**

Anion gap: $140 - (106 + 10) = 24$; elevated anion gap consistent with metabolic acidosis

Combined (true) respiratory alkalosis and metabolic acidosis seen in sepsis, or salicylate intoxication
Metabolic acidosis with normal anion gap occurs esp. due to loss of bicarbonates as in diarrhea or the group of condition known as renal tubular acidosis or plasma chloride increased as in hyperchloraemia metabolic acidosis.

Rule #8:

- **Mixed Acid-Base Disorders: Coexistent metabolic acidosis and metabolic alkalosis may occur. Always check the change in the anion gap vs. decrement in bicarbonate to rule out a concealed metabolic disorder.**

Case #5

A 5 year old with Bartter's Syndrome is brought to clinic, where she collapses. She has recently been febrile, but history is otherwise unremarkable. $\text{pH}=6.9$, $\text{PaCO}_2=81$; $\text{Na}^+=142$, $\text{K}^+=2.8$, $\text{Cl}^-=87$, $\text{HCO}_3^-=16$

Are the data consistent? $[\text{H}^+] = 24 \times \frac{\text{PaCO}_2}{\text{HCO}_3^-} = 122$, $\text{pH}\sim 6.9$; data are consistent
 PaCO_2 , pH are deranged in same direction consistent with respiratory acidosis but HCO_3^- didn't increase (furthermore is decreased--- may be mixed disorder).

Is compensation appropriate?

Acute Respiratory Acidosis: Plasma $[\text{HCO}_3^-]$ should rise by ~1mmol/L for each 10 mm Hg increment in PaCO_2

Since HCO_3^- is inappropriately depressed, compensation is not appropriate, and there is a concomitant **metabolic acidosis** as well

Anion gap: 39, confirms metabolic acidosis

Combined Respiratory Acidosis and Metabolic Acidosis; are there other disorders present? What about the dx of Bartter's Syndrome? Bartter's Syndrome characterized by hypokalemic metabolic alkalosis. Does this patient have a concealed metabolic alkalosis?

Anion gap is 39, or 25-27 greater than normal. Typically, increases in anion gap correlate with decreases in HCO_3^-

Assuming a 1:1 relationship, as anion gap increases by 25, HCO_3^- should fall by 25, hence, Starting HCO_3^- must have been $16 + 25 = 41$. Therefore, starting HCO_3^- was ~41 mmol/l, consistent with expected chronic metabolic alkalosis. This **metabolic alkalosis** was "concealed" by the supervening profound **metabolic and**



respiratory acidoses associated with her arrest event. Final diagnosis: *Metabolic alkalosis, metabolic acidosis, & respiratory acidosis*

Rule #9:

- **Osmolar Gap:** It is a measure of molecules in plasma that are osmotically active, but cannot be measured by standard blood chemistry panels.
- Some of these molecules can lead to metabolic acidosis with an elevated anion gap, require rapid intervention to prevent permanent sideeffects.
- **Plasma osmolality:** $2(\text{Na}^+ + \text{K}^+) + \text{Glucose mmol/L} + \text{BUN mmol/L}$
- **Osmolar Gap:** Measured osmolality - calculated osmolality = $<10 \text{ mmos/L}$
- $> 25 \text{ mmos/L}$ indicates there is a significant concentration of an osmotically active molecule. Table 6 list the causes of normal or increased osmolar gap with metabolic acidosis.

Table 6 . Metabolic acidosis with an elevated anion gap

With normal osmolar gap	Increased osmolar gap
Diabetic ketoacidosis	Ethylene glycol ingestion
Lactic acidosis	Methanol ingestion
Salicylate ingestion	Alcoholic ketoacidosis
Severe renal failure (GFR : 10ml/min)	

Case #6:

A 3 year/male, unarousable, with urinary incontinence and sinus bradycardia. On examination vital signs are stable; respiratory effort is regular, but tachypneic. He is acyanotic. $\text{pH}=6.80$, $\text{PaCO}_2=33$, $\text{PaO}_2=298$. $\text{Na}^+=154$, $\text{K}^+=5.6$, $\text{Cl}^-=106$, $\text{HCO}_3^-=5$, $\text{BUN}=6$ creatinine=1.7, glucose=804, $\text{PO}_4=12.3$, $\text{Ca}^{++}=9.8$, $\text{NH}_4=160$, serum osmolality=517.

