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ORIGINAL ARTICLES

- A Survey of Cross-Infection Control Procedures in the Department Of Prosthodontics and Maxillofacial Prosthetics among Dental Students and Interns** 162-166
Bhochhibhoya A, Acharya B, Rana SB, Sharma R, Acharya J
- Spectrum of Head and Neck Masses in KIST Medical College Teaching Hospital** 167-170
Chalise SR, Bhatta S, Pantha T, Khanal MP, Aryal G
- Symptoms of Hyponatremia in Hospitalized Patients in a Medical College in Kathmandu** 171-173
Adhikari P, Khatiwada B
- An Evaluation of Hearing among Mobile Phone Users** 174-178
Joshi RR, Shah S, Rijal AS, Shrestha KK, Dhungana A, Maharjan S
- The Profile and Antimicrobial Susceptibility Patterns of Aerobic Bacterial Isolates from Pus/Wound Swab Samples in a Tertiary Care Hospital, Nepal.** 179-183
Barakoti A, Guragain A, Adhikari RP, Amatya R
- Partial Edentulism and Awareness towards its Management** 184-187
Rana SB, Acharya B, Acharya J, Mainali A, Bhochhibhoya A, Sharma R
- Evaluation of Outcomes following ERAS Programme in Laparoscopic Cholecystectomy** 188-192
Paudel P, Ghimire S, Rai S, Shrestha ML
- Clinical and Biochemical Profile of Acute Gastroenteritis in Children in Nepal Medical College Teaching Hospital** 193-195
Sharma A, Upadhyay S, Lama L
- Patient Satisfaction in Nepal Medical College Teaching Hospital** 196-203
Shrestha S, Devkota R, Shrestha S
- Effect of Yoga and Exercise On Glycemic Control and Psychosocial Parameters in Type II Diabetes Mellitus- A Randomized Controlled Study** 204-212
Singh VP, Khandelwal B
- Use of Intravenous Indocyanin Green to Delineate Biliary Tree Anatomy and Cystic Artery Anatomy in Patients undergoing Laparoscopic Cholecystectomy** 213-216
Koirala R, Rajbhandari A, Rai P, Gurung TM
- Evaluation of Rotahaler Technique and Impact of Intervention in Patients with Bronchial Asthma and/or Chronic Obstructive Pulmonary Disease** 217-220
Shrestha D, Devkota KC, KC A, Shakya R, Shrestha L

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A SURVEY OF CROSS-INFECTION CONTROL PROCEDURES IN THE DEPARTMENT OF PROSTHODONTICS AND MAXILLOFACIAL PROSTHETICS AMONG DENTAL STUDENTS AND INTERNS

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ABSTRACT

The potential for transmission of infectious diseases within the dental office is considerably high. Dental graduates require a high level of training, clinical skills and knowledge on infection control. A cross sectional study was conducted in the Department of Prosthodontics and Maxillofacial Prosthetics, Nepal Medical College to evaluate the knowledge, attitude and awareness of dental students and interns and assess their satisfaction toward applying these measures in cross-infection control procedures. A pre-tested self-administered questionnaire consisting of 27 close-ended questions was distributed among students. The study sample comprised of 164 clinical dental students and interns: 32 (19.5 %) interns, 58 (35.4 %) third-year students, 31 (18.9 %) fourth-year students and 43 (26.2 %) fifth-year student. Most of the students and interns (95.1%-98.1%) regularly wear the protective barriers like face mask and gloves during dental procedure. However those using protective gown were less (52.4%). Comparison of mean values of attitude and knowledge scores among the various academic levels indicated statistically significant difference ($p=0.000$). The mean scores were significantly higher for interns. Comparing the scores of respondents by gender, the difference between the mean attitude scores was statistically insignificant ($p=0.069$). Similarly, there was no statistically significant difference in mean knowledge scores between males and females ($p=0.604$). The findings of this study showed insufficient knowledge, attitude and awareness among dental students and interns towards infection control in prosthodontic clinic. It may be recommended to focus on constantly motivating students and interns in the correct and routine use of infection control measures and strictly monitor their adherence to the cross-infection control protocols.

KEYWORDS

Attitude, awareness, cross-infection, disinfection

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INTRODUCTION

Oral cavity harbors a wide variety of microorganisms and it is a very good environment for their inoculation, growth and transmission.¹ The potential for transmission of infectious diseases within the dental office is considerably high which presents a significant health hazard to dental practitioner, lab personnel and patients. Although several recommendations and guidelines are issued, studies demonstrate that infection control protocol is not followed strictly in the dental settings.² Prosthetic rehabilitation in the clinics needs to be supplemented by the laboratory, and hence the risk of cross infection has to be halted in both the fronts. Dental impressions, maxillo-mandibular registration bases, facebows, articulators prostheses are all exposed to contamination in the patient's mouth. Such items can spread infectious agents to the clinician, other patients and the staff of the dental laboratory.³⁻⁵ Dental graduates require a high level of medical training, clinical skills and knowledge on infection control measures. Therefore, it is recommended that the importance of infection control is explained meticulously to students in their early years in dental school.^{6,7} The current study aims to determine the level of knowledge, attitude and awareness in infection control procedures among dental students and interns in the Department of Prosthodontics and Maxillofacial Prosthetics, Nepal Medical College.

MATERIALS AND METHODS

A questionnaire based survey was conducted among dental students and interns of Nepal Medical College, Kathmandu, Nepal. The study sample comprised of 164 clinical dental students and interns. All the students voluntarily participated in the study. A pre-tested questionnaire from a published study was used which consisted of 27 close-ended questions: 2 questions related to the demographic data (academic level and gender), 17 questions to assess the attitude and awareness towards cross infection control, 4 questions related to knowledge and education, and last 4 questions related to satisfaction about the knowledge and attitude.⁸ The self-administered questionnaires were distributed among dental students and interns and the researcher was present at all times to facilitate the respondents. Each correct response was provided a score of one. The mean score was calculated on basis of gender and academic level and comparisons were drawn. Data was entered in Statistical Package for Social Sciences (SPSS) ver. 17. Descriptive statistics (mean, standard deviation and percentages) were used to describe the quantitative and categorical variables. Chi-Square test was used to compare the mean values of the variables. The level of significance was set at $p < 0.05$ for all statistical tests.

RESULTS

A total of 164 students participated in the present study: 32 (19.5 %) interns, 58 (35.4 %) third-year students, 31 (18.9%) fourth-year students and 43 (26.2 %) fifth-year

student. (Table 1)

Table 1: Distribution of students according to academic level

Academic Level	Distribution of students
3 rd Year	35.4%
4 th Year	18.9%
5 th Year	26.2%
Internship	19.5%

Table 2: Attitude and awareness towards cross-infection control procedures in the department of prosthodontics

Questions related to attitude and awareness towards cross-infection control	Distribution of responses	
	Yes	No
Do you regularly wear the following barrier during dental procedure?		
Gloves	95.1%	4.9%
Face mask	98.2%	1.8%
Protective glass	57.9%	42.1%
Protective gowns	52.4%	47.6%
Head cap	84.8%	15.2%
Do you regularly disinfect the following items between patients?		
Rubber bowl	34.8%	65.2%
Alginate mixing spatula	39.6%	60.4%
Trimming burs	32.9%	67.1%
Shade guide	45.7%	54.3%
Dental operatory	75.6%	24.4%
When taking primary or final impression, do you		
Rinse the impression under running water immediately after being removed from patient's mouth?	72.6%	27.4%
Apply disinfectant on the impression after being rinsed with water?	6.1%	93.9%
Do you regularly disinfect the following items before sending it to dental laboratory?		
Dental cast	6.1%	93.9%
Dental prosthesis	34.1%	65.9%
Metal framework for RPD/FPD	37.2%	62.8%
Bite registration/Wax occlusion rim	11.6%	88.4%
Articulator	13.4%	86.6%

The total number of males were 42 (25.6%) and females were 122 (74.4%). A greater proportion (98.1%) of the participants used face mask, 95.1% regularly wore gloves, 84.8% used head cap and 52.4 % wore protective gowns during dental procedure in the prosthodontic department. 34.8% of respondents regularly disinfected

rubber bowl, 75.6% of students disinfected the dental operatory and 45.7% disinfected shade guide between patients. 39.6% of students disinfected alginate mixing spatula and 32.9% disinfected trimming burs. 76.2% rinsed the impression under running water immediately after being removed from patient's mouth. Only 6.1 % disinfected cast, 11.6% disinfected wax occlusion rim and 13.4% disinfected articulator before sending to dental laboratory. (Table 2)

60.4% of respondents had few discussion classes about infection control during your under-graduate program and 36% never had any discussion. 55.8% never had a clinical demonstration on infection control. All the respondents feel that there should be more emphasis and training on infection control during dental curriculum. 92.1% were willing to implement and follow the infection control procedures which were taught in the college. (Table 3)

Table 3: Assessment of knowledge about cross-infection control procedures in the department of prosthodontics

Questions related to knowledge about cross-infection control procedures	Distribution of responses	
Have you had a clinical discussion about infection control during your under-graduate or internship program?		
No, never had a discussion before	36%	
Yes, only few discussion during undergraduate program	60.4%	
Yes, 1 weekly discussion during one semester	0.6%	
Yes, 1 weekly discussion during one academic year	3%	
More than that	0%	
Have you attended a clinical demonstration on infection control during your under-graduate program?		
No, never had a training before	55.8%	
Yes, once during the undergraduate program	41.7%	
Yes, twice during the undergraduate program	2.5%	
Yes, every year	0%	
Do you think there should be more emphasis and training on infection control during dental curriculum and continuing dental education program on the same should be conducted?	Yes	No
	100%	0%
Are you willing to implement and follow the infection control procedures which are taught in your college?	92.1%	7.9%

A total of 74.4 % thought that their knowledge regarding infection control was good. 85.4 % felt that implementation of infection control policy was fair. Regarding knowledge and performance in infection control, 68.9 % of the subjects were fairly satisfied. Similarly 57.7 % were fairly satisfied with theory classes

and clinical discussion on infection control. (Table 4)

Table 4: Assessment of satisfaction towards cross-infection control procedures

Questions related to satisfaction towards cross-infection control procedures	Distribution of responses
How do you evaluate your knowledge about infection control in the department?	
Poor	14%
Fair	74.4%
Good	11%
Excellent	0.6%
How do you evaluate your implementation of infection control policy in the department?	
Poor	3.7%
Fair	85.4%
Good	10.4%
Excellent	0.6%
Are you satisfied with your knowledge and your performance in infection control in the department?	
Not satisfied	22%
Fairly satisfied	68.9%
Almost satisfied	9.1%
Totally satisfied	0%
Are you satisfied with theory classes/ clinical discussion about infection control that you had during your under graduate program?	
Not satisfied	34.4%
Fairly satisfied	57.7%
Almost satisfied	7.4%
Totally satisfied	0%

DISCUSSION

Dental graduates require a high level of training, clinical skills and knowledge on infection control. Measuring attitude and awareness of dental students toward infection control is very important for motivating them to adopt attitudes and behaviors learnt on infection control when they become professional practioners.⁸⁻¹⁰ This study evaluated cross-infection control procedures in the Department of Prosthodontics and Maxillofacial Prosthetics among dental students and interns, Nepal Medical College.

The upsurge in the incidence of communicable diseases such as Hepatitis B and Acquired Immuno Deficiency Syndrome (AIDS) has led to a significantly increased risk of cross infection in dental clinics and laboratories.¹¹ The Centers for Disease Control and Prevention Guideline for infection control

in dental healthcare settings provided different strategies to control infection in the dental clinic and dental laboratory.¹² Epidemiologic studies show that infectious disease acquisition and transmission can be greatly reduced by vaccination, protective eyeglasses and use of gloves and masks.¹³ Assessment of attitude and awareness towards cross-infection control procedures in the prosthodontic department revealed that most of the students and interns (95.1%-98.1%) regularly wear the protective barriers like face mask and gloves during dental procedure. However those using protective gown were less (52.4%). (Table 2) These findings were consistent with the study conducted among dental students and interns in King Saud University.⁸ The risk of cross contamination in prosthodontic clinics may be reduced by disinfection of prostheses, frameworks, impressions, stone casts, stock trays, burs, shade guides, spatulas, bite forks and wax trial insertions.¹⁴ In this study respondents were less concerned about disinfection procedures. Only 32.9%-75.6% of respondents disinfected different items like rubber bowl, alginate mixing spatula, shade guide between patients. 76.2% of students rinsed the impression after being removed from patient's mouth. (Table 2) In the previous study by Ibraheem,⁸ 96.5% of the subjects disinfected impression before it was sent to the laboratory.

To evaluate awareness on infection control amongst dental students, it is necessary to have background information in their education about infection control in the dental clinic.⁸ This study disclosed poor knowledge among the respondents. This could be due to insufficient numbers of lectures, discussions and clinical demonstrations on infection control during under-graduate program. The findings of this study revealed that 36% of students never had any discussion and 55.8 % never had a clinical demonstration on infection control. (Table 3) The result of this study regarding knowledge on infection control is similar to previous studies by Ibhira⁸ and Askarian.¹⁵

Self-assessment of satisfaction level offer opportunities to analyze the respondents' own experiences in the dental clinic. Regarding their attitude towards the knowledge, attitude and awareness of cross-infection control procedures, 85.4 % of the subjects were fairly satisfied with the implementation of infection control policy. 74.4% thought that their knowledge regarding infection control was good. (Table 4)

Comparing the attitude of respondents by gender, it was seen that 76.2% of males had poor attitude, which was higher than that of females (60.7%). 95.2% of males had poor knowledge which was lower than that of females (97.5%). But, the difference between the mean attitude and knowledge scores of females and males was statistically insignificant. (Tables 5 and 6)

Table 5: Attitude score among males and females

Gender	Attitude score		Comparison of Attitude scores (p-value)
	Good	Poor	
Male	76.2%	23.8%	0.069
Female	60.7%	39.3%	

Table 6: Knowledge score among males and females

Gender	Knowledge score		Comparison of Knowledge score (p-value)
	Good	Poor	
Male	95.2%	4.8%	0.604
Female	97.5%	2.5%	

However, comparison of mean values of attitude scores among the various academic levels indicated statistically significant difference ($p < 0.05$). Similarly, the mean knowledge scores showed statistically significant difference ($p < 0.05$). The mean scores were significantly higher for interns in both the cases. 78.1% of interns had good attitude. The 5th year students had lowest mean attitude score. Only 4.7 % of them had good attitude score. (Table 7 and 8)

Table 7: Attitude score among respondents according to academic level

Academic Level	Attitude score		Comparison of Attitude scores (p-value)
	Good	Poor	
3 rd Year	41.4%	58.6%	0.000
4 th Year	22.6%	77.4%	
5 th Year	4.7%	95.3%	
Intern	78.1%	21.9%	

Table 8: Knowledge score among respondents according to academic level

Academic Level	Knowledge score		Comparison of Knowledge scores (p-value)
	Good	Poor	
3 rd Year	0%	100%	0.000
4 th Year	0%	100%	
5 th Year	0%	100%	
Intern	15.6%	84.4%	

The findings of this study showed insufficient knowledge, attitude and awareness among dental students and interns towards infection control in prosthodontic clinic. Educational efforts are needed to improve attitudes and awareness. It may be recommended to focus on strategies to sensitize and motivate dental students to implement infection control measures in their routine practice. Also, dental schools should strictly monitor the subjects' adherence to the infection control guidelines which can greatly reduce the possibility of cross contamination in prosthodontics. One of the limitations of the present study is that the respondents' practice could not be supervised and relied on their subjective self-assessment. Therefore, the responses might not have accurately reflected the true levels of knowledge, attitude and awareness. The other limitation is that the study was conducted in a single institution, and thus the results cannot be generalized to the students and interns of other dental colleges. The recognition of the potential for transmission of numerous infectious diseases within the prosthodontic office has led to an increased concern for infection control in dental practice. The insufficient knowledge, attitude and awareness regarding infection

control procedures may be a reflection of insufficient teaching and clinical supervision of students. Dental schools should focus on constantly motivating students in the correct and routine use of infection control measures and strictly monitor the adherence to the guidelines. Regular continuing dental education

programmes should be organized so as to update and reinforce the students' knowledge regarding infection control protocols. Also, there is a need to improve the current dental curriculum by including infection control module.

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SPECTRUM OF HEAD AND NECK MASSES IN KIST MEDICAL COLLEGE TEACHING HOSPITAL

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ABSTRACT

Head and neck region is a common site for swelling, so neck masses commonly present to the clinicians. The etiologies of head and neck masses is divided into inflammatory, congenital and neoplastic, so directed history, thorough systemic examination, cyto/histopathological examinations are the cornerstone to the diagnosis. This study was conducted to study the spectrum of head and neck masses in patients attending otolaryngology outpatient department of KIST Medical College Teaching Hospital. Three hundred and ninety five patients with head and neck masses were evaluated clinically and pathologically. Inflammatory lesions were commonest (68.1%) followed by neoplastic (26.1%). In inflammatory lesions reactive lymphadenitis was the most common (35.2%), followed by tubercular lymphadenitis (15.7%). Most common benign lesion was goiter (12.9%) followed by pleomorphic adenoma (2.5%). Malignant neoplasm comprised of 8.9% of head and neck masses, out of which metastatic lymph node was the commonest (4%). Inflammatory/infective masses still remain the commonest cause of head and neck masses. Tubercular adenitis should be considered as an important etiology in our context.

KEYWORDS

Congenital, head and neck masses, inflammatory, lymphadenopathy, neoplasm, pathology

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INTRODUCTION

Neck masses present commonly to clinicians. A large number of diseases can manifest as a palpable swelling in the head and neck region. Commonly presenting head and neck masses are due to lymph node, thyroid and salivary gland enlargement.

In children under 15 years, 90% of neck masses are benign and of these up to 55% may be congenital. Benign neck masses can be classified as congenital and acquired. The latter group is often enlarged lymphadenopathies, but there may be a wide range of different pathologies involved causing their swelling. In the adult population, 80% of malignant lesions are metastatic.¹

The evaluation and management of patients who present with a neck lump should have a systematic and uncompromising clinical approach.¹ A directed history and thorough physical examination are the cornerstones on which a diagnosis is made. In particular, the age of the patient is critical in formulating an appropriate differential diagnosis for neck masses. Unlike adults, neck masses in children seldom represent ominous disease.²

So this paper presents the spectrum of head and neck masses regarding age, gender, site, clinical and pathological diagnosis according to age groups.

MATERIALS AND METHODS

This retrospective study was conducted in Department of Otorhinolaryngology & Head and neck surgery (HNS), KIST medical college teaching hospital, Lalitpur, Nepal during a period of 4 years from January 2010 to January 2014. Three hundred and ninety five patients with swelling in head and neck region, attending Otorhinolaryngology & HNS, outpatient department, during the period, were included in this study. Clinical history regarding age, gender, site of lumps were recorded.

The cases were stratified into infective / inflammatory lesions, congenital-developmental malformations and neoplastic lesions. Neoplastic lesions were further subdivided into benign and malignant lesions.

Pathological diagnosis was recorded from computer database. Data were analyzed using Statistical Package for Social Science (SPSS, version 17) for windows.

RESULTS

Total number of patients included in this study were 395. Out of which 353 (89.4%) patients were evaluated with FNAC and 42 (10.6%) patients needed further biopsy of the swelling to confirm the disease.

Mean age of the patients was 31.2 (2- 84) years. Most of the patients 90 (22.8%) were in the range of 20-30 years

(Fig. 1) and there was slight female preponderance with male to female ratio of 1:1.2. Most of the patients 314 (79.5%) had swelling at lateral part of neck while only 81 (20.5%) patients presented with mid line swellings.

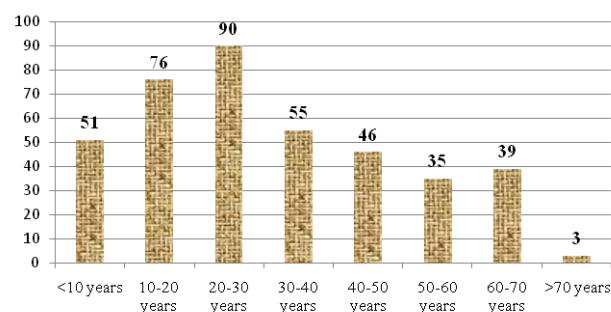


Fig. 1:

Distribution of patients according to age groups

Lymph node was the most common site involved (56%). Incidence of lymph node lesion was higher in male (54.09%), while thyroid lesion was higher in female (81.5%). Site wise distribution of head and neck lesion is shown in (Fig. 2).

Pathological evaluation of the cases revealed 68.1% inflammatory, 26.1% neoplastic and 5.8% congenital, as shown in the Table 1.