Data consistent? $\text{H}^+ = 24 \times 33/5 = 167$; $\text{pH}= 6.80$ ----- consistent.

Primary disorder is metabolic acidosis since HCO_3^- , pH , PaCO_2 all are decreased.

Is compensation appropriate?

Metabolic acidosis: PaCO_2 should fall by $1\sim 1.5 \text{ mmol/L} \times$ the fall in HCO_3^-

$1\sim 1.5 \times 20 = 20\sim 30$, so expected PaCO_2 is $5\sim 15$; but given PaCO_2 level is inappropriately high suggestive of presence of respiratory acidosis.

Anion gap: $154-106-5 = 43$. Increased anion gap.

What is the calculated serum osmolality, and does an osmolal gap exist?

$2(\text{Na}^++\text{K}^+) + \text{BUN mgdl}/2.8 + \text{Glucose mgdl}/18 = 365$ but measured is 517, suggestive of increased osmolar gap.

What is the most likely diagnosis? Most likely due to methanol/ ethanol or ethylene glycol ingestion.

Rule # 10

- **Base excess :** Amount of strong acid(base) that has to be added to a sample of blood to produce a pH of 7.40 under 37 C and PaCO_2 of 40mmHg.
- Normal range= $\pm 3 \text{ momol/L}$.
- A base excess above 3.0 mmol/L indicates 3 mmol/L of strong acid is needed to be added per liter to the sample to get pH of 7.40: indicates metabolic alkalosis.
- A base excess of below $- 3\text{mmol/L}$ indicates a metabolic acidosis.

C.) Integrate the clinical findings with the interpretation of the data to get the final diagnosis.

जनचेतनाको लागि

छारे रोग : हाम्रो दायित्व

डा. निर्मल लामिछाने

नशा, स्नायु तथा मानसिकरोग विशेषज्ञ

(१) पृष्ठभूमि (Background)

आधुनिक चिकित्सा विज्ञानको द्रूत विकासले दिनपरदिन शारीरिक रोगको उपचार जस्तै नसा, स्नायु तथा मानसिकरोग को उपचार पनि आशालागदो बनाउँदै लगेको देखिन्छ। नेपालको सन्दर्भमा पनि धेरै स्थानमा यी सेवा बिस्तार हुँदै गएको देखिन्छ। तर पनि जनचेतनाको अभावले धेरै नेपालीहरू अन्य थाउमा विशेषतः भार तको रान्चि, आगरा, गोरखपुर, सिलिगुरी जस्ता ठाउमा उपचार का निमित्त जाने गर्दछन्।

छारे-रोग भनेर हामीले धेरै सुनेका र देखेका छौं। तर हामीले सुनेको र देखे गरेको र साधारण हिसाबले बुझेको छारे-रोग बाहेक अरु धेरै प्रकारका छारे-रोग हुन्छन्। छारे-रोग पनि अरु रोगसरह नै शरीरभित्र खराबी भएको कारणले पैदा हुन्छ। यो रोगको प्रकोप जुनसुकै समय र स्थानमा हुन सक्दछ। सुरुमा कहिलेकाहीँ मात्र छोप्ने व्यक्तिलाई उपचार नगरेमा छिटोछिटो छोप्न सक्छ र दिनमा धेरै पटक पनि छोप्न सक्छ। अन्टोरो ठाउँ या आगोको नजिक छोप्दा चोटपटक लागि अङ्गभङ्ग हुने या जल्ने डर हुन्छ र मृत्यु पनि हुन सक्छ। यस्तै कुनै दुर्घटना नभएमा छारे रोगले मात्र व्यक्तिको ज्यानलाई कुनै खतरा हुँदैन। त्यसैले, चिकित्सक, आम जनता र सम्बन्धित सबै सचेत रही छारे-रोगको पहिचान, उपचार, र रोकथाममा आ-आफ्नो भूमिका निभाउन सरिक हुनुपर्दछ।

(२) छारे रोगको परिचय (Seizure disorder)

समयसमयमा केहीबेरका लागि मात्र अपर्भट मुर्छा पर्ने, आँखा पल्टाउँने, मुखबाट फिज निकाल्ने, हातखुट्टा भटकाउँने र एकाएक आफैँ ब्यूँझने एक प्रकारको मस्तिष्कको रोगलाई छारे-रोग, एपिले प्सी (Epilepsy) वा सिजर डिस्अर्डर (Seizure disorder) भनि धेरैको बुझाई छ। तर यो छारे-रोगको एक प्रकार मात्र हो। वास्तवमा छारे रोग मस्तिष्कको कुन भागमा असर परेको हो सोहि आधारमा विभिन्न चिन्ह तथा लक्षणले प्रस्तुत हुने गर्दछन्।

। सामान्यतया छारे रोगका चिन्ह तथा लक्षणहरू ५ मिनेट भन्दा कमै हुने गर्दछन्। त्यसपछि बिरामी एकाएक आफैँ ब्यूँझने हुन्छन्। कुनैकुनै छारे-रोगमा बिरामी बेहोस हुँदैन भने कुनैमा बे होस भएको पाइन्छ।

(३) छारे रोगको मार (Epidemiology)

छारे रोग मस्तिष्क सम्बन्धि समाजमा अत्यन्त व्याप्त रोग हो। आम जनसंख्यामा भन्दा एक प्रतिशत व्यक्तिहरू यो रोगबाट पीडित भएका हुन्छन्। छारे-रोग कुनै पनि उमेरका मानिसलाई हुन सक्छ भने छारे-रोगका कारणहरू भने उमेर समूह हेरेर फरक फरक हुने गर्छ। सर्वसाधारण जनसंख्याको करिब १ प्रतिशत मानिस यो रोगले ग्रस्त भएको पाइन्छ।

(४) छारे रोगका कारणहरू (Etiology)

धेरै जस्तो अवस्थामा छारे-रोगका कारण यकिन गर्न नसकिने भएतापनि यसको सम्भावित मुख्य कारणहरू निम्न प्रकार छन् :-

- जन्मदा मस्तिष्कमा लागेको चोट।
- मस्तिष्क ज्वर (मेनिन्जाइटिस, इन्सेफलाइटिस आदि)।
- टाउकोमा चोटपटक लागनाले।
- मस्तिष्कको ट्युमर।
- अत्याधिक रक्सी सेवन।
- मस्तिष्कलाई असर पार्ने कुनै पनि कारण जस्तै - धेरै लामो अवधिसम्मको कडा कमलपित्त, कडा खालको मृगौलाको रोग, परजीविको कारणले आदि।

जुनसुकै तत्व वा तत्वहरूको मिश्रणले भूमिका खेलेतापनि अन्तत्त्वगत्वा मस्तिष्क तथा स्नायुकोषको विशेष समूह (neurons) मा नै गड्बडि हुने देखिन्छ।

(५) छारे रोगका चिन्ह तथा लक्षणहरू (Clinical Features)

छारे रोग धेरै प्रकारका हुन्छन् र मस्तिष्कको कुन भागमा असर परेको हो सोहि आधारमा विभिन्न चिन्ह तथा लक्षणले प्रस्तुत हुने गर्दछ। सामान्यतया छारे रोगका चिन्ह तथा लक्षणहरू जस्तै : मुर्छा पर्ने, आँखा पल्टाउँने, मुखबाट फिज निकाल्ने, हातखुट्टा



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भटकाउंन आदी लक्षणहरु ५ मिनेट भन्दा कमै हुने गर्दछन् । त्यसपछि विरामी एकाएक आफैँ ब्यँभने हुन्छन् । कतिपय विरामीले मुर्छित अवस्थामा जिब्रो/ओठ टोक्ने, दिसा/पिसाब गर्ने हुन्छ र ब्यँभे पछि केहि समय बेसूर हुने, थकाईको महशुश गर्ने वा निदाउंने हुन्छन् । कुनैकुनै छारे-रोगमा भने विरामी बेहोस नहुने तर अनौठो व्यवहार देखिने हुन्छ । यस्ता विरामीको पहिचान अनुभवि र **विशेषज्ञ** डाक्टर बाट मात्र सम्भव हुन सक्दछ । यस्तो अवस्थामा रोगको सहि पहिचानका निमित्त इ.ई.जि.,(EEG), सिटि स्क्यान (CT Scan) र एम.आर.आई (MRI) जस्ता परिक्षणको आवश्यकता पर्न सक्दछ ।