Table 1: Distribution of head and neck masses according to final diagnosis

Diagnosis	Number of cases	Percentage (%)
Infective/ Inflammatory	269	68.1
Reactive lymphadenitis	139	35.2
Tubercular lymphadenitis	62	15.7
Sialadenitis	43	10.9
Thyroiditis	14	3.5
Abscess	10	2.5
Cysticercosis	1	0.25
Congenital/developmental malformations	23	5.8
Lymphangioma	7	1.8
Dermoid cyst	2	0.5
Epidermoid cyst	8	2.0
Thyroglossal cyst	4	1.0
Branchial cyst	2	0.5
Neoplastic lesions	103	26.1
Benign	68	17.2
Goiter	51	12.9
Pleomorphic adenoma	9	2.5
Lipoma	8	2.0
Malignant	35	8.9
Metastatic lymphnode	16	4.0
Papillary carcinoma	7	1.8
Follicular carcinoma	3	0.75
Lymphoma	3	0.75
Mucoepidermoid carcinoma	2	0.5
Anaplastic carcinoma	2	0.5
Adenocystic carcinoma	1	0.25
Acini cell carcinoma	1	0.25

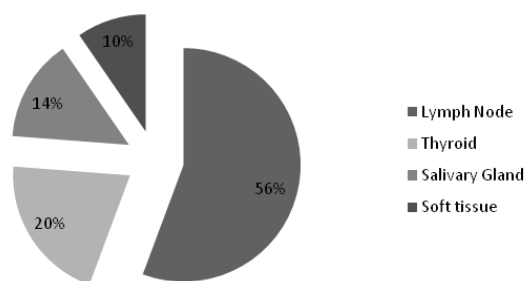


Fig. 2:

Site wise distribution of head and neck masses.

All the patients were also stratified according to age into children (≤ 15 years), adults (16-65 years) and elderly (>65 years).

The most prevalent disease in the children was infective / inflammatory (90.2%), followed by congenital-development malformation (7.4%). Malignant diseases were not seen in this age group. Similarly, the most common etiology of diseases encountered in adults were infective / inflammatory (63.9%) followed by benign lesions. However, in elderly patients no congenital- developmental malformation was noted. Neoplastic lesions were mostly seen in this age group (59.4%), among which half of the patients (31.3%) had malignant lesions (Table 2).

Table 2: Cross tabulation between age group and etiology of head and neck masses

	Congenital		Infective / Inflammatory		Benign lesion		Malignant lesion		Total
	n	%	N	%	n	%	n	%	
Children (<15 years)	7	7.4	85	90.2	2	2.1	0	0	94
Adult (16-65 years)	15	5.5	172	63.9	57	21.1	25	9.3	269
Elderly (>65 years)	1	3.1	12	37.5	9	28.1	10	31.3	32
Total	23		269		68		35		395

*Chi-Square Tests- $p < 0.0001$

The most common malignant lesion was metastatic lymph nodes followed by thyroid malignancies. Malignancy was found to be high in this age group compared to children and adults. (31.3% vs 9.3%, $p = < 0.0001$)

DISCUSSION

Neck masses are the first sign of many diseases. It is important to have a focused approach when evaluating a patient with neck mass. Three hundred and ninety five patients with head and neck masses were evaluated in this study in four years time clinically and pathologically (FNAC or biopsy) to reach the diagnosis. The age group ranged from 2 to 84 yrs, maximum number of patients were in the age group of 20-30 years which was similar to other studies.^{3,4} This helps us to know the diversity of head and neck masses in all age group. We included patients of all age groups however most of the studies of head and neck masses are mainly done in children.⁵⁻⁸

In our study lymph node was the most common site followed by thyroid and salivary glands. The findings were similar to other studies.^{3, 9,10} Although lymph node lesions were common in male and thyroid in females, overall head and neck lesions were common in females.¹¹⁻¹⁴

We evaluated all the patients with neck masses clinically and subjected them for FNAC or biopsy. Most of the cases were diagnosed by FNAC (89.4%) while only a small group of patients (10.6%) further needed biopsy to confirm the diagnosis. Rathod *et al*¹⁰ and Smallman *et al*¹⁵ concluded in their study that FNAC is the first line of investigation in the diagnosis of head and neck swellings.

In developing countries, inflammatory lesions are the most common neck masses; however, in developed countries congenital and neoplastic masses predominate.¹⁴ Among 395 patients in our study 68.1% were inflammatory, 26.1% were neoplastic and only 5.8% were congenital neck masses. Similarly, in a study done by Ragesh *et al*⁵, the most common cause of swellings were inflammatory adenopathy which accounts for 54%. In contrary, Balikei *et al*¹⁴ observed neoplastic mass (47.6%), followed by inflammatory (33.4%) and congenital neck masses (18.9%) in their study. Roy A *et al*¹⁶ also noticed neoplastic lesions to be more common comprising of 53%.

In our study, reactive lymphadenitis was the most common cause of inflammatory neck masses followed by tubercular lymphadenitis. This fact has also been supported by another study done in this region by Hirach and S *et al*¹¹ who observed reactive hyperplasia (41.5%) as the number one cause followed by tubercular lymphadenitis (28%). But Benzabih M *et al*¹⁷ reported that the most frequent cause of benign enlargement was tuberculous lymphadenitis (66.3%), followed by reactive lymph node hyperplasia (19.2%). We also found cysticercosis as a cause of neck mass in our study.

Goiter was the most common benign lesion followed by pleomorphic adenoma. Among malignant thyroid neoplasm papillary carcinoma was the commonest. Rathod *et al*¹⁰ in their study also found that the most common benign thyroid lesion was goiter and malignant lesion was papillary carcinoma. In other studies goiter was excluded and was not discussed so far.¹⁴ Thapa *et al*¹⁸ studied 35 patients with head and neck tumors from Kathmandu and concluded that tumor of thyroid (20%) was the most common tumor followed by that of larynx (17.1%). All the thyroid

tumors were follicular type in contrary to our study. Among malignant lesion metastatic lymph node was most common in our study. El Hag IA *et al*¹⁹ in their study also found metastatic carcinoma of lymph node as the most common type of malignant neoplasm.

Most neck masses of specific cause occur in rather predictable locations within typical age groups. The patient's age should be a prime consideration in the diagnosis.² Three main age groups need to be considered: children (<15 years), adult (16-65 years), and elderly (>65 years). Each age group exhibits a certain relative frequency of disease occurrence, which can guide the diagnosis. In children and adults, the most common cause of neck mass was infective / inflammatory. Congenital or developmental malformations were mostly seen in children. In adult, the rate of neoplasia increases and the rate of congenital lesion decreases.

Benign neoplasms were mostly seen in adulthood where as malignant neoplasm should be considered in elderly. Our study has also supported the same notion and verified by many eminent authors in their studies.^{11,14,18,20-22}

Thus, inflammatory/infective masses still remain the commonest cause of head and neck masses. Fine needle aspiration cytology is of considerable value to achieve correct diagnosis and management in patients with head and neck masses. Tubercular adenitis should be considered as an important etiology in our context. Congenital neck masses are common in children while benign lesions in adults. Any neck mass in elderly patients should be taken cautiously because the chance of malignancy is high.

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SYMPTOMS OF HYPONATREMIA IN HOSPITALIZED PATIENTS IN A MEDICAL COLLEGE HOSPITAL IN KATHMANDU

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ABSTRACT

Total body water and tonicity is tightly regulated by renal action of antidiuretic hormone (ADH), renin-angiotensin aldosterone system, norepinephrine and by the thirst mechanism. Abnormalities in water balance are manifested as sodium disturbances – hyponatremia and hypernatremia. Hyponatremia ($\text{Na}^+ < 135 \text{ meq/l}$) is a common abnormality in hospitalized patients and is associated with increased morbidity and mortality. Symptoms of hyponatremia non-specific and can be neurological or non-neurological. Neurological symptoms were common followed by gastrointestinal symptoms. Symptoms may be mild but at times it may be life threatening like seizure and death. In this study of 123 patients, out of total 620 patient admitted in Medical ward and ICU, neurological symptoms were commonest presentation with lethargy being the most common symptoms about a third patient had Gastrointestinal symptoms namely anorexia and nausea and vomiting. One tenth of the patients were asymptomatic and detected during routine investigations. Hyponatremia is common medical disorder which has variety of clinical manifestations.

KEYWORDS

Hospitalized patient,
hypernatremia, symptoms

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INTRODUCTION

Disorders of serum sodium are a common electrolyte abnormality encountered in hospitalized patients. Hyponatremia, a decreased level of serum sodium, has a reported incidence of 15–30% of the hospitalized patients. It poses considerable diagnostic and management problems for clinicians. The condition has a multifactorial etiology, and multiple causes of hyponatraemia may be identified in individual patients. In the acute setting, treatment often has to be initiated before a confirmatory diagnosis can be made and results of supportive biochemical investigations are available. Both over-correction and under-treatment can produce devastating effects on cerebral function. Symptoms of hyponatremia are mainly neurological and sometimes non neurological symptoms are also seen. Neurological symptoms from hyponatremia occur due to trans-cellular movement of water from the hypotonic ECF into the central nervous system. Swelling of the neurons is manifested as headache, lethargy, confusion, gait disorder, nausea, vomiting and in severe hyponatremia as seizures, coma, permanent brain damage or death. Non neurological symptoms are mainly gastrointestinal including anorexia and nausea.

MATERIALS AND METHODS

This is a cross-sectional observational study conducted in Nepal Medical College teaching Hospital, Jorpati, Kathmandu. All the cases admitted in Medical ward or Intensive care unit with hyponatremia ($\text{Na}^+ < 135 \text{ mmol/l}$) were enrolled and their presenting symptoms were noted. Hyponatremia was categorized to Mild ($\text{Na}^+, 130\text{--}134 \text{ mmol/l}$), moderate ($\text{Na}^+ 125\text{--}129 \text{ mmol/l}$) and profound ($\text{Na}^+ < 125 \text{ mmol/l}$). The study was aimed to find out the severity of hyponatremia in hospitalized patient and their age of presentation and symptoms. The study was conducted for a period of six months (May–October, 2014); a total of 123 were enrolled in the study after getting their consent. Those cases who were on peritoneal or hemodialysis were excluded from the study. Data obtained were recorded and analyzed in Microsoft Excel sheet.

RESULTS

For the period of six months 123 patients were evaluated out of total 620 patients admitted in the Medical Ward. This comprise of about 20% of total admission. Among them 74 were male and 49 were female. Mean age of presentation in this study was 54.74 years. Minimum age was 16 years and maximum age was 89 years. (Fig. 1)

Regarding severity of hyponatremia, 65(53%) had mild hyponatremia 38(30%) had moderate hyponatremia

and 20(16%) had profound hyponatremia. However in this study we did not distinguish hyponatremia by volume status. Most common presenting symptom were neurological, among them lethargy tops the list with presenting complaints of 110 (89%) patients this is followed by dizziness, headache and confusion with 100 (81%), 92 (75%) and 60 (48%) respectively. Gait disorder were observed only in 5 (4%) patients. (Fig. 2). No patient had seizure.

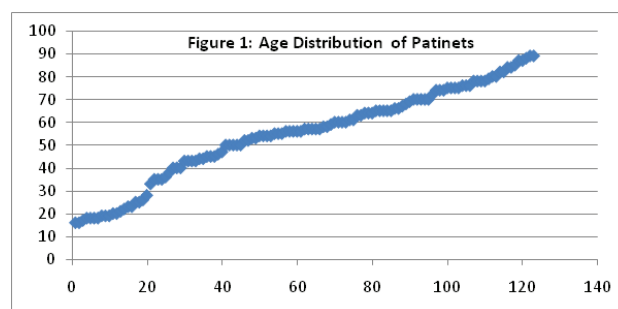


Fig. 1:
Age Distribution of Patients

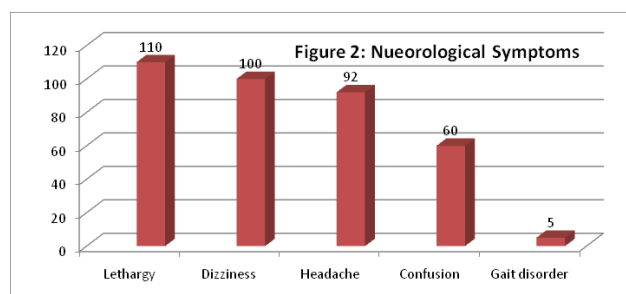


Fig. 2:
Neurological Symptoms

There were Gastrointestinal symptoms also; 40 (32%) of the patient presented with anorexia while 38 (30%) presented with nausea and vomiting. However 13(10%) did not have any symptoms, they were picked up during routine investigations and all of these patient were in the category of mild hyponatremia.

DISCUSSION

Hyponatremia is one of the commonest electrolyte abnormalities we encounter in medical practice. Hyponatremia itself is a disorder which needs careful evaluation and management. If it is associated with some disease, it may point towards prognosis. Like hyponatremia with congestive heart failure is a poor prognostic factor. Symptoms of hyponatremia are divided into neurological and non-neurological. Neurological symptoms are lethargy, dizziness and headache. More severe symptoms like gait disorder and seizure may occur sometimes leading to death. Gastrointestinal symptoms are main non- neurological symptoms like anorexia and nausea and vomiting. In our study also there were mainly neurological symptoms most common being lethargy followed by dizziness and headache. The neurological symptoms relate to the rapidity of fall of serum sodium. There are usually no

symptoms if serum sodium is 130–135 mmol/l. In this study 10% of the patient did not have any symptoms and all of them had mild hyponatremia. Nausea and malaise are seen if serum sodium falls to 125–130 mmol/l. Headache, nausea, vomiting, muscle cramps, restlessness, disorientation and depressed reflexes can be seen if serum sodium falls below 125 mmol/l. In our study around 30% had gastrointestinal symptoms which is seen in moderate to profound hyponatremia. When severe hyponatraemia evolves over a period of hours, seizures, coma, permanent brain damage, respiratory arrest, brain-stem herniation and death may occur. In sharp contrast, patients with chronic hyponatraemia are often asymptomatic irrespective of the degree of hyponatraemia. Symptoms may only occur if there is acute exacerbation of hyponatraemia, or if serum sodium falls below 110 mmol/l. In chronic hyponatraemia present for 48 hours, the brain adapts

to protect itself against cerebral oedema: a rapid increase in plasma sodium can lead to a decrease in brain cell volume with resultant demyelination. It may not be apparent until 2–6 days after correction of sodium, and most patients are left with permanent neurological dysfunction including quadriplegia, pseudobulbar palsy and seizures. Coma and death may occur. Individuals at particular risk include elderly patients on thiazides, alcoholics and patients with primary polydipsia.

In conclusion, hyponatremia is one of the commonly encountered in admitted patient, symptoms are varied and nonspecific depending on onset and rapidity by which it appears.

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AN EVALUATION OF HEARING AMONG MOBILE PHONE USERS

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ABSTRACT

Since its introduction in the 1983, the use of mobile phones is becoming increasingly popular and almost indispensable in modern day life and it is one of the fastest growing technological developments of our times, but there are many adverse biological effects of microwave radiation. Radio frequency electromagnetic radiations are emitted from mobile phone antennae and their base stations. The radiofrequency from the mobile phones travels through the external ear to reach the peripheral auditory system and finally to the central auditory system, leading to high energy deposition making it the most affected target organ. This study was done to analyze the auditory thresholds shift at frequencies from 500 to 8,000 Hz of the mobile phone users at Nepal Medical College and Teaching Hospital. This comparative cross-sectional study was done by testing the hearing thresholds from 500 to 8,000 Hz. Two hundred four subjects were evaluated. Subjects were tested with conventional audiometry. Results showed that there were significant differences in auditory thresholds of the dominant ear, right ear in our case, of the subjects at the frequencies of 1 KHz, 2 KHz and 8KHz. Therefore, we concluded that the auditory threshold shift in the dominant ear is due to use of mobile phone.

KEYWORDS

Auditory, hearing loss, mobile phone, threshold shift

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INTRODUCTION

The use of mobile phone has spread very rapidly and widely since its availability in 1983. It was estimated that there were more than 2.14 billion mobile phone users in the world till 2005, which increased to 6.88 billion mobile phone users worldwide in 2013. There are total of 18 million phone users among total Nepalese population at present.¹

Mobile phones transmit and receive signals using electromagnetic fields in the radiofrequency band through the antennae that are present around our towns and the phone itself. The Global System for Mobile Communications (GSM) is currently the most widely used digital mobile phone service operating at 900 to 1,800 MHz frequency bands.² The international standards permit GSM 900 mobile phones to transmit at a pulsed power of 2W with an average output of 0.25 W.³

Mobile Phones emit the radiofrequency which are below the guidelines of the International Commission on Non Ionizing Radiation Protection (ICNIRP). These radiofrequencies are not sufficiently energetic to destabilize electron configuration so it cannot produce the genotoxic effects such as DNA mutations.⁴ But the data on its long term effects is sadly lacking.

The radiofrequency from the mobile phones travels through the external ear to reach the peripheral auditory system and then to the central auditory system, leading to high energy deposition making it the most affected target organ of thermal and non-thermal effects.

The auditory system and particularly the cochlear outer hair cells (OHC) are known to be highly sensitive to a great variety of exogenous and endogenous agents. Hair cells are known to be sensitive to chronic exposure as well. The externally applied electric and magnetic fields are known to be able to produce some hearing sensation.⁵ Moreover, the delicate hair cells in the organ of Corti do not have regenerative properties, thus damages are often permanent with little chance of recovery in advanced stages. Therefore, the ear is at risk of exposure to noise from the mobile phone as well as its electromagnetic radiation.

This study was done to evaluate the hearing threshold of mobile phone users.

MATERIALS AND METHODS

This comparative cross-sectional study was performed in Nepal Medical College Teaching Hospital from November 2016 to October 2017. A total number of 204 subjects of both sexes in the age group of 19-46 years who were using mobile phones for at least 8 years were selected.

The physical and otoscopic examinations were performed by ENT surgeon to rule out any external or middle ear pathology that could affect hearing. Subjects

with known family history of hearing loss, history of chronic ear disease, recent upper respiratory infection, meningitis, head injury, occupational persistent noise, exposure to ototoxic drugs and loud noise, history of any chronic medication, users of bluetooth and subjects with bilateral hearing loss were excluded.

We were not able to find non mobile users as controls thus, as almost all of the subjects were using the mobile phone on only one ear (the dominant ear), we used the dominant ear as the study group and the non dominant ear as control. The dominant ear has also been used by other studies.^{22, 23}

The informed consent was taken. Ethical clearance was obtained from institutional ethical committee.

The hearing levels of subject were tested by AD 229 b, Interacoustic Pure tone audiometer (PTA). Audiometry was performed by an experienced audiologist at frequencies of 250, 500, 1000, 2000, 4000 and 8,000 Hz. Subjects were considered to have normal hearing if verified by PTA to have no loss exceeding 25 dB between 250 and 8,000 Hz and classified as having hearing loss if any of the hearing thresholds were above 25 dB in any frequencies.

All subjects in this study used GSM 2G and 3G mobile phones. The study was single blinded, as the audiologist did not know which was the dominant ear. The audiograms were examined.

RESULTS

Two hundred four subjects were enrolled in the study. Among them, 140 (68.6%) were males and 64 (31.4%) were females. The age of the subjects was between 19 and 46 years. The mean age was 32.28 years with standard deviation of 7.96.

All the subjects used their right ear, the dominant one while using mobile phone.

Duration of mobile use in all the subjects was more than 8 years. The duration of mobile phone use per day varied from thirty minutes to three hours with the mean of 1.48 hours with standard deviation of 0.506.

The subjects were further categorized into two groups: those who used the mobile phone less than mean value of 1.5 hours per day and those who used for more than 1.5 hours per day. The hearing loss between these groups was compared.

The auditory threshold at all frequencies of both the ears were within normal limit in both the groups, but when we analyze auditory threshold for the individual frequencies, we noticed that the auditory threshold was progressively increased in the higher frequencies and even more in the group of subjects who used it more than 1.5 hours per day.

When we compared the two groups in the left ear, we noticed that though the frequencies were within

normal limit, the auditory threshold progressively increased with the increase of the frequencies and moreover it was more for the group of subjects who used the mobile for more than 1.5 hours.

In the right ear also, the auditory threshold were

increased as the frequencies increased, and when we compare the two groups, the thresholds increased significantly in the subjects who used the mobile phone for more than 1.5 hours in the frequencies of 1KHz, 2KHz and 8KHz. **Table 1**

Table 1: Comparison of hearing thresholds in all frequencies between groups in both ears.