(६) छारे रोगका उपचार (Treatment)

छारे-रोगको उपचार समयमा नै भएमा पूरै निको हुन सक्छ । शिघ्र उपचार नै सफल उपचारको आधार हो । साधारणतया छारे-रोगको उपचार अस्पतालको बहिरङ्ग विभागबाट नै गर्न सकिन्छ । यो रोगको उपचार साधारण स्वास्थ्य चौकीमा पनि सम्भव हुन्छ, कुनै ठूलो अस्पतालमा गइरहुनु पनि पर्दैन । बहुसंख्यक विरामीहरुलाई विशेष स्वास्थ्य परीक्षण गराउनु जरुरत पर्दैन । रोगको प्रकृति अनुसार उपचारका लागि हाल विभिन्न किसिमको औषधीहरु उपलब्ध छन् । रोगको सहि पहिचान, सहि औषधी, मात्रा र अबधिको प्रयोग गरेमा यो रोगको उपचार अत्यन्तै प्रभावकारी हुने गर्दछ । धेरै अवस्थामा यस रोगको उपचार सरल र सस्तो पनि छ । यस रोगमा प्रयोग हुने हरूमा प्रमुख औषधी निम्न लिखित पर्दछनः

- फेनोबार्बिटोन(Phenobarbitone)
- फेनिटोइन(Phenytoin)
- कार्बामाजेपिन(Carbamazepine)
- सोडियम भाल्प्रोएत(Sodium Valproate)

(७) छारे रोगका विरामी र परिवारले ध्यान दिनुपर्ने कुराहरु (Psychoeducation):

● विरामीलाई रोगले छोपेको बेलामा देखेको विवरणहरु याद गर्ने र स्वास्थ्य कर्मीलाई ति विवरणहरु दिएमा रोगको सहि पहिचान तथा उपचारमा मद्दत हुन्छ र गलत निदानबाट पनि बचिन्छ । जस्तै: छोपेको समय, हातखट्टाको अवस्था, जिब्रो टोकिएको, मुखबाट फिज निस्केको, आखा माथि पल्टिएको, कपडामा दिसा पिसाब भएको, अनौठो व्यवहार गरेको आदि लक्षणहरुको आधारमा डाक्टरलाई रोगको सहि पहिचानमा मद्दत पुग्दछ ।

- उपचार निरन्तर र लामो अबधिको हुन्छ । एक दिन पनि नविराईकन पछिल्लो पटक छोपेको मितिले कम्तीमा पनि दुई वर्षसम्म औषधीसेवन गरिरहुनु पर्दछ । त्यसैले आफूले खाने औषधीको नाम याद राख्ने, आफुसँग पर्याप्त औषधीको मात्रा राख्ने र औषधीलाई घरमा सुरक्षित स्थानमा राख्नु पर्दछ ।
- छोप्ने क्रम रोकिएपछि पनि औषधी सेवन टुटाउंनु हुँदैन र धेरै समयदेखि रोकिएको रोगलाई निको भैसक्यो भन्ठानेर डाक्टरको सल्लाहबेगर उपचार रोकेमा फेरि रोग दोहोरिन सक्छ ।
- कुनैकुनै औषधीले भुम्म पार्ने हुदाँ औषधी सेवन गरेको अवस्थामा सवारी तथा मेसिनरी सामान चलाउंनु हुँदैन ।
- कसैकैलाई औषधीको शुरुवातको समयमा केहि दुष्परिणामहरु देखिन सक्दछ । जस्तै : शरिर चिलाउंने वा शरिरमा दानाहरु देखिने, चक्कर वा वाक्वाकी लाग्ने आदि । औषधीको प्रयोग गर्दा यस्तै वा अरु कुनै किसिमको कठिनाईको अनुभव भएमा तुरुन्तै डाक्टर वा स्वास्थ्यकर्मीसँग छलफल गर्नु पर्दछ ।
- यस्तो रोग लागेको व्यक्तिले कुनै पनि नसालु पदार्थ सेवन गर्न हुँदैन । मदिरा, गाँजा, भाडजस्ता वस्तुहरुले मस्तिष्कमा प्रत्यक्ष असर पार्ने हुँदा रोग निको हुन पाउँदैन । नसालु पदार्थको सेवनले यस रोगमा प्रयोग हुने औषधीको प्रभावकारितालाई घटाउने र रोग बल्किने गराउंदछ । रोग निको भई डाक्टरको सल्लाहले औषधी छाडिसकेपछि पनि लागू पदार्थको सेवन गर्न हुँदैन ।
- कुनै पनि बेला र ठाउँमा रोग निस्कन सक्ने हुनाले छारे-रोगका विरामीले आगो, पानी, छाँगो, भीर, उँचाइ र मेसिनरी चीजदेखि सर्तक हुनुपर्दछ । र सुरुको अवस्थामा त यस्ता चीजबाट टाढै रहनु बेस हुन्छ ।
- औषधी सेवन गरिरहेको समयमा अरु कुनै रोग लागेमा सम्बन्धित चिकित्सकलाई आफूले खाइँरहेको औषधीको विवरण दिनु पर्दछ । यसो गर्नाले दुबै रोगको उचित उपचार हुन्छ र औषधीहरुको दुष्परिणामबाट पनि बचिन्छ ।
- छारे-रोगका विरामीले आफ्नो दिनचर्यालाई नियमित बनाउंन अत्यन्त जरुरी र लाभदायक हुन्छ, जस्तै;
 - ⇒ राती नियमित समयमा सुत्ने र बिहान ठिक समयमा उठ्ने जस्तै; ९ बजे देखि ५ बजेसम्म ।
 - ⇒ ६ देखि ८ घण्टाको निन्द्रा शरिरको दैनिक आवश्यकता हो । दिउँसो नसुत्नु नै हाम्रो सामाजिक परिपेक्षमा हितकर हुन्छ । त्यसैले राती नै पुरा निन्द्रा सुत्ने बानी सर्वोत्तम हुन्छ ।
 - ⇒ सधैँ नियमित समयमा भोजन गर्ने बानी बसाल्ने र पौष्टिक सन्तुलित खानाहरु खाने ।
 - ⇒ नियमित कसरत गर्ने । यसको लागि बिहान २० मिनेट



(वा २ देखि ३ किलोमिटर) हिड्नु सबै भन्दा सरल र उपयोगी उपाय हुन्छ ।

यस्तै केही सीमित कुराहरुबाहेक छारे-रोगका विरामीहरुले अरु सरह स्वभाविक जीवन बिताउन सक्छन् । अध्ययन गर्न, प्रायः जुनसुकै पेशा अपनाउन, पारिवारिक जीवन सुरु गर्न कुनै रोकटोकको आवश्यकता छैन र समाजमा अरु व्यक्ति सरह प्रतिष्ठित जीवन बिताउन सक्छन् ।

(८) छारे-रोगसम्बन्धी व्याप्त गलत धारणाहरु (Myths & Facts about Seizure disorders)

हाम्रो समाजमा छारे-रोगसम्बन्धी धेरै गलत धारणाहरु छन् र जसले गर्दा यो रोगबाट पीडित व्यक्तिले अनाहकमा दुःख पाउँछन् । केही गलत धारणा र वास्तविकताहरुको यहाँ उल्लेख गरिएको छ :-