Frequency	Left Ear					95% Confidence interval of the difference	Right ear					95% Confidence interval of the difference		
	<1.5 hrs		Over 1.5 hrs				<1.5 hrs		Over 1.5hrs					
	Mean	SD	Mean	SD	p	Lower	Upper	Mean	SD	Mean	SD	p	Lower	Upper
250HZ	13.22	2.40	13.93	2.40	.032	-1.370	-0.062	12.25	2.50	12.13	2.49	.752	-0.599	.829
500HZ	12.21	2.49	12.47	2.51	.479	-0.974	0.459	12.48	3.13	12.27	2.50	.614	-.622	1.050
1KHZ	12.13	3.41	12.40	2.51	.554	-1.159	0.623	12.36	2.50	13.47	2.32	.002	-1.801	-0.404
2KHZ	11.82	2.86	12.47	3.32	.145	-1.515	0.225	11.71	2.38	12.93	3.09	.002	-1.990	-0.466
4KHZ	19.69	3.52	20.16	4.33	.204	-1.809	0.389	13.41	3.12	14.53	3.96	.026	-2.111	-0.134
8KHZ	20.16	4.59	21.73	4.69	.020	-2.903	-0.254	12.83	3.11	14.53	4.44	.002	-2.751	-0.657

DISCUSSION

The auditory system is the first biological structure to be entered by the electromagnetic radiations from mobile phones. Generally, the effects of noise on hearing were described as acoustic trauma, temporary threshold shift and permanent threshold shift.

A permanent threshold shift of hearing is defined as hearing loss that, once it occurs, is permanent and irreversible. It may be small amounts of permanent damage result from many noise-induced temporary threshold shifts.²⁴ Permanent threshold shifts may be cumulative effects of small noise exposures that are repeated over a period of many years.²⁵

Even though, the use of mobile phones is becoming increasingly popular and almost indispensable in modern day life and it is one of the fastest growing technological developments of our times, there are many adverse biological effects of microwave radiation. Radio frequency electromagnetic radiations are emitted from mobile phone antennae. These can penetrate organic tissue and be absorbed and converted into heat. These effects depend on factors like: the duration of the irradiation, the rate of absorption and the distribution of electromagnetic radiation energy by different tissues of the body and individual characteristics of the central nervous system and immune systems.^{11,26}

The close proximity of a mobile to ear may lead to the deposition of a large amount of electromagnetic radiation energy in the ear.²⁷

There have been numerous studies on electromagnetic radiation from mobile phones and its effects on public health.^{6,7,9-12,21}

In various comparative study, pure tone thresholds

were analyzed in mobile phone users and non-users, and the significant difference was noted, even though thresholds were normal.⁹ In a study done to see the effects of mobile phone use on hearing function on frequencies between 500 to 4,000 Hz, concluded that the hearing loss was associated with long-term exposure to electromagnetic fields generated by mobile phones.¹⁰

The ear that is frequently used for the mobile, is identified as the dominant ear, receives maximum electromagnetic radiations. Electromagnetic absorption is maximum on the dominant side where the phone is held and decreases to one-tenth on the opposite side of the head.²⁸ In our study, the hearing loss was significantly observed in mobile users in the right ear in certain frequencies. So, we were able to conclude that the dominant ear has significant hearing loss compared to the non-dominant ear in certain frequencies.

The subjects using mobile for more than 1.5 hours daily for 8 years and more, had increased auditory threshold in the right ear in the frequencies of 1KHz, 2KHz and 8KHz, thus indicating that the hearing loss depends on duration of exposure. In a study done in 873 subjects of Saudi population, Meo and Dress found impaired hearing with earache and earache and/ or warmth on the ear in 34.59%.²⁹ Likewise, Garcia C *et al.* noted mild hearing loss in 323 mobile phone users for 3 years, which was not statistically significant.⁶ Oktay MF *et al* observed that auditory thresholds in those who talked approximately 2 hours per day were found to be higher than those in either moderate users or control subjects. They concluded that a higher degree of hearing loss is associated with long-term exposure to electromagnetic field generated by cellular phones.¹⁰

Panda *et al* found high frequency hearing loss in subjects using the mobile phones for more than 4 years.³⁰ Sahoo GC *et al* observed hearing loss in mobile

phone users and observed that severity of the deafness seemed directly correlated with duration of the mobile phone use.³¹

Meanwhile, in some other studies no significant effect was seen on hearing when the subjects were exposed to 10-min of EMF from a mobile.¹¹ Panda et al. found no significant differences between the mobile phone users and control for any of the audiological parameters.²³ Sivert *et al.*, and Davidson and Lutman reported no effect of mobile phone use on audio-vestibular system.^{32, 33}

In conclusion, with the excessive use of mobile phones in individuals, there has been raised concern regarding

social and psychological effects. This study showed that the use of mobile phones predispose to hearing loss in the dominant ear. The unilateral increase in auditory threshold shift in the dominant ear in our study implies that the mobile phone is the cause. There appears to be correlation between the duration of daily use and the period of mobile phone use for years to the degree of hearing loss. Hearing loss and other health hazards resulting from the use of mobile phones are important factors that need further research, so more qualitative and quantitative studies in the future with larger sample sizes are suggested.

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PROFILE AND ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF AEROBIC BACTERIAL ISOLATES FROM PUS/WOUND SWAB SAMPLES IN A TERTIARY CARE HOSPITAL, KATHMANDU.

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ABSTRACT

The organisms responsible for producing infection in different anatomical sites and their antimicrobial patterns show a wide range of variations from one place to another. The difficulty in therapeutic challenges due to increased incidence of drug resistance in organisms has been associated with poor patient outcomes. During Feb 2015 to Jan 2016, a total of 1052 pus samples (collected by swab or aspiration) from different anatomical sites received in microbiology laboratory of Nepal Medical College and Teaching Hospital (NMCTH) were included in this study. Samples were processed for isolation of organisms, their identification was done by standard microbiological techniques followed by antimicrobial susceptibility test using Kirby Bauer disc diffusion method. Vancomycin screening agar was used for Methicillin-resistant *Staphylococcus aureus* (MRSA) isolates. Of the 1052 samples processed, 502 had microbial growth of which, 491 yielded single organism, 7 yielded more than one organism and 4 grew *Candida albicans*. The most common bacterial isolate was *Staphylococcus aureus* (n=211), 9.96% of which being MRSA, none were resistant to vancomycin. The other organisms isolated were *Escherichia coli* (n=116), *Acinetobacter calcoaceticus*-*Acinetobacter baumannii* (ACB) complex (n=56), *Klebsiella pneumoniae* (n=32), Coagulase Negative *Staphylococcus* (n=27) and others. Among the gram positive isolates, 12.85% were multidrug resistant out of which resistance were mostly seen against ampicillin (70.75%), cotrimoxazole (51.23%) and ciprofloxacin (25.29%) whereas sensitivity of gentamycin, cloxacillin and vancomycin were 85.78%, 88.94%, 100% respectively. Similarly among the gram-negative isolates, 31.5% were multidrug resistant. Higher rate of resistance were seen against ampicillin (88.17%), ceftriaxone (74%) cotrimoxazole (63.49%) and ciprofloxacin (53.17%), but were susceptible to gentamycin (75%) and imipenem (94.22%) and tigecycline (97.94%). Both gram positive and gram negative organisms are equally responsible for causing wound infection. In Conclusion, Gram positive organisms isolated from pyogenic infections comparatively offer a wide range of antimicrobial therapeutic options than gram negative isolates. For gram positive organisms, cloxacillin can be used for initial empirical treatment. Since our study showed a higher rate of resistance in gram negative infections, they usually produce limited therapeutic options. Even though limited data are available, one should always consider the possibility of fungal etiology, especially when the patient is not improving despite administration of antibiotics for a significant duration of time.

KEYWORDS

Pus Culture, Swab Culture, Multi-drug Resistance,

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INTRODUCTION

A whitish yellow or yellow liquid accumulation of dead white blood cells and dead bacteria produced during an inflammatory pyogenic infection is called pus.¹ Accumulation of pus in an enclosed tissue space produces an abscess. Pus can be formed in different anatomical sites by a wide ranges of microbial species which can be endogenous or exogenous organisms, polymicrobial or monomicrobial.²

The most common pus producing bacteria are *Staphylococcus aureus*, *Klebsiella spp.*, *Pseudomonas spp.*, *Escherichia coli*, *Streptococci spp.*^{3,4} Several studies done across the world on wound infections have been consistent enough to show a predictable bacterial profile. This makes for an important observation for a clinician who intends to start empirical treatment for his/her patients while laboratory culture reports are awaited.⁵ Selection of an effective antimicrobial agent requires a good knowledge of the involved pathogen, pathophysiology of the infectious process and also an understanding of pharmacology of the intended therapeutic agents.⁶

The reasons for increase in multiple problems like prolonged hospital stay, economic burden and significant morbidity and mortality may be due to increased incidence of drug-resistant microorganisms.⁷ In under developed countries like Nepal where clinicians are forced to use broad spectrum antibiotics due to lack of proper culture and susceptibility testing data, these problems have accelerated and the chances of spread of drug resistant bacteria are major threats.

This study was performed with the objective of finding the prevalence of gram positive and gram negative aerobic pathogens responsible for causing wound infections in our setting, their antibiograms, the percentage of multidrug resistance (MDR) organisms.

MATERIALS AND METHODS

This hospital based prospective cross sectional study was done in the Department of Microbiology, NMCTH, Nepal from Feb 2015 to Jan 2016. Pus samples received at the Microbiology laboratory were processed as per standard laboratory procedures on Blood agar, Chocolate agar and MacConkey agar plates. The culture plates were incubated aerobically at 37°C for 24 hours. The specific identification of bacterial pathogens grown was done based on their colony morphology, gram's staining characteristics, biochemical properties using

standard laboratory procedures.⁸

Antibiotic sensitivity testing was performed using modified Kirby Bauer disc diffusion method on Mueller Hinton agar plate. Zone diameters of inhibition around each disc was measured using a calibrated ruler and interpreted according to Clinical and Laboratory Standard Institute (CLSI) guidelines⁸. The antibiotics discs and the concentrations used were ampicillin (10 µg), cefixime (5 µg), ceftriaxone (30 µg), ciprofloxacin (5 µg), co-trimoxazole (25 µg), gentamycin (10 µg), for Enterococcus gentamycin (120 µg), piperacillin / tazobactam (100/10 µg), imipenem (10 µg), vancomycin (30 µg), cloxacillin (5 µg), polymyxin B (300 u), tigecycline (15 µg). cefoxitin (30mcg) disc was used for screening of MRSA. Vancomycin screening agar was used for Methicillin-resistant *Staphylococcus aureus* (MRSA) Isolates. Organism resistance to more than 2 classes of antibiotics was considered as MDR. *Staphylococcus aureus* ATCC 25923 and *Escherichia coli* ATCC25922 were included as control strains.

RESULTS

Out of 1052 pus and swab samples, 502(47.72%) showed positive results for aerobic culture. Among 502 samples, 249 were gram positive organisms, 242 gram negative organisms, 7 showed a mixed growth pattern(4 gram positive and 8 gram negative) and 4 showed growth of *Candida albicans* (Figure 1). The most common isolate was *Staphylococcus aureus* (41.45%) followed by *Escherichia coli* (22.79%), *Acinetobacter calcoaceticus*- *Acinetobacter baumannii* complex (ACB complex) (11.00%) and others.

Out of 211 *Staphylococcus aureus*, 21 were MRSA (9.96%). Among the total gram positive bacterial isolates(n=253), 12.85% were multidrug resistant out of which resistance were mostly seen against ampicillin (70.75%), cotrimoxazole (51.23%) and ciprofloxacin(25.29%) whereas sensitivity of gentamycin, cloxacillin and vancomycin were 85.78%, 88.94%, 100% respectively (Table 1).

Out of 252 gram negative isolates, most common organism was *Esc. Coli* (n=116,) followed by ACB complex (n=56) (Picture 1). Among the gram-negative isolates, 31.5% were multidrug resistant. Higher rate of resistance were seen against ampicillin (88.17%), ceftriaxone (74%) cotrimoxazole (63.49%) but were susceptible to tested aminoglycosides (73.4%), carbapenems (93.47%) and tigecycline (97.94%) (Table 2).

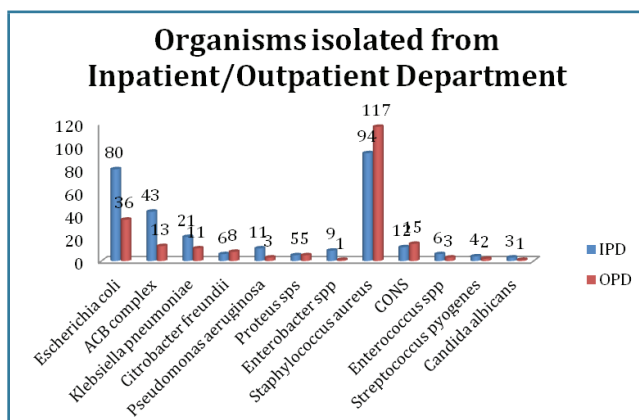
Table 1: Antimicrobial resistance patterns of gram-positive organisms

Antibiotics	CoNS(n=27)	Enterococcus spp(n=9)	S. aureus (n=211)	S.pyogenes(n=6)	Total Resistance % among tested
Ampicillin	13(48.15%)	2(22.23%)	160(76.19)	2(33.34%)	70.75%
Cephalexin	2 (7.41%)	NT	50 (23.86%)	0(0.00%)	21.32%
Cotrimoxazole	10 (37.03%)	NT	113(53.81)	2(33.34%)	51.23%
Ciprofloxacin	6 (22.23%)	1 (11.12%)	57 (27.14%)	0 (0.00%)	25.29%
Gentamicin*	2 (7.41%)	1 (11.12%)	32 (15.24%)	1 (16.67%)	14.22%
Cloxacillin	4 (14.81)	2 (22.23%)	21 (9.96%)	1 (16.67%)	11.06%
Vancomycin	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0.00%

*Gentamycin High Level (120Microgram) for Enterococcus

Table 2: Antimicrobial resistance patterns of gram-negative organisms

Antibiotics	E.coli (n=116)	ACB complex (n=56)	K. pneumoniae (n=32)	P. aeruginosa m (n=14)	C. freundii (n=14)	Enterobacter Species (n=10)	Proteus species (n=10)	Total Resistance%
Ampicillin	98 (84.48%)	52 (92.86%)	NT	NT	14 (100%)	NT	NT	88.17%
Ceftriaxone	90 (77.59%)	43 (76.78%)	25 (78.13%)	8 (57.14%)	9 (64.28%)	8 (80%)	5 (50%)	74%
Cefixime	85(73.2 %)	40 (71.34%)	21 (65.2%)	NT	9 (64.28%)	8 (80%)	7 (70%)	71.42%
Cotrimoxazole	80 (68.97%)	34 (60.71%)	13 (40.63%)	12 (85.71%)	7 (50%)	6 (60%)	8 (80%)	63.49%
Ciprofloxacin	66 (56.90%)	42 (75%)	12 (37.5%)	6 (42.86%)	4 (28.57%)	2 (20%)	2 (20%)	53.17%
Piperacillin/ Tazobactam	45 (36.84%)	52 (92.86%)	16 (50%)	2 (14.28%)	1 (7.14%)	NT	0 (0.00%)	47.94%
Gentamycin	23 (19.83)	31 (55.36%)	6 (18.75%)	3 (21.43%)	2 (14.28%)	1 (10%)	0 (0.00%)	25%
Polymyxin-B	15 (13.18%)	2 (3.57%)	0 (0.00%)	NT	1 (7.14%)	NT	0 (0.00%)	7.89%
Imipenem	6 (5.26%)	8 (14.28%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	NT	0 (0.00%)	5.78%
Tigecycline	0 (0%)	4 (7.14%)	0 (0.00%)	0 (0.00%)	1 (7.14%)	NT	0 (0.00%)	2.06%

**Fig. 1: Organisms isolated from Inpatient/Outpatient Department**

DISCUSSION

A positive isolation rate of 47.72% as seen in our study is comparable to that shown by Mulu *et al* while Azene KM *et al* have shown a 70.5% isolation rate.^{9,10} The variation in sample type, size, source and laboratory facilities available may account for the variation in isolation rate. The possible delay in sample being transported to the laboratory and the omission of looking for anaerobes may help to explain the lower isolation rate in our study.

Our study has shown that gram positive and gram negative organisms have comparable isolation rates from pus/swab samples; *Staphylococcus aureus* (41.45%) being the predominant one. This finding is similar with the findings of Azene MK *et al* where they have found

Staphylococcus aureus as the most common organism (41.6%) causing wound infection.¹⁰ Similarly Tiwari P *et al.* has also reported *Staphylococcus aureus* as the most common organism isolated from pus (35.5%).¹¹ In contrast with these findings, reports from Nigeria have shown *Pseudomonas aeruginosa* as being the most common isolates from pus sample.¹² Such difference in findings could be due to geographical variations or due to the different sources of samples being processed.

The prevalence of MRSA in our study was 9.96% which is similar to 17.5% as found in the study done in Ethiopia.¹³ This prevalence rate of MRSA is much lower than the prevalence reported from India (unto 41%).¹⁴ This signifies that the cloxacillin can still be the best empirical antibiotics to treat the community acquired wound infections in our settings. Other gram positive organisms causing wound infection in our study were CoNS (5.30%), *Enterococcus* (1.76%) and *Streptococcus pyogenes* (1.18%). Most of the gram positive organisms were isolated from samples received from out patients and were sensitive to vancomycin (100%), cloxacillin (88.94%), gentamycin (85.78%), ciprofloxacin (74.71%) and resistant to ampicillin (70.75%) followed by cotrimoxazole (51.23%). This pattern of antibiotic susceptibility seen in our study could be attributed to the predominant isolates being obtained from outpatient department thereby reflecting the community at large.

E.coli was the most common among the gram negative isolates accounting for 22.78%. This finding is similar to the finding of Azene MK *et al.*¹⁰ In our study, 11.00% of isolates were ACB complex which is similar to 13.4% as reported in a hospital based study from Nepal.¹⁵ Among gram negative isolates, ampicillin (88.17%) showed a higher degree of resistance

followed by ceftriaxone(74%). Similar susceptibility patterns were also observed in a study by Iffat Javed *et al.*¹⁶ Comparatively, aminoglycoside showed lower percentage of resistance (25%). Imipenem (94.22%) and tigecycline (97.94%) where tested were fairly sensitive for those organisms showing resistance to ampicillin, cephalosporins and aminoglycosides as also seen by Balan *et al.*¹⁷ This finding suggests that the higher antibiotics like carbapenem and tigecycline are still very effective in treating gram negative infections.

In our study, most of the gram negative organisms were isolated from inpatients. This may be the reason for the higher incidence of drug resistance noticed among gram negative isolates. Similar type of resistance patterns were noticed among gram negative isolates reported in a WHO community surveillance report on pathogenic organisms, which suggested that more number of resistant organisms were observed among hospitalized patients than in those in the community.¹⁸ The predominance of mono- microbial infections observed in our study is substantiated by a study done by Basu S *et al.*¹⁹ Such observations may be due to the limited laboratory facilities in our setting, starting from the point of sample collection and transport to the end of sample processing where we didn't consider anaerobiasis.

In the present study, 4 (0.79%) swab samples cultured grew *Candida albicans*, all of which were reflectory

to higher classes of antibiotics treatment. Hence, occurrence of fungal agents can't be neglected in cases where patients are not improving despite antibiotics treatment. Similar prevalence (0.8%) of fungal aetiology was reported in a study conducted in India by Hanumanthapa P *et al.*²⁰ Isolation of *Candida species* from different wound sample has been reported by different authors.²¹ This supports the fact that pus samples received in the laboratory may need to be processed to seek fungal pathogens and the occurrence of such fungal agents may not be neglected in cases where patients are not improving despite antibiotic treatment.

In conclusion, both gram positive and gram negative organisms are equally responsible for causing wound infection. Gram positive organisms isolated from pyogenic infections comparatively offers a wide range of therapeutic options than gram negative isolates. For gram positive organisms, cloxacillin and quinolones can be used for empirical treatment. Since our study showed higher rates of resistance in gram negative organisms, they usually produce limited therapeutic options. Even though limited data are available, one should always consider the possibility of fungal etiology, especially when the patient is not improving despite administration of antibiotics for significant duration of time.

Declaration of Interests: The authors declare no conflicts of interest.

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PARTIAL EDENTULISM AND AWARENESS TOWARDS ITS MANAGEMENT

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ABSTRACT

This cross sectional study was carried out among 200 patients within age of 18-75 years visiting the Department of Oral Medicine and Radiology, CODSH-Nepal Medical College with at least one missing tooth with an objective of exploring the attitude and knowledge of people towards partial edentulousness and management of the same. The methodology selected was a questionnaire survey followed by clinical examination. The result showed that caries was most common reason for the loss of teeth (60%) in both male (48.6%) and female (66.40), only 23.5% of total respondents had undergone treatment. Among various reasons for not restoring edentulous state, felt no deficiencies (35.0%) was the most common reason for not getting treated, negative attitude towards prosthesis (23.5%), aware but for economic reason (22.5%), lack of awareness (16.0%) and (3.0%) had fear with dental procedures. When compared to other groups, age 72 and above were aware but not availing prosthesis due to economic reasons (50%). The study revealed majority of respondents were not getting treated due to various reasons which showed that the population needs to get educated and motivated.

KEYWORDS

Awareness, partial edentulism

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INTRODUCTION

Edentulism is the state of being edentulous without natural tooth/teeth. Tooth loss is a permanent condition in that the natural order has been disrupted, and in this sense it is much like a chronic medical condition. Edentulism not only leads to impairment of normal function, comfort, aesthetics and speech, but also leads to various undesirable consequences like occlusal discrepancies, migration and spacing of surrounding teeth, supra eruption, loss of space, TMDs and other unfavorable conditions. The term management suggests a focus on meeting needs that may change over time. Different epidemiologic studies have confirmed the pattern,¹⁻⁶ prevalence²⁻⁷ and correlation of partial edentulism, and its association with age, sex, gender, socioeconomic status its prosthetic rehabilitation status,⁸ removable versus fixed restoration rate and lack of awareness on the part of public.³

MATERIALS AND METHODS

The study was conducted in the Department of Oral Medicine and Radiology, CODSH-Nepal Medical College. The study followed a cross sectional design using a self administered questionnaire. A validated, translated questionnaire was used for this study. The researcher was present at all times with the participants to help them fill out the questionnaire. Respondents between the age 18-72 years and above were included in the study after obtaining consent. Out of total medical colleges in Kathmandu valley, Nepal Medical College was selected on purpose. The prevalence of awareness regarding partial edentulism was obtained from a prior study to estimate the sample size. For this survey, a sample size of 200 was derived (least estimated difference/ permissible error=0.06) using the formula for estimation of sample size by proportion. An excess of 20% was added to cover withdrawal issues and the minimum sample size was calculated to be 200. Any respondent unwilling to participate was excluded from the study. The

questionnaire comprised of the General Information section to assess the respondent's socio-demographic data and dentition status. Section II consisted of a questionnaire which was used to evaluate the awareness of the respondents towards the management of partial edentulism.

Ethical approval was taken from the Research and Ethical Sub Committee, Nepal Medical College (NMC-RESC)

RESULTS

Table 1 shows reasons for loss of tooth/teeth, in which caries was most common reason for the loss of teeth (60%) in both male (48.6%) and female (66.40). Followed by Periodontal cause accounted for 33.5%, however, this was not statistically significant (p value>0.05). Table 2 shows the duration patient had been edentulous for. Most of the patient were edentulous for more than one year (77%). Table 3 shows among 200 edentulous patient 153 (76.5%) were not treated and only 47 (23.5%) were using different types of prosthesis. Table 4 revealed that when awareness was assessed, it was seen that individuals of age 36-53 years presented with complete lack of awareness (21.3%) and also responded that they felt no deficiencies due to lack of prostheses (37.7%) when compared to other groups. However, age 72 and above were aware but not availing prosthesis due to economic reasons (50%). These findings were not statistically significant. (p-value >0.05) Table 5 shows how often these patient visited dentist. (77%) didn't visit dentist regularly whereas only (2.0%) visited dentist once in 6 months. Gender wise preference of prosthesis showed that higher proportion of males were found to be using removable partial dentures (94.44%) over fixed partial dentures (5.56), whereas, females showed preference for fixed partial dentures (33.33%) when compared to males (5.56%). This was also statistically significant (p value <0.05) (Table 6)

Table 1: Reasons for loss of tooth/teeth

	Gender	Reasons for loss of tooth/teeth				Total
		periodontal	caries	trauma	periodontal and caries	
male	Count	33	35	3	1	72
	% within gender	45.8%	48.6%	4.2%	1.4%	100.0%
female	Count	34	85	7	2	128
	% within gender	26.6%	66.40625%	5.5%	1.6%	100.0%
Total	Count	67	120	10	3	200
	% within gender	33.5%	60.0%	5.0%	1.5%	100.0%

*p-value>0.05, taken from Fischer Exact test

Table 2: Duration of edentulism

Duration of edentulism	Frequency	Percent
less than 3 months	18	9.0
3-6 months	13	6.5
6months to 1year	15	7.5
more than one year	154	77.0
Total	200	100.0

Table 3: Distribution of treated versus untreated

Patient	Frequency	Percent
Untreated	153	76.5
Treated	47	23.5
Total	200	100.0

Table 4: Reasons for not restoring edentulousness

		Reasons for not restoring edentulousness					Total
Age group		lack of awareness	aware but for economic reason	felt no deficiencies	fear	negative attitude	
18-35 years	Count	6	20	16	3	10	55
	% within age group	10.9%	36.4%	29.1%	5.5%	18.2%	100.0%
36-53 years	Count	13	11	23	0	14	61
	% within age group	21.3%	18.0%	37.7%	.0%	23.0%	100.0%
54-71 years	Count	13	11	29	3	22	78
	% within age group	16.7%	14.1%	37.2%	3.8%	28.2%	100.0%
Above 72 years	Count	0	3	2	0	1	6
	% within age group	.0%	50.0%	33.3%	.0%	16.7%	100.0%
Total	Count	32	45	70	6	47	200
	% within agegroup	16.0%	22.5%	35.0%	3.0%	23.5%	100.0%

*p value>0.05, taken from Fischer Exact test

Table 5: Frequency of patient visiting dentist

Frequency of patient visiting dentist	Frequency	Percent
once in 6 months	4	2.0
once a year	41	20.5
not regular	155	77.5
Total	200	100.0

Table 6: Gender wise distribution of prosthesis

Variable			FPD	RPD	p-value*
gender	male	n	1	17	0.03
		%	5.56	94.44	
	female	n	9	18	
		%	33.33	66.67	
Total	n		10	35	
	%		22.22	77.78	

*p-value taken from Fischer- Exact test

DISCUSSION

The loss of teeth can lead a patient to seek care for functional reasons as they notice a diminished function to a level that is unacceptable to them. The level at which a patient finds function to be unacceptable varies among individuals.³ This study analyzed patients visiting Nepal medical college and hospital, CODSH with at least one missing teeth, patient with no missing teeth were not included and patients were aged 18 to 75 years. Motive of the study was to evaluate the knowledge and awareness of patient towards treatment of edentulism. In the surveyed group, dental caries was the most common reason for the loss of tooth/teeth in both male (48.6%) and female (66.40%) group (Table 1). Most of the patients were edentulous for more than one year (77%) which showed that they are not aware of the consequences of the disease and its complications (Table 2). The restored cases were only 23.5% (Table 3) out of the affected cases, which showed that there was a

lack of awareness to treat the same. Patients who were not treated had various reasons for not restoring the missing tooth/teeth, felt no deficiencies (35%) which clearly shows they are not aware of the consequences of the disease, negative attitude towards prosthesis (23.5%), lack of awareness (16%) which indicates the lack of knowledge about the treatment and unwanted effects of the same, few (3.0%) even had fear with dental treatment, only 22.5% of total patients were aware but financial consideration were preventing them of getting treated. Among surveyed patients only (2.0%) visited dentist regularly, which also indicates lack of awareness towards their oral health. This study shows that patients need to be motivated towards prevention of the disease and also various awareness programs has to be conducted so as to enlighten them about the unwanted consequences and benefits of the treating the same. In conclusion, the incidence of partial edentulism among surveyed patients were 36% male and 64% female which was highly significant showing female dominance. In a similar study where all restored cases were with fixed bridges and no anterior edentulousness was found, women were found to be more aware than men to restore it.³ The reason for higher proportion of females presenting with partial edentulism in this study could hence be because of the fact that women being more aware, sought treatment and hence were diagnosed with partial edentulism. A predominant reason for loss of tooth/teeth was dental caries (60%). Among 200 edentulous patients only 47(23.5%) were treated and Lack of awareness, felt no deficiencies, negative attitude towards prosthesis and fear towards dental treatment were found in all age. However, individuals above 72 years of age showed more awareness than any other age groups. This was, however, different from the findings of another study where highest proportion of awareness was found among individuals below the age of 19 years.¹¹ The finding of this survey showed the need to educate the population regarding the importance of tooth/teeth, treatment of diseased tooth/teeth and also to replace the same in-case if it has to been extracted due to any reasons.

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EVALUATION OF OUTCOMES FOLLOWING ERAS PROGRAMME IN LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT

Enhanced Recovery after Surgery (ERAS) is a multimodal perioperative care protocol designed to decrease major morbidity and promote accelerated postoperative recovery. ERAS guidelines are emerging for areas outside the original area of colorectal surgery. Selected components of ERAS are applied for selected surgical procedures. All the patients who underwent laparoscopic cholecystectomy from 1st August 2016 to 30th July 2017 at department of surgery, Nepal Medical College and Teaching Hospital were evaluated in this prospective randomized study. Among the 204 patients enrolled, mean age, BMI, operative time, pain score, doses of top up analgesia, hospital stay, time to ambulation and tolerance of oral feeding were comparable between the two groups. The patients in ERAS group had better score for sadness (ERAS: 1.2 ± 0.42 and Conventional: 1.4 ± 0.68 , $p = 0.004$), ability to stand (ERAS: 2.8 ± 0.41 and Conventional: 1.9 ± 0.6 , $p = 0.001$) and mean impact on work stand (ERAS: 1.7 ± 0.4 and Conventional: 1.9 ± 0.2 , $p = 0.008$). Postoperative nausea vomiting was more in the conventional group (ERAS: 8, Conventional: 20, $p = 0.015$). Overall feeling of wellbeing was better in ERAS group and more patients in this group opted to go home after 24 hours (ERAS: 27, Conventional: 14, $p = 0.002$). In conclusion, implementation of ERAS protocol enhances postoperative recovery, improves patient's satisfaction and reduces postoperative nausea vomiting and depression in patients undergoing laparoscopic cholecystectomy.

KEYWORDS

Cholecystectomy, ERAS, pain, Postop QRS, recovery

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INTRODUCTION

Major GI surgeries generally involve a prolonged hospital stay and one week is usually the minimum that can be expected.¹ This prolonged hospital stay is not usually due to postoperative complications but to the conventional perioperative care protocol followed. Inadequate pain management, intestinal dysfunction and immobilization have been recognized since 1997 as among the main factors delaying postoperative recovery in patient subjected to major surgery.² This led Kehlet *et al.* to propose an evidence based multidisciplinary action protocol, known initially as fast-track or better called Enhanced Recovery Programs (ERAS). However, ERAS is not achieving the degree of implantation hoped for.^{3, 4} In this era of minimal access and fast track surgery, patient undergoing laparoscopic cholecystectomy prefer to stay at hospital for shorter period and resume to work as early as possible. Implementation of ERAS protocol has shown better patient satisfaction and feeling of wellbeing after surgery. This study was carried out to implement perioperative interventions according to ERAS protocols to optimize perioperative recovery after laparoscopic cholecystectomy.

MATERIALS AND METHODS

This was a prospective randomized study conducted at department of surgery, Nepal Medical College and Teaching Hospital from 1st August 2016 to 30th July 2017. All the patients who underwent laparoscopic cholecystectomy during this period were included in this study.

Patients were randomized into two groups by simple odd even number randomization technique. All patients got a serial number starting from 1. First case was allocated into group A, then all odd serial number were included in group A and even serial number in group B. The patients were given verbal and written information regarding ERAS protocol and a signed consent was taken. The patients in the group A received conventional perioperative care plan and ERAS perioperative care plan was given to the patients in the group B which included carbohydrate solution 12 hours and 6 hours prior to the surgery, ambulation within 6 hours of surgery, liquid diet started after 6 hours of surgery, oxygen supplementation at the rate of 6 liters/min for 2 hours by mask and then at 2 liters/min by cannula for 4 hours irrespective of oxygen saturation detected by the probe, and intravenous paracetamol (no parenteral opiates). Diabetic patients, conversion to open and breach of protocol were excluded from the study. The patients on oral analgesia, with mobilization reaching pre-surgical level, tolerating solid food, passing gas and stool, without nausea, and most importantly patients wanting to go home were discharged. The patient had first follow up visit 7 to 10 days after surgery. Outcome analysis were compared between the groups regarding postoperative recovery (pain score, time to ambulation), postoperative nausea vomiting, complications (wound related and systemic) and hospital stay.

RESULTS

Total 204 patients who underwent laparoscopic cholecystectomy were included in the study. Most of the patients were female 78% (n=158). Equal number of patients were distributed in the ERAS group and conventional group (n=102 in each group). Mean age was 45.3 ± 3.6 years (16-80) and age was similar in two group (ERAS = 44.6 ± 13.1 , conventional = 44.9 ± 14.2). The mean BMI was 24.7 ± 3.1 (19.3-30.2) and it was comparable in two groups. The mean operative time was 34.5 ± 6.5 (25-60) minutes, hospital stay was 45.5 ± 5.7 hours and time to ambulation was 7.9 ± 0.8 hours. (Table 1) Oral feeding was started after 6 hours and normal diet was resumed at 24 hours surgery in all patients.

Table 1: Baseline clinical parameters

Clinical parameters	ERAS	Conventional	P value
Operative time	33.6 ± 5.7	35.3 ± 7.1	>0.05
Hospital stay	44.1 ± 7.8	46.0 ± 5	>0.05
Time to ambulation	8 ± 0.92	7.9 ± 0.69	>0.05

The mean pain score was comparable in the two groups (ERAS: 1.4 ± 0.6 , Conventional: 1.5 ± 0.7) and the mean doses of top up analgesia given was also similar in the two groups. However, the patients in ERAS group had better score for sadness (ERAS: 1.2 ± 0.42 and Conventional: 1.4 ± 0.68 , $p = 0.004$), ability to stand (ERAS: 2.8 ± 0.41 and Conventional: 1.9 ± 0.6 , $p = 0.001$) and mean impact on work stand (ERAS: 1.7 ± 0.4 and Conventional: 1.9 ± 0.2 , $p = 0.008$) and the difference was statistically significant. (Table 2)

Table 2: Comparison of PostopQRS scores

Mean score at 24 hours	ERAS group	Conventional group	P value
Mean pain score	1.4 ± 0.6	1.5 ± 0.7	0.42
Top up analgesia (mean doses)	1.1 ± 1.0	1.2 ± 1.04	0.54
Mean sadness score	1.2 ± 0.42	1.4 ± 0.68	0.004
Mean ability to stand score	2.8 ± 0.41	1.9 ± 0.6	0.001
Mean impact on work score	1.7 ± 0.4	1.9 ± 0.2	0.008

Postoperative nausea vomiting was noticed more frequently in conventional group (ERAS: 8, Conventional: 20, $p = 0.015$). Overall feeling of wellbeing was better in ERAS group and more patients in this group opted to go home after 24 hours (ERAS: 27, Conventional: 14, $p = 0.002$). (Table 3)

Table 3: Comparison of outcome parameters

Outcome parameters	ERAS group	Conventional group	P value
Postoperative nausea vomiting	Yes 8	20	0.015
	No 94	82	
Willing to go home at 24 hours	Yes 27	14	0.02
	No 75	88	

DISCUSSION

Enhanced recovery after surgery (ERAS) is an optimized well-structured protocol that is designed to reduce surgical stress and prepare patient for the surgery to fasten postoperative recovery.⁵ ERAS protocol covers all three phases of perioperative surgical care and focus on factors such as prolonged bed rest, delayed return of normal bowel function, need for intravenous analgesia that usually cause delay in recovery, increase length of hospital stay and specialist intervention after surgery.⁶ There are some key factors of an ERAS programme which differ from the conventional surgical approach. Patients are given high carbohydrate drinks pre-operatively and normal diet will be started as quickly as possible postoperatively. Early mobilization is encouraged after surgery (within a few hours if operation is in the morning). Anesthesia has an important part to play in the whole process, with the use of regional anesthesia for more effective pain control and keeping usage of opiates to a minimum. The basic components of ERAS can be tailored to surgery specific protocols. The recommendations are based on good quality randomized controlled trials or meta-analysis of them.^{6,7,8,9} For homogeneity of the population and minimization of bias, we selected only patient undergoing laparoscopic cholecystectomy. Laparoscopic cholecystectomy has been practiced as a day care surgery since long even with conventional perioperative care plan. However, implementation of ERAS had significantly improved patients feeling of well being. Patients receiving ERAS protocol could ambulate without support and do activities to take care of themselves earlier compared to conventional group. Patients in ERAS group were more satisfied at 24 hours with fewer incidences of postoperative nausea/vomiting after surgery. Higher number of patients in ERAS group was ready to go home at 24 hours after surgery. Although recent meta-analyses proved that ERAS has a better outcome compared with conventional postoperative care, there is still a lack of standardization in these studies which hinders achievement of higher levels of evidence.¹⁰⁻¹³ The main problem is the multidisciplinary integration of ERAS into routine clinical care, challenging surgeons, anesthetists, nurses, and other involved health care professionals.^{14,15} Although ERAS significantly decreases length of stay (LOS) and the overall occurrence of complications, compliance with its protocol in daily clinical practice worldwide is not optimal.^{12,16} Following numerous clinical studies, Lassen et al. summarized 20 treatment components as Consensus Guidelines, which need to be considered when ERAS is used in clinical practice. Fifteen out of 20 components reached evidence grade A in ERAS.¹² Several publications mention different ERAS components that have been included into their protocols, highlighting the ongoing evolution of ERAS protocols. Ahmed et al. have performed an interesting systematic review of the compliance with ERAS components.¹² They identified 19 ERAS modalities partially differing from the Consensus Guidelines (20 components) and included 11 clinical trials. The review showed that none of the trials included all 19 ERAS components in their protocols. In fact, they identified a maximum of 14 components included by

Ramirez et al., 13 modalities included by Nygren et al. whereas Schwenk et al. and Kahokehret et al. considered only 4 components.¹⁷⁻¹⁹ Ahmed et al. reported that both clinical implementation (components not reported or included in the ERAS protocol) and compliance (in percent) showed widespread variation among the clinics, highlighting the necessity of further standardization.¹² This improved the evidence in ERAS protocols, as shown in a recent Cochrane meta-analysis including only 4 RCTs.¹¹ Although a high compliance with the ERAS protocol is clearly correlated with improved outcome after surgery, pure facts do not seem to be convincing.¹²

Conventional perioperative care is based on personal experiences and traditional surgical teachings, however growing amount of research in different aspect of perioperative care made ERAS protocol more evidenced based and able to comment on those practices which are unnecessary or even halt postoperative recovery in surgical patients. Most of the recent trials focusing on ERAS protocol and outcomes are able to show reduced length of hospital stay along with decreased morbidity.²⁰

The results that can be achieved with ERAS i.e. reductions in postoperative morbidity, average length of hospital stay and the consumption of resources – are significant and the general implantation of an ERAS is recommendable.²¹⁻²³ Unfortunately, the results communicated regarding surgery in an ERAS context have nearly all come from individual institutions, although they include those of four randomized clinical trial.^{20,21,24-26} Recently, the results of an international study (five hospitals in different countries, four with no prior experience in ERAS) reporting on patient follow-up, the degree of acceptance and the degree of compliance with the protocol of a common ERAS, have also become available.²² The results of these studies suggest that just making a protocol available is insufficient for objectives to be achieved; changes also need to be made to organizational strategies and the medical professionals involved in pre, intra and especially postoperative care require support via continuing education.²⁴⁻²⁷

In our study we improvised a simple and convenient perioperative care plan including only five ERAS components (preoperative carbohydrate loading, early postoperative feeding, early ambulation, continuous oxygenation for 6 hours and intravenous paracetamol for pain management). The patient's satisfaction was measured using PostopQRS scale. This is a simple and easily reproducible tool to assess postoperative recovery after surgery.²⁸ In this study we found no difference in mean postoperative pain score, need of analgesia tolerance to oral feeding and length of hospital stay between the two groups. However, our patients in ERAS group had significantly lower incidence of postoperative nausea/vomiting, less postoperative depression and better overall satisfaction at 24 hours after surgery. This was shown by significant number of patients in ERAS group choosing to go home at 24 hours. Hence, with the analysis of the results of our study we could demonstrate significant advantage of applying ERAS protocol in patients undergoing laparoscopic

cholecystectomy. In conclusion, implementation of ERAS protocol enhances postoperative recovery, improves patient's satisfaction and reduces postoperative nausea vomiting and depression in patients undergoing laparoscopic cholecystectomy.

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CLINICAL AND BIOCHEMICAL PROFILE OF ACUTE GASTROENTERITIS IN CHILDREN IN NEPAL MEDICAL COLLEGE TEACHING HOSPITAL

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ABSTRACT

The objective of this study was to find out the clinical and biochemical profile of acute gastroenteritis in children. This was a prospective study carried out in Nepal Medical College Teaching Hospital. Seventy-eight cases of acute gastroenteritis admitted in pediatric ward of NMCTH were studied. Most of the cases (48.7%) were in the age group 1-5 years. Loose stool, vomiting (58.9%), fever (48.7%), decreased urine output (24.3%) were the main presenting features. According to WHO classification, 32.1% had no dehydration, 55.1% had some and 12.8% had severe dehydration. Hyponatremia and hypokalemia was seen in 39.7% and 29.5% respectively. High level of serum urea was seen in 15.1 % and high serum creatinine was seen in 7.5%.