- छारे-रोग एक व्यक्तिबाट अर्को व्यक्तिमा सर्दैन र सँगै बस्दा, सुत्दा या जुठो खाँदा अर्को व्यक्तिलाई कुनै असर पर्दैन ।
- छारे-रोग मस्तिष्कसँग सम्बन्धित यस्तो रोग हो जस्को उपचार र रोकथाम सम्भव छ ।
- यो पागलपनाको रोग हैन र यो रोग लाग्नुमा विरामीको कुनै दोष हुँदैन ।
- यो रोग दैवी-शक्ति, भूतप्रेत, बोक्सी आदिको असरले निस्कने होइन । फुक्ने, बुटी बाँध्ने, पूजा गर्ने आदि कामबाट यो रोग निको हुँदैन ।
- छोपेको बेला विरामीको सास तथा विरामीको थुक, च्याल लागे पनि यो रोग सर्दैन ।
- यो रोगले छोपिरहेको बेलामा पानी छुयाउने, जुत्ता सुँघाउने जस्ता कामहरु गर्न हुँदैन ।
- छोपिरहेको समयमा जबरजस्ती दाँतको बीचमा कुनै कडा चीज वा औंलाहरु घुसाउनु हुँदैन ।
- छोपिरहेको समयमा विरामीलाई सजिलोसँग टाउको अलिक होचो पारेर सिरानी नराखी कोल्टो पारेर सुताइदिनुपर्दछ । एकछिनपछि विरामी आफैँ होसमा आउँछ । तर होसमा नआई पटकपटक धेरै समयसम्म छोप्ने भइरहेमा तुरुन्त अस्पतालमा लैजानुपर्दछ ।
- छारे-रोग लागेको व्यक्तिको बुद्धि विकासमा कुनै असर परेको हुँदैन र सहि अवसर पाएँमा उनीहरुले जिवनमा कुनैपनि काम गर्न सक्ने हुन्छन् । उनिहरुले अध्ययन गर्न सक्दछन्, काम गर्न सक्दछन्, र अरु सरह जीवनयापन गर्न सक्दछन् । इतिहासमा यस्ता धेरै हस्तिहरु छन्

जस्ले छारे-रोग लागेर पनि सफलताको शिखरसम्म पुगेका छन् ।

- छारे-रोग लागेको व्यक्तिले विवाह गर्न र सन्तानलाई जन्म दिन सक्दछन् ।
- छारे-रोग लागेको व्यक्तिलाई त्यस्तै व्यवहार गर्नुपर्दछ जस्तो व्यवहार हामी मधुमेह, उच्च रक्तचाप या दम रोग लागेको रोगीसँग गर्दछौ । उनिहरुलाई ज्यादा सहानुभूति वा उपेक्षा देखाउनु हुँदैन ।

(९) छारे-रोग जो कसैलाई लाग्न सक्दछ (Nobody is immune to seizure disorders)

यदि हामीले इतिहासको पानामा हेर्ने हो भने धेरै महान हस्तिहरु यस रोगको शिकार भएको तथ्य भेटाउँछौ । यसबाट छारे-रोग जो कसैलाई पनि लाग्न सक्ने तथ्य प्रस्ट हुन्छ । यस रोगबाट कुनै जाति, धर्म, गरिब, धनी, महिला, पुरुषको भेदभाव हुँदैन ।

तल छारे-रोगको शिकार भएका केहि महान हस्ति हरुको उल्लेख गरिएको छ :

- टाँनी ग्रेग (पूर्व क्रिकेटर)
- जाँन्टी रोड्स (पूर्व क्रिकेटर)
- आइजक न्यूटन (वैज्ञानिक)
- अल्फ्रेड नोबल (स्वीडिस केमिस्ट)
- ब्लेज पास्कल (चिकित्सक एवम लेखक)
- लॉर्ड बायरन (अंग्रेजी कवी)
- नेपोलियन बोनापार्ट (फ्रान्सेली शासक)
- लियो टॉलस्टाय (लेखक)
- एडवर्ड लियर (सम्राट)
- पायथागोरस (वैज्ञानिक)
- जाँन अँफ आर्क (फ्रेन्च संत)
- विन्सेन्ट वैन गाँग (डच पेन्टर)

नोट (Testimonial) : यो लेख जनचेतनाको लागि लेखिएको हो । रोगको सहि पहिचान र उपचार दक्ष चिकित्सकबाट गराउनु पर्दछ ।

लेखक: डा. निर्मल लामिछाने

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कर्मण्येवाधिकारस्ते
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दाँत र गिँजाको स्वास्थ्य (भाग १)

डा. प्रकाश बराल

सामुदायिक परोपकार दन्त उपचार केन्द्र

मुख शरीरको प्रवेशद्वार हो । दाँत र गिजा मुखभित्रका महत्त्वपूर्ण अङ्गहरू हुन् । दाँत र गिँजाको स्वास्थ्य मुखको स्वास्थ्यसँग प्रत्यक्ष सरोकार राख्दछ ।