KEYWORDS

Acute gastroenteritis,
dehydration, electrolyte
imbalance

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INTRODUCTION

Diarrheal diseases are one of the leading causes of morbidity and mortality in children worldwide, causing 1 billion episodes of illness and 3-5 million deaths annually.¹ Prevalence of diarrheal diseases in Nepal has decreased in last 20 years. Prevalence of diarrheal diseases in urban and rural area was 23.8 and 27.7 in 1996 where as it was 11.5 and 11.9 in 2006 respectively.² The two most risky consequences of diarrhea are malnutrition and death. Dehydration is the major cause of death in acute diarrhea. Fluid and electrolyte balance is the main therapy in acute diarrhea. Oral rehydration solution is still the choice of treatment for children with no or some dehydration. Intravenous fluid therapy is reserved for treatment of children with severe dehydration.³

The aim of this study was to evaluate symptoms, severity and biochemical parameters like urea, creatinine and electrolytes in children presenting with acute gastroenteritis.

MATERIALS AND METHODS

This was a prospective study done in Nepal Medical College Teaching Hospital. All cases of acute gastroenteritis admitted in the pediatric ward of NMCTH from April 2013 to September 2013 were studied. Patients admitted with the diagnosis of acute gastroenteritis were taken for the study. Clinical features were recorded and degree of dehydration assessed according to WHO.

Of the total 88 cases of acute gastroenteritis admitted during that period, only 78 cases were taken for the study as serum electrolytes were done only in those cases. Thus 10 cases were excluded from the study. Data like age, sex, symptoms, duration, severity of dehydration (according to WHO) were recorded. Investigations that were included in the study were stool routine and microscopic examination, serum sodium, serum potassium, urea, and creatinine. All the data were recorded and filled up in a preformed form and analyzed accordingly.

RESULTS

Out of 78 cases of acute gastroenteritis admitted in the pediatric ward of Nepal Medical College Teaching hospital, 44 (56.4%) were male and 34 (43.6%) were female. Maximum numbers of patients (48.7%) were in the age group 1-5 years followed by less than 1 years. (Table 1). Forty-five children (57.6%) presented with symptoms for 2-5 days. History of loose stool for less than two weeks was present in all these children. The other clinical features present in these children were vomiting, fever, decreased urine output and altered sensorium. Vomiting was seen in 46 (58.9%) children. Fever (48.7%), decreased urine output (24.3%), altered mental state (10.2%) and convulsion (3.8%) were also seen in these children (Fig.1). According to the WHO

classification, 25 (32.1%) had no signs of dehydration, 43 (55.1%) had some and 10 (12.8%) had severe signs of dehydration. (Table 2) Hyponatremia was seen in 31 (39.7%) children and hypokalemia in 23 (29.5%)

Table 1: Age wise distribution of children with acute gastroenteritis

Age	Number	Percentage
<1 year	21	26.92
1-5 years	38	48.72
>5 years	19	24.35

Table 2: Degree of dehydration according to WHO

Degree of dehydration	Number	Percentage
No dehydration	25	32.05
Some dehydration	43	55.12
Severe dehydration	10	12.82

Table 3: Serum sodium level in children with acute gastroenteritis

Serum sodium level	Number	Percentage
<135 mEq/L	31	39.74
135- 146 mEq/L	45	57.69
>146 mEq/L	2	2.56

Table 4: Serum potassium level in children with acute gastroenteritis

Serum potassium level	Number	Percentage
<3.5 mEq/L	23	29.48
3.5-5.5 mEq/L	51	65.38
>5.5 mEq/L	4	5.12

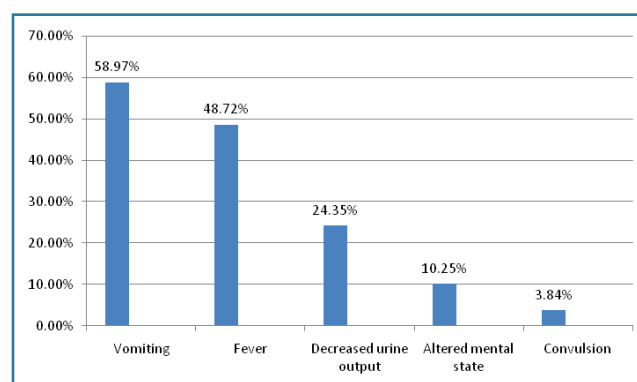


Fig.1: Bar diagram showing clinical presentation of acute gastroenteritis in children

children. (Table 3 and 4). Serum urea was high in 15.1% and high creatinine was seen in 7.5% cases. Stool routine and microscopic examination revealed fat droplets indicating viral etiology in 35.9% cases. Stool routine and microscopic examination showed dysentery in 15.28%. *Entamoeba histolytica* was seen in 16.66% cases whereas *Giardia lamblia* was seen in only 1.28%. Cholera was isolated in 3.85%. Majority of children (69.2%) stayed in hospital for 2-5 days.

DISCUSSION

Acute gastroenteritis is one of the commonest causes of hospital admission in children. Major consequences of acute gastroenteritis are dehydration and electrolyte imbalance. In our study of 78 children, 56.4 % were male and 43.6% female. This finding was similar to the study done by Rebella *et al* and Bottaro *et al* where 50% and 51% were male respectively.^{4,5} Beside loose stool, 58.97% had vomiting, 48.72% had fever and 24.35% had decreased urine output in our study. Bottaro *et al* in their study of 1140 children reported vomiting and fever in 34.6% and 27.5% respectively.⁵ In yet another study, vomiting was seen in 25.9% children presenting with acute gastroenteritis with dehydration.⁶ In our study, 32.05% had no dehydration, 55.12% had some and 12.82% had severe dehydration. Different studies have found severe dehydration in only 2% and 0.35%.^{4,5} The high percentage of severe dehydration in our study could be because of the fact that some children are brought to hospital only when they become severely ill. Hyponatremia was seen in 39.74% and hypokalemia in 29.48% children in our study. 15.09% had high serum urea and 7.54% had high creatinine level. KC *et al* in their study done at Kathmandu Medical College in adults with acute gastroenteritis found hyponatremia in only 2.9%, hypokalemia in 26.47% and high urea and creatinine level in 23.40% and 8.82% respectively.⁷ Studies have shown that serum urea and bicarbonate levels are helpful in assessing dehydration.^{8,9} However, some studies found out that measurement of the magnitude of BUN concentration is not an accurate method for assessing the hydration status of children with dehydration due to acute

gastroenteritis.¹⁰ In our study, 35.89% had only fat droplets in stool routine and microscopic examination indicating viral etiology. Most of the cases of acute gastroenteritis in children worldwide are viral.^{1,3,11} In our study, 15.38% had bacillary dysentery. *Entamoeba histolytica* was the most commonly isolated protozoa (16.66%). *Giardia lamblia* was seen in only one case (1.28%). This was in contrary to the study done by Joshy *et al* in Manipal College of Medical Sciences, Pokhara where *Giardia lamblia* was the most commonly isolated protozoan parasite (73.4%) followed by *E histolytica* (24.4%).¹² There were 3 cases of cholera (3.85%). All 3 cases were sensitive to ciprofloxacin. This antibiotic susceptibility was comparable to the study done by Shrestha *et al* in which *Vibrio cholera* was 100% sensitive to ciprofloxacin, ampicillin, tetracycline and erythromycin.¹³ Various studies have shown the benefit of oral rehydration solution in management of mild to moderate dehydration caused by acute gastroenteritis.¹⁴⁻¹⁶

Intravenous fluid can be reserved for cases with severe dehydration and electrolyte imbalance. Acute gastroenteritis with dehydration is one of the important causes of hospital admission in children. Hyponatremia and hypokalemia are more common in these patients. These parameters must be checked in all patients with acute gastroenteritis especially those presenting with features of dehydration. Though it is not a common practice to look for bicarbonate level in our setup, it would be better to check serum bicarbonate value in those presenting with severe dehydration.

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PATIENT SATISFACTION IN NEPAL MEDICAL COLLEGE TEACHING HOSPITAL

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ABSTRACT

Patient satisfaction is considered as a vital indicator to assess the quality of care. Being such an important aspect, evidence has shown that this has not been on a priority list of health care system and thus needs to be addressed. This study was therefore, conducted to assess patient satisfaction in Nepal Medical College Teaching Hospital.

It was a descriptive cross sectional study that involved the participation of 470 participants via convenience sampling method. Face to face interview technique was employed to collect data using semi-structured questionnaire. Both descriptive and inferential statistic (chi square test and independent t test) was used for data analysis. The study finding revealed that more than two third of participants (86.0%) were satisfied with the hospital services and patient satisfaction level was not associated with the variables of the study. Of all the five domains, patients were satisfied with the doctors' care, accessibility of services, and nursing care while they were unsatisfied with hospital policy and hospital facilities. On one hand, patients were satisfied with majority of items of five domains but patients also revealed their dissatisfaction with few items such as: explanation of procedures and way of giving health advice by nurses; cleanliness of bed, toilet, water facilities; payment system and in patient visiting time.

Even though, most of the participants were satisfied with majority of dimensions of care; dissatisfaction with the hospital facilities, hospital policy, nurses' explanation of procedures and health advice calls for the need to take necessary actions in these aspects to enhance patient satisfaction.

KEYWORDS

Nepal, patient satisfaction, teaching hospital

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INTRODUCTION

Patient care is one of the essential aspects of both nursing and medical profession. Over the years, dimension of patient care has changed along with technological advancement, yet the core component remains the same that is, providing quality patient care.¹ One of the effective measures to evaluate the quality of care is to assess the level of patient satisfaction.² Assessment of patient satisfaction helps to identify the gaps and work on those gaps to render effective, efficient, accessible, acceptable, equitable and safe health care services.³⁻¹⁰ Even though, patient satisfaction is an integral component of health care system, in the resource constraint countries like ours, where the priority of health care management is to deliver quality services at affordable cost, assessing patient satisfaction level has gained no limelight. This study was therefore conducted with the motive to assess the level of patients' satisfaction and to identify principal drivers to patient satisfaction among the patients admitted in Nepal Medical College Teaching Hospital (NMCTH).

MATERIALS AND METHODS

This descriptive cross sectional study was conducted in a 750 bedded tertiary level, private teaching hospital (NMCTH) which is located in the capital city of Nepal, Kathmandu. Ethical approval was sought from Nepal Medical College Institutional Research/Review Committee (NMC-IRC) and verbal consent was obtained from the participants before commencing study. A convenience sampling method was employed to collect data from the total of 470 participants (235 each from medical and surgical ward) after calculating the sample size¹¹ using the formula Z^2PQ/d^2 where, P (probability of attribute) was taken in reference to the study by Khan *et al* (2007)⁴ as 45%; $Z=1.96$, d (allowable error) = 10% of P. Participants of 18 or more years of age, admitted for two or more nights, alert and in condition to express their opinion were included in the study while those not willing to participate were excluded.

A semi-structured questionnaire was developed after an extensive literature review to match the context of hospitals in Nepal. The questionnaire consisted of a 34 item five point likert scale and an open ended question which was aimed to collect suggestions from participants to improve patient satisfaction. There was a total of 34 items under the five domains namely: satisfaction towards the hospital basic amenities (6 items), satisfaction towards nursing care (10 items), satisfaction towards doctors' care (8 items), satisfaction towards hospital accessibilities (6 items) and satisfaction towards hospital policy (4 items). The five point likert scale ranged between 1 (indicating very unsatisfied) to 5 (indicating very satisfied). Higher the score, higher was the satisfaction level. The mean score

of three or less was considered as unsatisfied towards service while that of more than three was considered as satisfied in each domain. Similarly, while classifying overall satisfaction level in the total of 34 items, total 34 was multiplied with the midpoint '3' yielding a score of 102 as per the reference by Kothari.¹² Therefore, participants securing score of 102 or less were classified as unsatisfied and more than that were kept under satisfied participants. Data was collected via face to face interview technique.

The content validity of instrument was maintained through comprehensive literature review and consultation with subject experts. Pre-test was done in 10% of total samples (among 47 participants) and were excluded in the main study. The internal consistency of the instrument was measured using the Cronbach alpha test, which yielded the value of 0.77. Data were entered and analyzed via SPSS v. 16. Descriptive statistics was used for socio demographic data and overall patient satisfaction score. Chi square test was used to assess the association between the independent variables and patient satisfaction and independent t test was used to assess any difference in patient satisfaction level between medical and surgical ward.

RESULTS

Half of the respondents (50.9%) fall in the age group of 35 to 64 years, with nearly equal proportion of male and female study participants. Majority of participants (48.3%) were illiterate and agriculture was the main occupation for maximum number of participants. Two third of respondents (67.7%) were never hospitalized at NMCTH. Regarding hospital stay, duration of stay was less than seven days for 81.7% of participants. More than half (56.8%) of the patients were from outside the Kathmandu valley (Table 1). Patient satisfaction was found to be influenced by none of the independent variables assessed such as age, gender, marital status, educational status, ward type, previous hospitalization and length of hospital stay (Table 2).

Scores of each domain converted out of 5 (Minimum Score = 1 and maximum score = 5; Overall Mean Scores $\leq$ 3: unsatisfied; Overall mean score $>$ 3: satisfied) *:p value significant at <0.05 level

Cleanliness of ward, physical and psychological safety of ward topped the list of satisfaction among basic hospital amenities (Table 3). With regard to satisfaction with nursing care, respondents were found to be satisfied with all the items assessed, except on the way nurses provided advice about the illness (2.74 ± 1.11) and explained about the nursing procedures (2.72 ± 0.98) to be carried out (Table 4). However, the overall mean score (3.41 ± 0.41) reveals that patients were satisfied with overall nursing care. There was a significant difference ($p < 0.05$) in the satisfaction level in the way nurses gave advice ($p = 0.04$) and explained about the

procedure ($p=0.00$) between medical and surgical ward (Table 4). While analyzing satisfaction with doctors' care, patients seemed to be satisfied with all the items assessed. A significant difference was observed in the way politeness ($p=0.01$) and respect/dignity ($p=0.00$) was maintained by doctors while comparing between medical and surgical ward (Table 5). The aspect of accessibility of services revealed that most of the patients were satisfied with all the items under this

domain (Table 6). Visiting hours and payment system in the counter was the highly rated item of dissatisfaction among study participants under the domain 'Hospital policy'. While, participants were found to be satisfied with hospital charges and ease to information (Table 6).

Table 1: Socio-demographic description of respondents.		n=470	
Variables	Medical Ward n (%)	Surgery Ward n (%)	Total n (%)
Age groups (in years)			
18-34	39 (8.3)	71 (15.1)	110 (23.4)
35-64	122 (26.0)	117 (24.9)	239 (50.9)
≥65	74 (15.7)	47 (10.0)	121 (25.7)
Mean age $\pm$ SD= 49.48 $\pm$ 17.820			
Gender			
Male	113 (24.0)	118 (25.1)	231 (49.1)
Female	112 (26.0)	117 (24.9)	239 (50.9)
Marital Status			
Unmarried	29 (6.2)	37 (7.9)	66 (14.0)
Married	185 (39.4)	186 (39.6)	371 (78.9)
Divorce	1 (0.20)	1 (0.20)	2 (0.40)
Widow/widower	20 (4.3)	11 (2.3)	31 (6.6)
Educational Status			
Illiterate	126 (26.8)	101 (21.5)	227 (48.3)
Informal education	28 (6.0)	32 (6.8)	60 (12.8)
Primary education	23 (4.9)	20 (4.3)	43 (9.1)
Secondary education	37 (7.9)	30 (6.4)	67 (14.3)
Intermediate level	15 (3.2)	38 (8.1)	53 (11.3)
Bachelors and above	6 (1.3)	14 (3.0)	20 (4.3)
Occupational Status			
Agriculture	76 (16.2)	80 (17.0)	156 (33.2)
Service	22 (4.7)	21 (4.5)	43 (9.1)
Business	13 (2.8)	21 (4.5)	34 (7.2)
Homemaker	46 (9.8)	54 (11.5)	100 (21.3)
Labor	13 (2.8)	21 (4.5)	34 (7.2)
Student	26 (5.5)	33 (7.0)	59 (12.6)
Retired/Can't work because of work and disease	39 (8.3)	5 (1.1)	44 (9.4)
Previous hospitalization			
Yes	96 (20.4)	56 (11.9)	152 (32.3)
No	139 (29.6)	179 (38.1)	318 (67.7)
Length of stay (at the time of data collection)			
≤ 7 days	210 (44.7)	174 (37.0)	384 (81.7)
>7days	25 (5.3)	61 (13.0)	86 (18.3)
Average length of stay: 6.68 $\pm$ 6.94 days			
Address of Patient			
Within Kathmandu Valley	113 (24.0)	90 (19.1)	203 (43.2)
Outside Kathmandu Valley	122 (26.0)	145 (30.9)	267 (56.8)

Table 2: Association between independent variables and Patient Satisfaction. n=470

Variables	Patient Satisfaction			χ ²	p value
	Unsatisfied n (%)	Satisfied n (%)	Total n (%)		
Age groups (in years)					
18-34	19 (4.0)	91 (19.4)	110 (23.4)	1.391	0.499
35-64	30 (6.4)	209 (44.5)	239 (50.9)		
≥65	17 (3.6)	104 (22.1)	121 (25.7)		
Gender					
Male	33(7.0)	198 (42.1)	231 (49.1)	0.022	0.881
Female	33 (7.0)	206 (43.8)	239 (50.9)		
Marital Status					
Unmarried	7 (1.5)	59 (12.6)	66 (14.0)	0.751	0.386
Married	59 (12.6)	345 (73.4)	404 (86.0)		
Educational Status					
Literate	41 (8.72)	202 (42.97)	243 51.70)	3.338	0.068
Illiterate	25 (5.31)	202 (42.97)	227(48.29)		
Ward Type					
Medical Ward	31 (6.59)	204 (43.40)	235 (50.0)	0.282	0.595
Surgery Ward	35 (7.44)	200 (42.55)	235 (50.0)		
Previous hospitalization					
Yes	21 (4.46)	131 (27.87)	152 32.34)	0.010	0.922
No	45 (9.57)	273 (58.08)	318(67.65)		
Length of Stay at the time of data collection					
≤ 7 days	52 (11.06)	332 (70.63)	384(81.70)	0.436	0.509
>7 days	14 (2.97)	72 (15.31)	86(18.29)		

Pearson Chi Square ((χ^2) Test *: p value significant at < 0.05 level
 Unsatisfied: ≤ 102 score; Satisfied: ≥ 103 score (Total score =170)

Table 3: Patient satisfaction towards basic hospital amenities.

Statements	Patient Satisfaction Mean Score			t test	p value
	Medical Ward (Mean ± SD)	Surgery Ward (Mean ± SD)	Total Mean Score (Mean± SD)		
Domain 1: Basic Hospital amenities (6 items)					
Cleanliness of ward	3.22 ± 0.80	3.31 ± 0.96	3.26 ± 0.88	-1.093	0.275
Physical and psychological safety in ward	3.26 ± 0.96	3.16±0.91	3.21 ± 0.94	1.177	0.240
Elevator facilities	2.99 ± 0.92	3.01 ± 0.90	3.0 ±0.91	-0.25	0.80
Cleanliness of bed	3.06 ± 0.96	2.91 ± 1.02	2.98 ± 0.99	1.624	0.105
Water facilities	2.44 ± 1.07	2.18 ± 1.00	2.31 ± 1.05	2.74	0.006*
Cleanliness of bathroom and toilet facilities	2.17 ± 1.09	2.29 ± 1.06	2.23 ± 1.07	-1.11	0.26
Overall Mean score	2.85 ± 0.48	2.80 ± 0.57	2.83 ± 0.52	1.003	0.018*

Table 4: Patient satisfaction towards nurses' care.

Domain 2: Nursing care (10 items)					
Statements	Medical Ward (Mean $\pm$ SD)	Surgery Ward (Mean $\pm$ SD)	Total Mean Score (Mean $\pm$ SD)	t test	p value
Friendly and courteous manner of nurses	3.96 $\pm$ 0.54	3.88 $\pm$ 0.68	3.92 $\pm$ 0.62	1.416	0.157
Confidence and trust in nurses	3.79 $\pm$ 0.72	3.75 $\pm$ 0.82	3.77 $\pm$ 0.77	0.53	0.59
Answers your questions in a way you could understand	3.60 $\pm$ 0.89	3.57 $\pm$ 0.79	3.59 $\pm$ 0.84	0.273	0.785
Treats you with respect , dignity and maintains privacy	3.53 $\pm$ 0.86	3.65 $\pm$ 0.83	3.59 $\pm$ 0.84	-1.579	0.11
Addresses your worries and concerns	3.50 $\pm$ 0.85	3.58 $\pm$ 0.81	3.54 $\pm$ 0.83	-1.050	0.29
Involves you and your family in making decisions about your care.	3.49 $\pm$ 0.89	3.59 $\pm$ 0.91	3.54 $\pm$ 0.90	- 1.22	0.22
Knows about your latest condition	3.42 $\pm$ 0.83	3.53 $\pm$ 0.74	3.47 $\pm$ 0.78	-1.465	0.14
Attends you immediately when called for help without delaying	3.26 $\pm$ 0.95	3.29 $\pm$ 1.01	3.27 $\pm$ 0.98	- 0.32	0.74
Gives you advice about the ways to avoid illness and stay healthy	2.64 $\pm$ 1.13	2.84 $\pm$ 1.08	2.74 $\pm$ 1.11	-1.99	0.04*
Explains about every details before, during and after procedure	2.58 $\pm$ 0.97	2.86 $\pm$ 0.97	2.72 $\pm$ 0.98	-3.077	0.002*
Overall Mean Score	3.37 $\pm$ 0.37	3.45 $\pm$ 0.43	3.41 $\pm$ 0.41	-2.068	0.033*

Scores of each domain converted out of 5 (Minimum Score = 1 and maximum score =5; Overall Mean Scores $\leq$ 3: unsatisfied; Overall mean score $>$ 3: satisfied) *:p value significant at $<$ 0.05 level

Table 5: Patient satisfaction towards doctors' care.

Domain 2: Doctors' care (8 items)					
Statements	Medical Ward (Mean $\pm$ SD)	Surgery Ward (Mean $\pm$ SD)	Total Mean Score (Mean $\pm$ SD)	t test	p value
Confidence and trust in doctors	3.94 $\pm$ 0.67	3.94 $\pm$ 0.62	3.94 $\pm$ 0.64	0.14	0.88
Speaks to you politely	3.86 $\pm$ 0.71	4.00 $\pm$ 0.65	3.93 $\pm$ 0.68	-2.35	0.019*
Addresses your worries and concerns	3.69 $\pm$ 0.75	3.69 $\pm$ 0.79	3.69 $\pm$ 0.77	-0.60	0.95
Involves you and your family in making decisions about your treatment and care	3.60 $\pm$ 0.75	3.65 $\pm$ 0.83	3.63 $\pm$ 0.79	-0.63	0.52
Knows about your latest condition/ Progress	3.61 $\pm$ 0.75	3.60 $\pm$ 0.74	3.60 $\pm$ 0.75	0.24	0.80
Gives information about your disease condition and treatment modalities to your satisfaction	3.50 $\pm$ 0.90	3.53 $\pm$ 0.82	3.51 $\pm$ 0.86	-0.42	0.67
Explains in details about every procedures before, during and after procedure	3.32 $\pm$ 0.94	3.32 $\pm$ 0.92	3.32 $\pm$ 0.93	0.00	1.00
Treats you with respect, dignity and maintains privacy	3.00 $\pm$ 1.05	3.29 $\pm$ 0.95	3.14 $\pm$ 1.016	-3.20	0.001*
Overall Mean Score	3.56 $\pm$ 0.43	3.62 $\pm$ 0.44	3.59 $\pm$ 0.43	-1.568	0.896

Scores of each domain converted out of 5 (Minimum Score = 1 and maximum score = 5; Overall Mean Scores $\leq$ 3: unsatisfied; Overall mean score $>$ 3: satisfied) *:pvalue significant at $<$ 0.05 level

Table 6: Patient satisfaction towards accessibility of services and hospital policy

Domain 4: Accessibility (6 items)					
Statements	Medical Ward (Mean ± SD)	Surgery Ward (Mean ± SD)	Total Mean Score (Mean ± SD)	t test	p value
Prescribed medicines available at hospital pharmacy	3.74 ± 0.80	3.75 ± 0.76	3.74 ± 0.78	-0.23	0.81
Scheduled procedures performed at an appointed time	3.66 ± 0.74	3.65 ± 0.74	3.66 ± 0.74	-0.18	0.85
Admission process is well organized.	3.54 ± 0.91	3.65 ± 0.887	3.59 ± 0.99	-1.38	0.16
Investigations : USG, CT scan, X-ray are done in time without delay	3.35 ± 0.85	3.40 ± 0.89	3.37 ± 0.87	-0.63	0.52
Lab services: (availability of staff, report dispatched timely)	3.34 ± 0.99	3.34 ± 0.97	3.34 ± 0.98	-0.47	0.96
Availability of consultant doctors.	3.01 ± 0.90	3.18 ± 0.91	3.10 ± 0.91	-1.98	0.04*
Overall Mean Score	3.43 ± 0.43	3.49 ± 0.46	3.46 ± 0.44	-1.371	0.373
Domain 5: Hospital Policy (4 Items)					
Hospital charges are reasonable	3.26 ± 0.79	3.34 ± 0.75	3.30 ± 0.77	-1.01	0.31
Information regarding hospital services can be easily obtained	2.91 ± 1.06	3.36 ± 0.98	3.14 ± 1.05	-4.66	0.00*
The visiting time and hours allocated in ward is systematic and adequate	2.94 ± 1.14	2.79 ± 1.08	2.86 ± 1.11	1.448	0.14
Easy to pay bills in counter	2.61 ± 0.90	2.51 ± 1.02	2.56 ± 0.96	1.143	0.25
Overall Mean Score	2.93 ± 0.51	2.99 ± 0.52	2.96 ± 0.51	1.377	0.832

Scores of each domain converted out of 5 (Minimum Score = 1 and maximum score = 5; Overall Mean Scores ≤ 3: unsatisfied; Overall mean score >3: satisfied)
*:pvalue significant at <0.05 level

An open ended question was asked to explore the required improvements to be made by the hospital to enhance patient satisfaction. The responses of participants were analyzed descriptively and grouped to identify the main themes. Patients emphasized on: cleanliness of toilet (27.02%), and separate registration counter for emergency, outpatient department (OPD) and ward patients (26.38%) as the major improvements to be done by the hospital. Similarly, 17.87% stressed on the need of clean drinkable water facilities while, 16.80% participants focused on the need of visitor room. Some of the patients (11.07%) did felt the need of explanation about the disease process, treatment, state of patient, prognosis by doctors to enhance quality care. Besides these, other felt need of patients were, clean bed sheets (7.02%), cleanliness of bed (6.17%), facility of hot and cold water (6.17%), increment in the number of toilet (5.31%), proper communication by doctors and nurses (5.31%) and allocation of fixed visiting hours (5.74%).

The overall mean score indicates that the highest ranked item of satisfaction was the doctors' care, followed by accessibility of services and nursing care. While, the least was the satisfaction towards basic hospital amenities. More than two third of respondents (86.0%) were found to be satisfied with the services provided by NMCTH (Table 2).

DISCUSSION

There are mixed evidence on whether socio-demographic factors could influence the patient

satisfaction level. Age did not influence patient satisfaction in our study which is similar with the finding of other studies.^{13, 14} However, some studies^{15,16} have reported that patient satisfaction increases with advancing age. This could be mainly because of the respect given to the older patients than younger patients or may be because older people did not expect much as they were unaware of their rights.¹⁵

Gender wise, patient satisfaction was found to be similar in male and female participants in this study which is comparable to other studies.¹⁷ Nevertheless, some studies,¹⁸ revealed more satisfied female than male while some, reported more satisfied male than female participants.^{13, 15} The possible explanation for this may be because females might have expected less due to ignorance about the standards of the care as they are more confined to home,¹⁹ while it may be equally possible that female are more likely to be aware of hygiene, practical skills and expect more from health care facility.¹⁵

Respondents who were illiterate were found to be more satisfied than literate which is agreed by few other studies.^{15,17} This may be because, respondents who are illiterate tend to have less or no information regarding the patient's rights and therefore, might have believed that the care provided to them is adequate enough.

Type of ward was shown to have no impact in patient satisfaction level in this study, which coincides with the finding of another study.¹⁸ On the contrary, patient satisfaction was found to be slightly higher in surgical ward than in medical ward in a study by Ahsan *et al.*¹⁹ This could possibly attributed to the increased interaction between medical professionals and patient party as more procedures are conducted in surgery than in medical ward such as taking informed consent, explaining about operative procedures.

Patients' bitter or better experience in the past might play the role on how they take the present hospital stay. Our study findings shares similarity with few studies,^{16,20} to support that previous hospitalization does not influence in patient satisfaction level. In contradiction, Ahmed *et al*²¹ reported that the patients who were never hospitalized before were 3.8 times more likely to be satisfied than those who were previously hospitalized. It has been mentioned that with the increase in hospital stay, attention of health care personnel tends to decrease.¹⁴ Yet, there are studies which have mentioned that patient satisfaction increases with the increase in stay,²² which is likely due to increased interaction and attachment between health care professionals and patients.

Among all the basic pre-requisites, patients reported least satisfaction with cleanliness of toilet/bathroom in our study and this finding is in accordance with that of other studies.^{6,23} Dissatisfaction with water facilities was identified in this study and other two studies,^{17,24} where only 45.7% and 35% agreed that the clean drinking water was easily available. Unlike our study finding, another study conducted in Nepal have revealed lower percentage (7.20%) of patient satisfaction with safety.¹⁰ This may be because many hospitals of Nepal are still striving to fulfill other services such as logistics need and extension of outpatient services than focusing on safety and security need of patients.

The most liked aspects of nursing care in our study were the friendliness and courteous behavior of nurses which is in line with the study conducted in India.²⁵ Inconsistently, Jawahar,²⁶ reported that only 40% of patients thought that nurses were friendly while in the study by Khan *et al*⁴ 90% of the patients were not feeling comfortable talking to nurses. This variation could be because of the individual differences in the attitude of nurses and may be due to the working environment of nurses. Explanation of procedures and delivering information about the disease condition are not only among the least rated items in our study, but similar finding was mentioned in other studies.^{6,15} The possible reasons for this could be varied but the main influence may be due to short-staffing pattern, increased workload of nurses or ignorance on the part of nurses.^{15,27}

Findings of the present study show that, respondents were satisfied with the overall services provided by doctors which shares similarity with few other studies.^{13,28} This may be due to societal value and prestige given to the doctors as a high level professionals which may have led to form positive perception towards doctors care. Most of the patients who were seeking care at NMCTH were satisfied with the doctors' care as they felt that their worries/concerns were addressed and patients were satisfied with the way doctors informed them about the disease condition. These results are consistent with the study conducted in Nepal by Subedi and Uprety¹⁰ which mentioned that 75.2% of patients did felt that doctors listened to them carefully. One of the least rated items in our study was: explanation of procedures by doctors. This finding coincides with the study finding by Subedi and Uprety¹⁰ which reported that only 49.1% were satisfied with the explanation of

procedures by doctors. This could possibly be due to work load of doctors because of which they may not have got time to explain about the procedures or may be due to little value given about the importance of explaining about the procedures by doctors. It is also possible that doctors might have thought that patients won't understand technical words, so they may not have felt the need to explain in detail about the procedures to the patients.

Patients were not satisfied (2.56 ± 0.96) with the payment system in the counter in this study. Studies have documented mixed findings on this regard revealing excellent patient satisfaction (86.2%) in one of the study¹³ and moderate level of satisfaction (65.8%)¹⁰ in another study. Hospital charges were one of the highest rated items of satisfaction in this study which contradicts with the finding of another study conducted in Western Regional Hospital of Nepal.³ This could be because, poor rural people generally visit government hospital and they expect some sort of subsidization from the government as they cannot afford even the minimal expense. While, NMCTH is a private hospital and people visiting a private hospital may assume that the cost is high. But, since the cost may have been reasonable than what they thought, patient may have been satisfied with the hospital charges.

No study is devoid of limitation and this study is not an exception. Lack of random sampling method in selecting sample, small sample size, and inclusion of only one setting might influence the result of this study and may limit its generalizability.

In conclusion, majority of patients were satisfied with the services and the care delivered in NMCTH. Cleanliness of bed, toilet, proper water facilities, separate counter system for ward/OPD/emergency cases, provision of visitors room were the major suggestions given by patients to improve. Explanation of procedures and health advice to patients are the two main aspects that nurses have to improve. While, doctors should try to maintain privacy of the patients and explain them about the procedures properly. To fix all these loop holes, there is a necessity for regular tracking of various aspects of patient care by health care providers to stimulate mechanism to foster patient satisfaction and quality patient care.

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Conflict of Interest: None

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EFFECT OF YOGA AND EXERCISE ON GLYCEMIC CONTROL AND PSYCHOSOCIAL PARAMETERS IN TYPE II DIABETES MELLITUS- A RANDOMIZED CONTROLLED STUDY

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ABSTRACT

Type II Diabetes Mellitus has been strongly associated with psychosocial factors like stress, anxiety, depression and quality of life. There is not much evidence whether yoga can improve these factors and motivate subjects to engage in active life style. This study aims to evaluate effect of yoga and exercise over glycemic control, anxiety, depression, exercise self efficacy and quality of life after 3 months program. A total of 227 subjects were randomly allocated to yoga group and exercise group. Yoga group practiced yoga for 2 weeks under supervision and then carried out practice at home for 3 months. Exercise group practiced 30 minutes of brisk walking for 5 days a week. On comparison among the groups, in yoga group there was a mean change of 0.47 in glycated haemoglobin which was greater than mean reduction of 0.28 in exercise group with $p < 0.05$. State anxiety reduced by 7.8 and trait anxiety reduced by 4.4 in yoga group ($p < 0.05$) in 3 months as compared to non significant reductions of 3 and 1 in mean of state and trait anxiety scores in exercise group ($p > 0.05$). There was a statistically significant reduction in depression score in both groups, 8.6 in yoga and 4.0 in exercise which was greater in yoga group. Exercise self efficacy improved by 19.2 in yoga group ($p < 0.05$) while it improved only 2.2 in exercise group ($p > 0.05$). Quality of life improved by 23.7 in yoga group and 3.0 in exercise group which was non-significant in exercise group as compared to yoga group. Yoga is superior to exercise alone as a life style modification program in improving glycemic control, anxiety, depression and quality of life as well as exercise self efficacy.

KEYWORDS

Anxiety, depression, exercise, exercise self efficacy, life, quality of, yoga,

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INTRODUCTION

Diabetes Mellitus (DM) is the biggest disorder among non-communicable diseases, which has taken a heavy toll of 12,81,300 deaths in 2010, 92.7% to rise over 6,65,000 deaths in 1990. Diabetes has ranked 15th in global list of causes of death in 1990 has jumped many steps to position itself to 9th in 2010. In South Asia, diabetes is 10th important cause of death in the list. Type II Diabetes Mellitus (Type II DM) is commonest form of diabetes which is directly associated to increasing stress due to changing life style, dietary habits like tobacco, alcohol and low vegetable intake.¹ Patterns of DM are different in developed nations and developing nations like India. Age range of 45-64 yrs comprises maximum diabetics in Indian population as compared to ≥ 65 yrs in USA. It implies that productive population of India is falling prey to DM and this trend is increasing in urban India. Prevalence of DM has been found to be lower in low economic group as compared to high income group (12.6% v/s 24.6% in ≥ 40 yrs of age) and this is directly related to physical activity where job nature of lower socio-economic class involves moderate to strenuous physical activity at work place. Abdominal adiposity is strongly and positively correlated with Diabetes in India.²

Life style modifications like diet restrictions and increased physical activity are main stay of Type II DM management along with medications. Findings of past studies were remarkable for their consistent findings in the protective effects of physical activity on the occurrence of type II DM. In addition, some of the studies also showed a dose-response relationship between the frequency of physical activity and the degree of protective effect. These studies suggested a causative role for physical inactivity in type II DM.³⁻⁴

Stress and related entities like anxiety and depression have been associated with pathophysiology of Type II DM. One reason why recent time has seen Type II DM as an epidemic because this disorder is disease of affluence which is directly related to present life style. High stress level can overload the blood with high sugar as a response to stress. Pathophysiology of diabetes is bidirectional and it cannot be clearly said whether diabetes causes stress or stress causes diabetes. However, from a clinician point of view, it is important to control the disease and its after math both. In such a situation, yoga seems to be promising.⁵⁻⁶

Yoga philosophy attributes most diseases to insufficient life force, either in the body as a whole, or a blockage of life force localized to one part of the body leading to decrease in immunity and increased susceptibility to infections. Yoga emphasizes treatment of the root cause and not only the symptoms. Diabetics may benefit from yoga's ability to improve their glycemic control, stress and over all quality of life.⁷⁻⁹

There is a clear need to study efficacy of alternative therapies like yoga because of its holistic nature, cost effectiveness and free of side effects.⁹⁻¹⁰ The American Diabetes Association (ADA) Position Statement

recommends that the use of adjuvant therapies be based on evidence from clinical research.¹¹

There are certain inherent problems in prevention and management of Type II DM. One, It has been found that subjects show greater compliance to medications and lower compliance to exercise and lifestyle modifications. Further, increasing intensity of exercise leads to more dropouts from an exercise program. This study aims to evaluate whether yoga practices help to improve exercise self efficacy.¹²⁻¹³ This study also tends to find out effect of yoga and exercise over stress and other psycho social parameters like anxiety, depression and Quality of life. These factors are strongly associated with occurrence and post disease state.

There is paucity of literature evidence from randomized blinded trials with adequate sample. Our literature search could not retrieve any study from North East states of Indian population about these interventions in Type II DM. This study aims to evaluate effect of yoga and exercise over glycemic control, anxiety, depression, exercise self efficacy and quality of life after 3 months program.

MATERIALS AND METHODS

Randomized Controlled trial of parallel design comprising of two groups was conducted involving subjects with Type II DM from August 2011 to January 2014. Based on prevalence of Type II DM in Sikkim and effect size of 0.4 from a pilot study for primary outcome HbA1c, power at 80% and level of significance at .05, standard deviation of 2; sample size of 90 was required in two groups to know which is a better intervention.

Permuted Block Randomization was used. Twenty blocks were used with ten allocation chits in each block. Allocation of subjects was blinded and it was monitored by an independent person who was unaware about groups.

Study protocol was approved by Institutional Ethics Committee and then study was registered with Clinical Trials Registry-India- CTRI/2011/08/001954.

There were total of 902 subjects screened for study, out of which 675 were excluded due to reasons mentioned in **Fig. 1**. Interested subjects were invited for an assessment, after which the study purpose and method was explained and informed consent obtained. Subjects who met inclusion criteria were concealed allocated by another person, who was unaware of study, randomly by block randomization in two groups after which a baseline physical examination was performed and laboratory tests were ordered. There were 112 subjects in yoga group and 115 in exercise group at first stage. At the end of 3 months there were 101 subjects in yoga group and 99 in exercise group which was taken for analysis. Reasons of drop out have been shown in **Fig.1**.

Inclusion criteria was Type II DM subjects over 20 years of age diagnosed according to American Diabetes Association (ADA) criteria.¹⁴ HbA1c ranges from 7%-9%, diagnosis of Type IIDM for >1 Year, stabilized on Oral

hypoglycemic agents(OHA) for at least 3 weeks, no prior exposure to Yoga therapy as well as no involvement in structured exercise program based on self reporting. Exclusion criteria were: subjects requiring insulin, subjects with A1c >9%, hypertension, unstable or under investigated coronary artery disease, cancer, severe osteoporosis or any other musculoskeletal disorder which may limit administration of yoga therapy, diagnosed cerebrovascular disease, subjects on antipsychotic drug like SSRI, aversion of music, already practicing yoga or music therapy.

Demographic and baseline assessment was done on first day and intervention was started from the subsequent day. All subjects underwent clinical assessment by supervising physicians. For exercise group, exercise prescription was done by a qualified physiotherapist at moderate intensity of physical activity as per American Diabetes Association (ADA) Standards of Care guidelines. It included a structured program that emphasized lifestyle changes that include moderate weight loss (7% body weight) and regular physical activity (150 min/week), with dietary strategies including reduced calories and reduced intake of dietary fat. Diet prescription was done by an expert and exercise prescription was done by a physiotherapist. Exercise program was supervised for initial two weeks. Subjects were taught to perform brisk walking at a level ground for at least 150 min/week of moderate intensity aerobic physical activity (50–70% of maximum heart rate), spread over at least 3 days/week with no more than 2 consecutive days without exercise. In the absence of contraindications, adults with type 2 diabetes were taught to perform resistance training at least twice per week with an elastic band.¹⁵

Subjects in yoga group were trained for two subsequent weeks after which they were asked to practice for 3 months. Medications were prescribed by supervising physician as per standard guidelines in both groups. Medications score for both groups are shown in **Table 2**. On finishing supervised program all subjects in yoga group were given a ‘Yoga booklet’ with instructions written in English and local language Nepali. Both groups were provided with a ‘general instruction booklet’ which consisted of diet prescription and general information related to disease and standard care.

Adherence to program was ensured by asking all the subjects to maintain a ‘daily log’ in a diary to keep a proper record of the activities and lapse. One of the subject attendants was also asked to accompany subject during training and same countersigned once the subject finished practice at home. All the subjects were called over telephone every week in order to know their compliance as well as their difficulty. Subject companion was also contacted at same time to countercheck. Subjects were asked to visit once a month after supervised training while practicing at home. All the groups were tested under similar laboratory conditions.