कुनै व्यक्तिसँग बोल्दा मुख नै सामुन्नेमा पर्दछ । त्यस बखत दाँत र गिँजाको स्वास्थ्य राम्रो भएन भने मुख गन्हाउने हुन्छ र असहज स्थितिको प्रारंभ हुन जान्छ । दाँतले खाना चपाउने महत्त्वपूर्ण कार्य पूरा गर्नेको अतिरिक्त शरीरको सुन्दरता पनि बढाउँछ । टम्म मिलेका सफा चम्किला दाँतहरूले मुहारको शोभा बढाइदिन्छ । दाँत भएन भने खाना राम्रोसँग चपाउन नसकिने हुन्छ र खान पनि सकिँदैन, अनि शरीरले पोषक तत्व कम पाउँछ । सडेका दाँतहरू, नमिलेका टेडामेडा परेका दाँतहरूले अनुहारलाई नराम्रो बनाइदिन्छन् । यसबाट दाँत र गिँजाको स्वास्थ्य अति महत्त्वपूर्ण छ भनेर पुष्टि हुन्छ । दन्त स्वास्थ्यलाई हेल्चेक्याई गर्नु पटककै हुँदैन । समाजमा दाँत र गिँजाका रोगहरू जस्तै - दाँते कीरा (Dental Caries) दन्त हर्षा (Pyorrhea) आदि हाम्रो लागि एउटा विकराल समस्याको रूपमा देखा परिरहेको छ र राष्ट्रिय जनस्वास्थ्यकै लागि एउटा ठूलो चुनौतिको रूपमा देखा परेको छ ।

दाँतहरू बच्चाको उमेर ६ महिना पुगेपछि आउन सुरु गर्छ । दाँतहरू २ किसिमका हुन्छन् - दूधे दाँत र स्थायी दाँत । दूधे दाँत (Milk Teeth) २० वटा हुन्छन् । माथिको दाँया लहरमा अगाडिको दाँत (Incisor) = २ (दुईवटा)

कुकुर दाँत (Canine) = १ (एक वटा)

बङ्गारा (Molars) = २ (दुई वटा)

तल माथि, दायाँ र बाँया लहरमा = $५ \times ४ = २०$ वटा हुन्छन् ।

यी दुधे दाँतहरू साढे २ वर्षमा मुखमा उम्रिसक्छन् । दुधे दाँतहरू भरेपछि स्थायी दाँतहरू आउने क्रम सुरु हुन्छ । स्थायी दाँतहरू ६ वर्षदेखि आउन सुरु गर्छ र १२-१३ वर्षभित्र (बुद्धिबङ्गारा बाहेक) उम्रिसक्छन् । बुद्धिबङ्गारा १७ वर्षदेखि २१ वर्षभित्रमात्र आउँछ ।

माथिको दाँया लहरमा -

अगाडिको दाँत (Incisors) = २ वटा

कुकुर दाँत (Canine) = १ वटा

बङ्गारा अधिलिटरमा दाँत (Premolars) = २ वटा

बङ्गाराहरू (Molars) = ३ वटा

तल, माथि, दाँया, बाँया गरी $८ \times ४ = ३२$ वटा हुन्छन् ।

दाँत उम्रने बेलाका समस्याहरू :-

समस्या (१) कहिले काही दाँतहरू उम्रने बेलामा ज्वरो आउने, पखाला लाग्ने, गिँजा सुन्निने, बच्चा रोइरहने, दूध चुस्न नमान्ने जस्ता लक्षणहरू देखिन्छन् । यसलाई टिथीङ (Teething) भनिन्छ । यो अति साधारण समस्या हो । अभिभावकहरू आत्तिनु पर्दैन । ज्वरोको उपचारको लागि पारासिटामोल सिरप खुवाउने गरे मात्र पुग्छ, अरु समस्याहरू ३-४ दिनमा आफै ठीक हुन्छन् । गिँजालाई मनतातो नुन हालेको पानीले सफा कपासमा भिजाएर पुच्छिदिनुपर्छ ।