Yoga group (YG) was taught *pranayama* and *yoga-asana*

by an instructor daily for initial two weeks and then they were called regularly at an interval of 1 week for supervision and compliance for 3 months. At the end of 3 months all outcome measures were repeated. The whole yoga intervention consisted of following exercises: **Warm ups:** (starting from the head, working towards the toes. 10 repetitions of each movement) Neck rolls, Shoulder rotation, Arm rotation, Elbow movements, Wrist movements, Finger movements, Waist movements, Knee rotation, Ankle rotation, Toe movements.

Asanas in standing position consisted of 1. *Surya Namaskar*- Starting from 3 turns of each poses being maintained for ten seconds and adding each turns every week, 2. *Tad asana*- starting from ¼ minute and adding ¼ minute every week, 3. *Trikonasana*- starting from ¼ minute for each side, adding ¼ minute per week. Sitting *Asanas* were *Vajrasana*- starting from ¼ minute and adding ¼ minute every week, *Padmasana*- starting from ¼ minute and adding ¼ minute every week, *Ardhamatsyendrasana*- starting from ¼ minute for each side, adding ¼ minute per week and *Paschimotasana*- starting from ¼ minute for each side, adding ¼ minute per week. *Asanas* in prone position consisted of *Bhujangasana*- Starting from 3 turns to be maintained for ten seconds and adding one turn every week, *Dhanurasana*- Starting from 3 turns to be maintained for ten seconds and adding one turn every week and Supine position *asanas* were *Halasana*- Starting from 3 turns to be maintained for ten seconds and adding one turn every week, *Naukasana*- Starting from 3 turns to be maintained for ten seconds and adding one turn every week, *Shavasana*- starting from 2 minutes and adding a minute per week. *Pranayama* was also given as follows: *Bhastrika*- *pranayama*- starting from 3 min/day and adding 1 minute every month, *Kapal-bhati*- 10 min/day, *Anulom-viloma*- starting from 5 min/day and adding 1 minute every month and *Bhramari*- 5 times a day. Outcome measures were Glycated hemoglobin (HbA1c), State trait anxiety inventory (STAI), Beck depression inventory (BDI), Diabetes- Quality of Life (D-QOL),¹⁶ and Exercise self efficacy (ESE).¹⁷

Data was analyzed by SPSS (version 22.0; SPSS Inc. Chicago, Ill). Data analysis was blinded. First normal distribution of samples was plotted and verified by Smirnov-Kolmogorov test. All samples of variables under test was normally distributed and we decided to use ANOVA with repeated measures followed by post-Hoc analysis with Bonferroni's test, $p < 0.05$ was considered to be statistically significant. ANOVA was used to analyze the changes in outcome variables from baseline to 3 months to know that which intervention caused greater change.

RESULTS

Out of 112 subjects in yoga group, and 115 in control group, there were 11 drop outs in yoga, and 16 in

exercise group. Therefore 101 subjects in yoga and 99 in exercise group were analysed at the end of 3 months. The flow of patients has been illustrated in **Figure 1**.

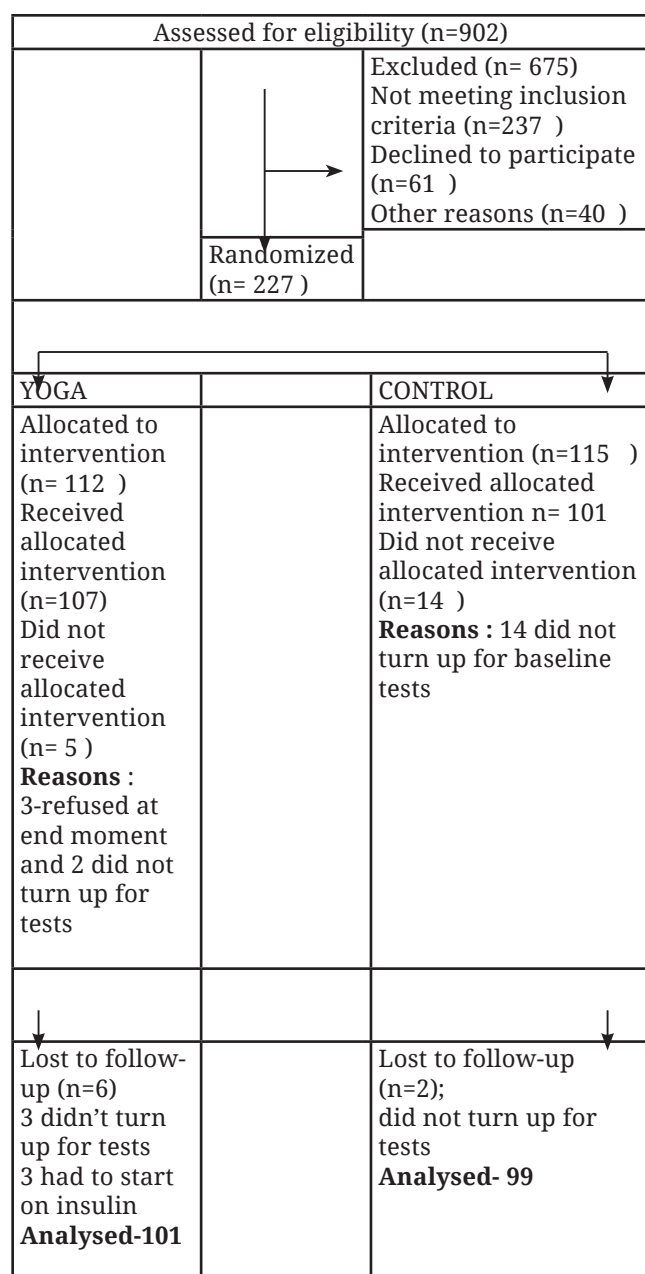


Fig. 1: CONSORT Flow diagram of subjects' allocation, intervention, drop outs, follow-up and analysis.

HbA1c= Glycated haemoglobin, FBS= Fasting blood sugar, PPBS=Post prandial blood sugar, TC= Total cholesterol, TGs= Triglycerides, LDL= Low density lipoproteins, HDL= High density lipoproteins, SSAI= Spielberger's State anxiety inventory, STAI= Spielberger's Trait anxiety inventory, Total Anxiety= Sum total of state and trait anxiety as mentioned by Spielberger. BDI= Beck depression inventory, DQOL= Diabetes quality of life, Self efficacy= Exercise self efficacy scale, BMI=Body mass index, SBP=Systolic blood pressure, DBP=Diastolic blood pressure.

Table 1: shows demographic, anthropometric measures and baseline characteristic of Yoga and Control group.

Characteristics		YOGA GROUP (101)	CONTROL GROUP (99)
Gender	M:F	41:60	49:50
Age (years)	Mean $\pm$ S.D.	50.3 $\pm$ 9.1	49.4 $\pm$ 8.7
	Range (years)	23-73	29-72
Education	Middle school	11	00
	High school	10	08
	Intermediate	27	20
	Graduate /PG	32	37
Occ-upation	Professional	21	34
	Skilled worker	06	00
	Clerk, shop owner, farmer	30	32
	Semi professional	30	26
Income (INR)	Professional	35	41
	11817-15753	05	28
	15754-31506	30	27
Socio economic Status	$\geq$ 31507	67	44
	Lower middle (11-15)	00	08
	Upper middle (16-25)	77	50
Duration of diabetes (years)	Upper class (26-29)	24	41
	1-2	33	36
	3-4	21	36
	5-6	30	18
Family history of diabetes	$\geq$ 7	17	09
	Yes	33	25
Tobacco use	No	68	74
	Yes	58	86
Smoking	No	43	13
	Yes	68	98
Alcohol	No	33	01
	Yes	95	99
Height	centimetres	160.4 $\pm$ 6.9	158.2 $\pm$ 6.1
Weight	kilograms	72.1 $\pm$ 8.3	65.6 $\pm$ 10.9
BMI	kg/m ²	28.2 $\pm$ 4.3	26.3 $\pm$ 4.6
SBP	mmhg	126.0 $\pm$ 5.4	129.0 $\pm$ 5.4
DBP	mmhg	82.1 $\pm$ 2.6	83.7 $\pm$ 2.6

HbA1c	%	8.6±0.6	7.7±1.0
FBS	mg/dl	319.4±102.8	283.8±102.3
PPBS	mg/dl	434.1±108.2	386.6±84.5
TC	mg/dl	182.5±29.6	172.6±34.1
TGs	mg/dl	208.1±6.0	226.2±6.1
LDL	mg/dl	136.9±10.4	145.1±9.4
HDL	mg/dl	35.8±9.0	43.1±9.6
SSAI		37.5±6.7	32.0±10.2
STAI		32.4±6.5	24.7±8.2
Total Anxiety		69.9±8.2	56.7±12.8
BDI		23.2±4.3	24.8±4.8
Self efficacy		31.1±9.9	35.2±9.6
DQOL		46.9±5.4	48.5±8.2

Baseline characteristics, demography and anthropometric measures of both the groups are shown in **Table 1**. Socio economic status was determined as per Kuppaswamy scale which is a sum of scores summated for education, occupation and family income. This scoring system has been developed only for Indian population and is well accepted for determining socioeconomic status in India. (18) Majority of subjects in both groups fall in to category of upper middle and upper class. Majority of subjects in both groups have no family history of diabetes while there is strong prevalence of tobacco use, smoking and alcohol consumption in subjects across all groups. BMI was 28.2±4.3 in yoga subjects, and 26.3±4.6 in exercise group subjects, which corresponds to over weight category.

Mean blood pressure (SBP & DBP) in Yoga group were 126.0±5.4, 82.1± 2.6 and 129.0±5.4, 83.7±2.6 in exercise group. Mean of blood pressure shows that subjects were in pre hypertensive group as per JNC VIII classification of hypertension. Mean glycated haemoglobin was 8.6

and 7.7 in yoga and exercise group respectively. State anxiety, trait anxiety and total anxiety were 37.5±6.7, 32.4±6.5, 69.9±8.2 in yoga group and 32.0±10.2, 24.7±8.2, 56.7±12.8 in exercise group. Level of depression measured by Beck Depression Inventory was 23.2±4.3 in yoga group, and 24.8±4.8 in exercise group.

Self efficacy level of exercise was 31.1±9.9 and 35.2±9.6 in yoga and exercise group respectively. Quality of life was measured by D-QOL developed for diabetes subjects of Indian population specifically, and baseline mean were 46.9±5.4 and 48.5±8.2. **Table 2** shows generic classification of scheduled drug intake by subjects across the groups which were fairly equivalent.

Table 2: shows general classes of Oral hypoglycaemic agents (OHA) and other drugs taken by subjects in all groups during study

Type of Drugs	Yoga (n=101)	Control (n=99)
Metformin	99	98
Sulfonyl Ureas		
• Glimiperide	11	09
• Glibenclamide	10	13
alpha1glucosidase inhibitor		
• Acarbose	09	12
• Voglibose	22	20
GLP1 agonists		
• Sitagliptine	05	10
• Vildagliptine	07	11
Glitazones		
• Pioglitazone	07	11
Statins	45	43
Vitamin supplements	75	77

Changes in yoga group and exercise group from baseline to 3 months have been shown with the help of mean and standard deviation, confidence interval, F value and p value in **Tables 3 and 4** respectively.

Table 3: shows mean changes with standard deviation in Yoga group for variables tested at baseline and 3 months of intervention.

Variables	Baseline	C.I.	3 Months	C.I.	F value	P value
HbA1c	8.6±0.6	8.5/8.7	8.1±0.7	8.0/8.2	71.5	<0.05
SSAI	37.5±6.7	36.1/38.8	29.6±9.9	27.6/31.6	95.7	<0.05
STAI	32.4±6.5	31.1/33.7	28.0±7.1	26.5/29.4	19.7	<0.05
Total Anxiety	69.9±8.2	68.2/71.6	57.6±10.5	55.5/59.8	121.5	<0.05
BDI	23.2±4.3	22.3/24.0	14.5±2.3	14.0/15.0	531.8	<0.05
self efficacy	31.1±9.9	29.0/33.1	50.3±7.0	48.9/51.7	321.5	<0.05
DQOL	46.9±5.4	45.8/48.0	70.7±7.4	69.2/72.2	502.6	<0.05

HbA1c= Glycated haemoglobin, SSAI= Spielberger's State anxiety inventory, STAI= Spielberger's Trait anxiety inventory, Total Anxiety= Sum total of state and trait anxiety as mentioned by Spielberger. BDI= Beck depression inventory, DQOL= Diabetes quality of life, Self efficacy= Exercise self efficacy scale.

Table 4: shows mean changes with standard deviation in Exercise group for variables tested at baseline and 3 months of intervention

Variables	Baseline	C.I.	3 Months	C.I.	F value	P value
HbA1c	7.7±1.0	7.5 7.9	7.4±1.0	7.2 7.7	18.2	<0.05
SSAI	32.0±10.2	29.8 34.1	28.9±10.2	26.8 31.1	4.7	<0.05
STAI	24.7±8.2	23.0 26.4	23.7±6.0	22.4 25.0	4.8	<0.05
Total Anxiety	56.7±12.8	54.1 59.4	52.7±12.1	50.1 55.2	8.7	<0.05
BDI	24.8±4.8	23.8 25.8	20.8±3.2	20.1 21.5	124.7	<0.05
self efficacy	35.2±9.6	33.1 37.2	37.4±7.0	35.9 38.9	106.1	<0.05
DQOL	48.5±8.2	46.8 50.3	51.6±10.0	49.5 53.7	27.0	<0.05

HbA1c= Glycated haemoglobin, SSAI= Spielberger's State anxiety inventory, STAI= Spielberger's Trait anxiety inventory, Total Anxiety= Sum total of state and trait anxiety as mentioned by Spielberger. BDI= Beck depression inventory, DQOL= Diabetes quality of life, Self efficacy= Exercise self efficacy scale.

Table 5: shows comparison of changes across both groups in terms of mean difference (M.D.) with standard error (S.E.). F value= Interaction effect computation of ANOVA across groups

Variables	YOGA GROUP			EXERCISE GROUP			F	p
	M.D.	S.E.	p	M.D.	S.E.	p		
HbA1c	0.47	0.12	<0.05	.28	0.13	<0.05	34.4	<0.05
SSAI	7.8	1.3	<0.05	3.0	1.3	>0.05	27.1	<0.05
STAI	4.4	1.14	<0.05	1.0	1.18	>0.05	24.8	<0.05
Total Anxiety	12.2	1.70	<0.05	4.0	1.76	>0.05	44.7	<0.05
BDI	8.6	0.45	<0.05	4.0	0.46	<0.05	312.6	<0.05
ESE	19.2	1.35	<0.05	2.2	1.39	>0.05	171.4	<0.05
DQOL	23.7	1.25	<0.05	3.0	1.3	>0.05	116.7	<0.05

HbA1c= Glycated haemoglobin, SSAI= Spielberger's State anxiety inventory, STAI= Spielberger's Trait anxiety inventory, Total Anxiety= Sum total of state and trait anxiety as mentioned by Spielberger. BDI= Beck depression inventory, DQOL= Diabetes quality of life, Self efficacy= Exercise self efficacy scale.

On comparison among the groups, in yoga group there was a mean change of 0.47 in glycated haemoglobin which was greater than mean reduction of 0.28 in exercise group with $p<0.05$. State anxiety reduced by 7.8 and trait anxiety reduced by 4.4 in yoga group ($p<0.05$) in 3 months as compared to non significant reductions of 3 and 1 in mean of state and trait anxiety scores in exercise group ($p>0.05$). There was a statistically significant reduction in depression score in both groups, 8.6 in yoga and 4.0 in exercise which was greater in yoga group. Exercise self efficacy improved by 19.2 in yoga group ($p<0.05$) while it improved only 2.2 in exercise group ($p>0.05$). Quality of life improved by 23.7 in yoga group and 3.0 in exercise group which was non-significant in exercise group as compared to yoga group. All mean differences with standard errors are shown in **Table 5**.

DISCUSSION

Up on comparison among both groups yoga showed better changes and positive differences as compared to exercise not only for glycemic control but all

psychosocial parameters including quality of life. Life style modification programs with yoga do show gradual change in HbA1c higher than exercise alone. A previous study has shown reduction of 1.2 in glycated haemoglobin as compared to 0.04 in exercise group at the end of 9 months.¹⁹ Another study done by Balaji et al had shown a larger change in HbA1c where Type II DM subjects were classified as only on OHA and OHA with insulin compared to a control group. This study also reported reduction in insulin requirements of Type II DM at the end of 3 months of yoga intervention.²⁰

There was a reduction in state anxiety by 7.8 at the end of 3 months, whereas trait anxiety reduced by 4.4 with total reduction in anxiety by 12.2 in yoga group. This reduction was more than exercise group which showed a change of 3 in state, 1 in trait and 4 in total anxiety score. A previous study by Gupta et al has also shown significant reduction in state and trait anxiety only in 10 days of yoga intervention. This study was performed on 176 subjects with different disease conditions where diabetics were also included.²¹

Depression evaluated by BDI reduced by 8.6 in yoga

group and 4.0 in exercise group at the end of 3 months. In this study yoga shows promising effect on depression in Type II DM. Yoga has not been extensively studied for reducing depression in Type II DM but its efficacy in reducing depression has been studied in other populations.²²⁻²³

In recent past, studies have shown strong correlation between stress, anxiety, depression and pathophysiology of Type II DM,²⁴ which are interrelated. Control of these psychosocial co morbidities may also show better glycemic control in Type II DM subjects by heightening subjects' interest in engaging exercise activity, good dietary habits as well as life style changes.

DQOL improved by 23.7 in Yoga and by 3 in exercise group at the end of 3 months. Effect of Yoga on quality of life in diabetics has not been studied extensively however a study has shown positive effect of yoga on quality of life in diabetics with cardiac complication after 6 months of yogic breathing program in addition to standard care.²⁵ This yogic breathing program is similar to pranayama in our study. Yoga based program showed higher changes in DQOL which could not be marked in exercise group at 3 months. This change is very important and requires lot of discussion. Yoga has greater potential in bringing change in outlook of diabetic subjects toward their life and it provides wholesome holistic benefits to subjects which are not provided by exercises program alone. This also redirects our attention to include yoga as an important tool in life style modification program/ standard care guidelines of Type II DM. This scale has been validated in Indian population in middle and higher income groups. Our base line data shows in Table 1 that most of our subjects belonged to this socio economic group. Further, higher socio economic groups are ready to accept Yoga as important life style program and Yoga may be launched as a community program to prevent and control diabetes.

In this study subjects in both groups were overweight but not obese. Type II DM subjects have exhibited poor adherence to physical activity and exercises programs and difficulty in initiating life style changes based on diet and exercise. In this study, ESE improved by 19.2 and 3.0 at 3 months in yoga and exercise group respectively. Yoga is highly promising in improving motivation of diabetic subjects to change, come out of inertia of physical inactivity and adhere to active, exercise related program with other necessary life style modifications. A previous study by Yang has also reported similar change in exercise self efficacy of diabetic subjects after yoga intervention.¹² This was one of the important assumptions of our study which gets proved that Yoga is helpful in changing people positively toward exercise based program. Further, Yoga is an important tool which can be added to exercise programs to get increased benefits without increasing intensity of resistance and aerobic exercise programs, which is one of the reason for drop out of diabetic subjects from exercise based programs.

Previous studies have shown positive effects of yoga intervention over these negative affective states

like stress and anxiety.²¹ Yoga researches provide a convincing evidence for its effectiveness over autonomic nervous system.²⁶ Bagchi and Wenger reported that yogic meditation induces inner relaxation of ANS without inducing sleep as well as raising immune levels in the body without exaggerating physiologic manifestation against outside stimuli, thereby providing a balance between body and outside world.²⁷

Yoga has a direct effect on optimizing sympathetic hormones like cortisol and catecholamine secretion, thereby improving parasympathetic activity and reducing metabolic rate.²⁸ It would not be wrong to state that correlation of diabetes with stress, anxiety and other psychologic factors are bidirectional and make understanding of co- relational mechanisms difficult.²⁹⁻³¹ In such a situation, yoga proves to be promising as it helps the body to bring back to balanced state of physical and emotional congruence. A previous study has reported the influence of stress in disturbing neuroendocrine and hypothalamus function that further affects immune modulation and immune homeostasis. Another study has reported incorporation of stress in human information processing pattern (HIP).³²⁻³³

Yoga acts via downregulating the HPA axis which gets hyperactivated as a response to abnormal physical or psychological demand (stressor). Yoga attenuates this stress cascade by reducing the perception of stress. Yoga decreases physiologic manifestations by reducing heart rate, blood pressure and respiratory rate.³⁴⁻³⁵ Reduction of cardiovascular risk factors in diabetes is a hallmark of successful diabetes management.³⁶⁻³⁸ Mechanism of action of Yoga can be hypothesized under two pathways: first, action of yoga by vagal stimulation and second, by parasympathetic activation and HPA axis modification.⁶ First mechanism explains Yoga's action through vagal stimulation by improving baroreflex sensitivity, reducing inflammatory cytokines, and thereby reducing blood pressure and resting heart rate.^{6, 36, 39-41} It improves endothelial function and reduces risks for cardiovascular diseases in Type II DM.⁶

Second postulated mechanism of action of yoga is through parasympathetic activation and associated anti stress mechanisms. It reduces perceived stress and HPA axis activation, thereby improving overall metabolic and psychologic profiles.⁶

Yoga shows better improvement in glycemic control measured by glycated haemoglobin, anxiety, depression, quality of life and exercise self efficacy as compared to exercise alone. These differences are significant and therefore yoga must be considered as a community strategy for prevention as well as control of diabetes epidemic across world. Yoga is superior to exercise alone in controlling psychosocial parameters and improving quality of life. Yoga increases exercise self efficacy which improves subjects adherence to life style modification programs. Yoga should be primarily adapted as an important intervention in diabetes guidelines along with other life style programs.

This study has few limitations. A major part of program was unsupervised to see feasibility of program and adherence was based on subjects reporting only. This program was hospital based and subjects were recruited from two tertiary care hospitals of state.

Future research should be directed toward studying effectiveness of yoga under supervised versus unsupervised program, by increased length of intervention, minute changes in medication scores and insulin as well as considering it in epidemiologic study design.

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USE OF INTRAVENOUS INDOCYANIN GREEN TO DELINEATE BILIARY TREE ANATOMY AND CYSTIC ARTERY ANATOMY IN PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT

Laparoscopic cholecystectomy is at times difficult. Intra operative cholangiogram is cumbersome. Advances in fluorescent imaging laparoscopically using intravenous Indocyanin green is an emerging modality which may make delineating bile duct anatomy easier. The aim of this study was to present our experience with indocyanin green fluorescence imaging in delineating common bile duct, common hepatic duct from cystic duct along with cystic artery in patients undergoing laparoscopic cholecystectomy. Thirteen patients undergoing laparoscopic cholecystectomy were injected with Indocyanin green 15 minutes before the patients were induced for surgery. High definition camera connected to a 30 degree 10 mm scope with lens and light source emitting both visible and near infra-red (NIR) light (KARL STORZ GmbH & Co. KG, Germany) was used to visualize the biliary tree. And intraoperative ICG was injected to look for cystic artery and hepatic arteries. Real time images were obtained which showed biliary anatomy and cystic artery course. There were no adverse effects of ICG insertion. And the extrahepatic biliary anatomy and cystic artery were visible in all the 12 cases. In conclusion, use of ICG in laparoscopic surgery is safe and simple. The delineation of the biliary anatomy is good. Larger studies are needed to determine its use in laparoscopic cholecystectomy.

KEYWORDS

Indocyanine green,
intraoperative cholangiogram,
laparoscopic cholecystectomy

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INTRODUCTION

Symptomatic cholelithiasis is a common condition requiring surgery. Laparoscopic cholecystectomy has rapidly become the standard surgical procedure for gallstone disease and is one of the most commonly performed surgical procedures today.¹⁻³ Despite improvements in imaging and surgical technique bile duct injury remains a significant problem. Aberrant anatomy, difficult surgery and pathology are the classical causes. Mistaking common bile duct for cystic duct is the most common cause.⁴⁻⁶ Literature points to rates between 0.3 – 0.7%.⁶⁻⁸ Unclear anatomy remains the most common cause for conversion to open cholecystectomy in patients and is in between 3-5% but rates as high as 10% have been reported.^{9,10}

Patients with biliary tract injury have increased morbidity, mortality and an increase in hospital stay. This adds to significant economic costs and decrease in quality of life.^{5,11,12} Intraoperative cholangiogram can help delineate the biliary anatomy but it is time consuming and cumbersome. So it has not become a routine. There is need for a simple safe and effective procedure to delineate biliary anatomy.¹³⁻¹⁴

Recently research has focused on using near infra red (NIR) light fluorescence using indocyanin green (ICG) to delineate biliary anatomy.¹⁵⁻¹⁷

MATERIALS AND METHODS

Patients

Thirteen consecutive patients who presented to surgical outpatient clinic of Nepal Medical College and Teaching Hospital with symptomatic cholelithiasis were included. The exclusion criteria were choledocholithiasis, iodine allergy, hyperthyroidism and hypothyroidism. The use of known medication interfering with hepatic ICG uptake (anticonvulsive medication, pethidine, morphine, nitrofurantoin cyclopropane, sodium bisulfite haloperidol, opium alkaloids, phenobarbital, phenylbutazon, probenecid, metamizole, rifamycin, methadone) was also considered a contraindication for inclusion in the study.

Laparoscopic equipment

In all cases, a laparoscopic system (KARL STORZ GmbH & Co. KG, Tuttlingen, Germany) was used. High definition camera system (IMAGE 1 SPIESTM, KARL STORZ) connected to a laparoscope with 30 degree telescope 10 mm diameter equipped with a specific filter for optimal detection of the NIR fluorescence and white light without manual switching. The xenon light source (D-LIGHT P SCB, KARL STORZ) was used to provide both visible and NIR light. Surgeon controlled pedal was used to Switch between standard light and NIR.

Indocyanin green injection

ICG is a negatively charged, amphiphilic, water-soluble but relatively hydrophobic, tricarboxyanine with a molecular mass of 776 Da.^{18,19} It has a peak emission at 822 nm when assessed with NIR light. Standard diagnostic procedures use between 0.1 and 0.5 mg/kg. Above 0.5 mg/kg, the incidence of immediate allergic reactions increases.²⁰ The ICG dye was injected Intravenously 15 min before surgery at the rate of 0.2 mg/kg to allow ICG to concentrate in the bile.^{20,21}

For delineation of the vascular anatomy, a small bolus of 0.2 mg/kg was injected in to the veins intraoperatively and laparoscopic light and visualization turned to NIR light.

RESULTS

Informed consent was taken in all the patients. Thirteen patients included in the study were injected with ICG 15 minutes before the surgery was scheduled. All the patients were ASA Grade I and II. One patient was diagnosed with mild fever due to sore throat and postponed. The other 12 were included in the analysis. There were 8 females and 4 males, with a mean age of 35 (range 22-56) years. None of the patients had complications pertaining to cholelithiasis. Since this was a preliminary study patient with comorbid conditions and or other high risk factors were not included in the study. There were no adverse reactions. There were no conversions to open cholecystectomies. Drain was placed in one patient. There was no post operative morbidity or mortality. All the patients were discharged on postoperative day 2. Skin staplers were removed on Day 7 or 8 depending upon out patient clinic days.

The average time from injection to us visualizing during surgery was 31 minutes (25-40 minutes). In all the 12 cases the common bile duct, the common hepatic duct, the cystic duct and the cystic duct CBD junction was visible. (See photos 1 and 2). Cystic artery was also clearly visible in all the twelve cases. Because the time from injection to visualization was quick the liver also appeared substantially fluorescent.

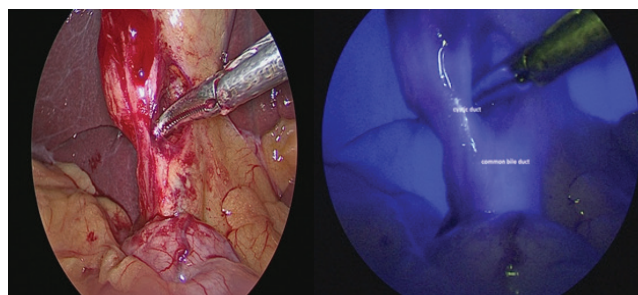


Photo 1: Identification of cystic duct and common bile duct using ICG in near infrared light

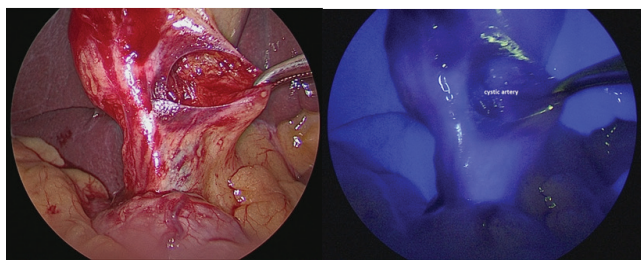


Photo 2: Identification of the cystic artery with injection of ICG in near infrared light.

DISCUSSION

We conducted this study to see the feasibility of using ICG and NIR light fluorescence in delineating the cystic duct and cystic artery anatomy. This would in our view help delineate and thus prevent CBD injury in patients with difficult cholecystectomy.

Use of NIR light and ICG to delineate cystic duct from CBD and cystic artery was successful in all the 12 patients who underwent this procedure. This was possible because 95% of the ICG is captured by the hepatocytes and released in to the bile with in fifteen minutes.²²

Other studies corroborate our findings with high rates of visualization in patients with uncomplicated cholelithiasis.²³⁻²⁶

In patients with deranged liver function there might be a delay in the ICG excretion in to the bile. In these patients earlier injection of ICG or delayed visualization by rechecking during the course of the surgery may be helpful.

Verbeek *et al* in their study have demonstrated optimal visualization of biliary ducts to be when the ICG is injected 24 hrs before the surgical procedure. They argue increasing time duration and injection and visualization helps to washout ICG from liver and helps delineate biliary anatomy better.²⁷

Studies point out that in dense adhesions due to post inflammatory attacks, post ERCP patients and patient with past history of cholangitis there may be limited visualization because penetration of NIR induced fluorescence is about 1 cm. This may also be the case when the patient has high BMI however studies suggest BMI does not adversely affect visualization. Ankersmit *et al* in a study of 18 patients with complicated cholelithiasis; report better visualization rates with 2nd and 3rd look during surgery. Their visualizations increased from 38% to 72% with repeated visualization.

This is in contrast to other smaller studies which report higher rates of delineation (92%- 100%).^{23,28-30}

At present ICG seems to be very effective at visualization of biliary anatomy in uncomplicated cholelithiasis. In patients with complicated cholelithiasis with impaired liver function and dense adhesion larger studies are required. Our study was limited by a small number of patients and none of our patients had complicated cholelithiasis. Vascular delineation in neurosurgical and ophthalmic procedures is routine and well established. Our study shows visualization of vascular anatomy possible. This may help in difficult cases where we might find finding the cystic artery difficult or when right hepatic artery may be mistaken for cystic artery.

In conclusion, Use of ICG and NIR fluorescence to delineate ductal anatomy is a promising tool which may make intraoperative cholangiogram a much simpler and less cumbersome procedure. It has the potential to become the standard of care for identifying the ducts in difficult cholecystectomies. Larger studies including complicated cholelithiasis and those comparing it with intraoperative cholangiogram are required. The use of near infrared light (NIR) and indocyanin green (ICG) to visualize biliary anatomy may be the future of intraoperative biliary imaging.

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EVALUATION OF ROTHALER TECHNIQUE AND IMPACT OF INTERVENTION IN PATIENTS WITH BRONCHIAL ASTHMA AND/OR CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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ABSTRACT

Improper inhalation technique is highly prevalent in asthma and COPD patients. Improper technique of inhaler device is associated with decreased medication delivery and inadequate disease control. Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines for COPD has highlighted the importance of regular inhalation technique assessment in improving the efficiency of drug delivery. It was an interventional study conducted in NMCTH, Jorpati, Kathmandu. Inhalation technique of 100 patients diagnosed with COPD and/or asthma were evaluated with a checklist. Then, the patients were trained with instructions, face-to-face demonstration and video demonstration regarding the correct use of the rotahaler. All patients were re-evaluated on their next OPD visit. Out of 100 patients included in the study, 63% were female whereas 37% participants were male. The mean age of participants was 60.42 ± 13.95 years. Only 13% participants performed all the steps of inhaler use correctly before training. Male, educated and asthma patients had better inhalation technique in comparison to female, uneducated and COPD patients respectively. The most common incorrectly performed step was breathing out gently to residual volume. The mean pre-training score was 5.96 ± 1.35 whereas the mean post-training score was 7.5 ± 0.75 . The difference in mean pre-training and post-training scores was highly significant statistically ($p < 0.01$). Patients using rotahaler device need face to face training to achieve correct technique of its use. Regular assessment and reinforcement of correct inhalation technique is essential for proper use of rotahaler devices by the patients.

KEYWORDS

Asthma, COPD, inhalation technique, rotahaler

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INTRODUCTION

Bronchial asthma and chronic obstructive pulmonary disease (COPD) are leading causes of global morbidity and mortality.^{1,2} Pressurized metered dose inhalers (pMDI) and dry powder inhalers (DPI) are the most appropriate drug delivery systems for drugs used in these diseases because there is minimal systemic absorption of the drugs used and hence will improve drug safety.³

Improper technique of inhaler device use has been found to be associated with decreased medication delivery and inadequate disease control.⁴ The proper technique of inhaler device use is an important factor to be considered during the management of these diseases. Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines for COPD has emphasized the importance of assessing inhalation technique in improving the efficiency of drug delivery.⁵ Improper use of inhaler devices have been reported in various studies.^{6,7} The presence of incorrect inhalation technique has been reported to be as high as 94% of patients.⁸⁻¹²

Bronchial asthma and COPD are very common diseases in Nepalese population. The rotahaler use technique is one of the determinants of drug delivery to the respiratory tract and hence the disease control. Improper inhalation technique is highly prevalent in the asthma and COPD patients. The study on rotahaler inhalation technique and the impact of intervention in asthma and COPD patients are lacking in Nepalese context. So, it would be worthy to study the frequency of proper rotahaler technique and the impact of intervention in asthma and COPD patients in Nepal Medical College Teaching Hospital (NMCTH).

The main aim of this study is to evaluate the rotahaler technique in patients of bronchial asthma and/or COPD and the influence of educational intervention on it.

MATERIALS AND METHODS

This study is an interventional study. It was conducted in the out-patient department (OPD) of pulmonary unit of Medicine Department of NMCTH, Jorpati, Kathmandu on COPD and/or asthma patients, who had been using rotahaler device, from April to November 2017, after ethical approval was obtained from Research and Institutional Review Committee of NMCTH.

One hundred participants were included in the study. Patients diagnosed with COPD and/or asthma, aged ≥ 18 years, using rotahaler device were included, whereas patients admitted in the hospital, patients with acute exacerbation and patients using other kinds of inhaler devices were excluded from this study. After taking informed consent, patients were assessed for inhalation technique. Use of rotahaler were evaluated in a practical manner by asking patients to demonstrate their inhalation technique using rotahaler.

The steps performed by patients were evaluated

with a checklist which was made on the basis of the instructions provided by manufacturer and previous studies.^{9,11,12} Each correct step was scored one and each incorrect step or missed step was scored zero.¹² After the assessment, patients were given instructions, face-to-face demonstration and video demonstration regarding the correct use of the rotahaler, and were trained until they could use the device correctly.

All patients were requested to demonstrate their inhalation technique after one month and were re-evaluated. The collected data was analyzed with SPSS version 16.0. The frequencies of proper use of rotahaler were reported as percentage. The mean score of rotahaler use before and after intervention were compared by paired t-test.

RESULTS

Out of 100 patients included in the study, 39 were diagnosed as asthma and 61 were diagnosed as COPD. Female participants were 63% whereas 37% participants were male. The mean age of participants was 60.42 ± 13.95 years and the highest percentage of participants were in the age group of 61-80 years i.e. 57%.

Table 1. Demographic characteristics of patients and association of patient characteristics with rotahaler use technique

Patient characteristics	Percentage of patients (n=100)	Number (percentage) of patients performing all steps correctly	p-value
A. Age group			
< 20 years	1	0 (0)	0.58
21-40 years	11	3 (27.27)	
41-60 years	27	3 (11.11)	
61-80 years	57	7 (12.28)	
>80 years	4	0 (0)	
B. Sex			
Male	37	8 (21.62)	0.04
Female	63	5 (7.93)	
C. Diagnosis			
Asthma	39	9 (23.07)	0.01
COPD	61	4 (6.55)	
D. Smoking habits			
Smoker	52	4 (7.69)	0.10
Nonsmoker	48	9 (18.75)	
E. Education			
Literate	24	6 (25.00)	0.04
Illiterate	76	7 (9.21)	
F. Duration of rotahaler use			
< 1 year	24	2 (8.33)	0.84
1-5 years	41	6 (14.63)	
6-10 years	25	4 (16)	
> 10 years	10	1 (10)	
G. Co-existing disease			
Yes	52	6 (11.53)	0.65
No	48	7 (14.58)	

Demographic characteristics of patients and association of rotahaler use technique with patient characteristics has been given in table 1.

Among the participants, 52% were smoker and 48% were nonsmoker. Among male participants, 81.08% were smokers and among female participants, 34.92% were smokers. Among female participants, 58.73% had history of using biomass fuel for cooking food. Most of the patient i.e. 76% were illiterate, while only 24% were literate. The highest percentage (41%) of duration of patients' rotahaler use was 1-5 years. Co-existing diseases were present in 52% of participants.

Correct inhalation technique had no association with age, smoking habit, duration of rotahaler use and coexisting disease. However, male, educated and asthma patients had better inhalation technique in comparison to female, uneducated and COPD patients respectively and the difference was found to be statistically significant.

Table 2. Performance of patients in various steps of rotahaler use

S.N.	Steps	Percentage of patients performing the steps correctly	
		Before training	After training
1.	Hold the rotahaler vertically	90	100
2.	Place capsule into the raised square hole of rotahaler	100	100
3.	Press the capsule firmly to the same level of raised square hole of rotahaler	100	100
4.	Hold the mouthpiece firmly with one hand and rotate the base with other	100	100
5.	Breathe out gently to residual volume away from the mouth piece	19	77
6.	Put the mouthpiece between teeth and close lips to form a good seal	53	92
7.	Inhale rapidly and deeply	67	83
8.	Remove the rotahaler from mouth and hold breath for 5-10 secs	67	98

The percentage of patients correctly performing each step of rotahaler use before and after training is shown in table 2.

Eighty seven percentage of patients performed at least one step incorrectly. The most common incorrectly performed step was breathing out gently to residual volume (81%), followed by putting the mouthpiece between teeth and closing lips to form a good seal (47%). Thirty three percent participants could not correctly inhale rapidly and deeply; 33% failed to remove rotahaler from their mouth and to hold the

breath for 5-10 seconds, while 10% of patients did not hold the rotahaler device vertically.

Table 3. Mean pre-training and post-training inhalation technique scores

Performance	Mean score	p-value
Before training	5.96 ± 1.35	<0.01
After training	7.50 ± 0.75	

Table 3 shows the mean scores of the patients performing rotahaler technique. The mean pre-training score was 5.96±1.35 whereas the mean post-training score was 7.5±0.75. The difference in mean pre-training and post-training scores was highly significant statistically (p<0.01).

DISCUSSION

Rotahaler is the most commonly used inhaler in Nepal as it is cheaper and easily handled by the patients.¹³ In our study, only 13% participants performed all the steps of inhaler use correctly before training which is consistent with findings of previous studies.¹¹ In this study, there was no association found between age, smoking habit, duration of use and coexisting disease with correct inhalation technique. However, male, educated and asthma patients had better inhalation technique in comparison to female, uneducated and COPD patients respectively which was found to be statistically significant (p<0.05). In study by Pun S *et al*, factors like age, education and smoking have been found to be related with more errors while performing the inhalation steps.¹¹ While Hasselink *et al* found no association between inhalation technique and age, sex, ethnicity, education, comorbidity and smoking habit, Pothrait *et al* found statistically significant difference only in participants with low education level.^{6,14}

The most commonly mistaken step was "Breathe out gently to residual volume away from the mouth piece" which is similar to findings of studies by Palen J *et al*, Pun S *et al* and Sapkota D *et al* where 66%, 84% and 61% participants respectively made error in exhaling to residual volume.^{9,11,15} When mistakes are done during the inhalation procedure, significant amount of drugs may fail to reach the lungs. Breathing out gently to residual volume away from the mouth piece is an important step, as without an adequate exhalation, patients may be unable to inhale forcefully and deeply enough through their inhaler in order to ensure deposition of drug into the lungs. Breathing out should be done away from the rotahaler. Breathing out into or through rotahaler may blow away the drug or form lumps of drug inside it making the drug less effective.^{8,16}

The impact of educational intervention in inhalation technique was found to be highly significant (p<0.01), which is similar to findings of other studies.^{12,14,17-19} This suggests that repeated training and demonstration can improve the rotahaler use technique in patients. Gracia- Antequera M *et al* also showed that patients receiving instruction of inhaler device use more than once over a period of time showed improvement in their handling of inhaler devices.²⁰ So, patients using

rotahaler devices will benefit from regular assessment of their technique and feedback, which will ensure compliance and adequate delivery of drug.

All patients using rotahaler device need face to face training and re-training to achieve correct technique of

rotahaler use. Regular assessment and reinforcement of correct inhalation technique is essential for proper use of rotahaler devices by the patients.

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