समस्या (२) कहिले काही दाँतहरू ढिलो आउँछन् ।

दाँतहरू सामान्यतया ५-६ महिना ढिलो, चाँडो आउन सक्छ । यसमा कुनै परवाह गर्नु पर्दैन तर डेढ वर्ष ढिलो हुन थालेमा दन्त विशेषज्ञलाई देखाउनु पर्छ । दाँत ढिलो उम्रनुमा धेरै कारणहरू हुन्छन् । जस्तै - पोषकतत्वको कमी (Nutritional Deficiency) हरमोनको मात्रा असन्तुलित (Hormonal disturbances) जस्तै थाइरोइड र पारा थाइरोइडको मात्रा घटीबढी हुने (Hyperthyroidism, hypothyroidism, hyperparathyroidism, hypoparathyroidism etc) पहिले कारणहरू पत्ता लगाउनु पर्छ र सोही बमोजिम त्यसको उपचार गर्नुपर्छ ।

दाँत ढिलो आउन लागेको महसूस भएमा एउटा X-Ray तत्काल गरेर दाँतको स्थिति (Position), बनावट (Morphology), कुनै बाधा-व्यवधानहरू (interferences) छन् कि नियालेर हेर्नुपर्छ । जस्तो - तन्तुको पिण्ड (Tumor) आवश्यकभन्दा बढी बनेका दाँतहरू (Supernumerary teeth) उदाहरणको लागि मेजोडेन्स (Mesiodens), बनौट बिग्रिएको बाङ्गो जरा (Dilacerated roots), दाँत बन्ने क्रममा चोट लागेर हड्डीसँग जोडिएको (Ankylosed) छ कि आदि आदि ।

समस्या (३) बुद्धि बङ्गारा आउँदा निकै पीडा दिन्छ र अक्सर यो ठीक ठाउँमा ठीक तवरले आउँदैन किन ?

समाधान - मानव विकासको क्रमसँगै (Human Evolutionary



trend) मानिसको शरीरमा पनि निकै परिवर्तनहरु देखा परिरहेका छन् । मानिसको माथि र तल्लो दाँतहरु रहने हड्डी (Maxilla / Mandible क्रमशः) सानो-सानो आकारमा परिणत भइरहेका छन् । वर्षौं पहिलेका पुर्खाहरुको आकार (Size) ठूलो थियो । सायद उनीहरु काँचो, खस्रो (Raw and rough foods) खानाहरु खान्थे । तर अहिलेका मानिसहरु मसिनो, नरम खानाहरु (Soft and refined diet) खान्छन् र चपाउने बल कम भएपनि हुन्छ । अतः दाँतहरुको संख्या पनि क्रमशः घट्ने क्रममा छ । अतः बुद्धि बङ्गारा अक्सर सानो आकारको हुन्छ । दाँतहरु रहने हड्डी नै सानो आकार (Small size) को हुँदै गएकोले बुद्धि बङ्गारा अटाउनै सकेन र यो प्रायः कोल्टे परेर उम्रन्छ वा गिँजाभिन्न आधा र आधा गिँजा बाहिर परेर बस्छ । यस्तो अवस्थामा गिँजा सुनिने, दुख्ने हुन्छ । यस अवस्थालाई पेरीकोरो नाइटिस (Pericoronitis) भनिन्छ । यसमा ज्वरो आउने, दुखाई कानतिर जाने (Pain referred to ear), गाला सुनिने (Buccal space infection) आदि हुन्छ । यसको लागि

पेनिसिलिन Penicillin वा सिप्रोफ्लोक्सासिन (Ciprofloxacin) वा इरिथ्रोमाइसिन (Erythromycin) मध्ये कुनै एक ग्रुपको प्रतिजैविकी औषधि (Antibiotic) दिने, मेट्रोनिडेजोल औषधि, एमएरोविक ब्याक्टेरियाको लागि दिने, दुखाई कम गर्ने Analgesic and Antiinflammatory ग्रुपको कुनै औषधि Brufen वा Declofenac, Nimesulide आदिमध्ये कुनै एक दिने ।

Betadine gargle ले मुख कुल्ला गर्ने ।

समस्याको स्थायी समाधानको लागि एउटा Dental X-Ray गरेर हेर्ने । कोल्टेपरेको अवस्थामा दाँत नै भिकेर फालिदिने (Dental Extraction) गर्नुपर्छ ।

(अरु समस्याहरु र तिनको समाधान क्रमशः अर्को जर्नलमा प्रकाशित गरिनेछ ।)

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