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Affiliated to Kathmandu University, Recognized by Nepal Medical Council



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Contents

Editorial

JKDC: A movement of Kantipur Dental College <i>Dr Sujita Shrestha</i>	5
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Research Article

Reasons for Choosing Dentistry among First Year Dental Students : Choice or Chance <i>Dr Sunita Khanal, Dr Rosina Bhattarai, Dr Sujita Shrestha, Dr G. Nagaraja Rao</i>	6
Comparison of Digital and Conventional Method for Age Estimation Measuring Root Dentine Translucency <i>Dr Dinesh Kumar Yadav, Dr Sushmit Koju, Dr Nisha Maharjan, Dr Dipshikha Bajracharya, Dr Radha Baral</i>	10
Attitude of Bachelor of Dental Surgery Students towards Specialization in Kantipur Dental College, Kathmandu <i>Dr Meenu Shrestha, Dr Manish Shrestha, Dr Bhageshwor Dharmi</i>	16
Correlation between Vital Capacity and Maximum Chest Expansion among Nepalese Young Adults <i>Dr Dilli Bahadur Pun, Mr Prashanna Shrestha, Dr Paresh Roy Choudhury, Dr Mrigendra Amatya</i>	20

Review Article

Lesions Associated with Impacted Tooth <i>Dr Radha Baral, Dr Bidhata Ojha, Dr Dipshikha Bajracharya</i>	25
Obstructive Sleep Apnea Syndrome - A Scoping Review <i>Dr Asal Acharya, Dr Rabindra Man Shrestha, Dr Pratistha Thapa, Dr Diwash Adhikari</i>	32

Case Report

Management of Complicated Crown-root Fracture by Reattachment- A Case Report <i>Dr Pratyush Sapkota</i>	39
An Eye for a Lost Eye: A Case of Customized Ocular Prosthesis <i>Dr Bebina Shrestha, Dr Dinesh Sharma Bhusal, Dr Gulshan Kumar Thakral</i>	42

View Point

Evolution of Dental Colleges in Nepal <i>Prof Dr Rabindra Man Shrestha</i>	47
Author Guideline	51

JKDC: A movement of Kantipur Dental College

Dr Sujita Shrestha

Chief Editor

Neil Armstrong once said, “Research is creating new knowledge”.

In the past few decades, there have been enormous changes in the world of research and health science journalism. The paradigm shift has taken place globally from “health research” to “research for health”. Research refers to the study and analysis of specific problems by using scientific methods. Health research can find important information about disease trends, risk factors, outcomes of treatment or interventions, patterns of care, health care costs etc.

Publishing the scientific research by writing an article is the most imperative way of communication. Publications are the most common means for the authors to disseminate their work; which are also helpful for academic promotions and professional esteem. Articles are brought out in different forms and are published in medical journals, newspapers, magazines, and on the internet. Publishing research in scientific journal is the most effective and permanent way of sharing the information to a large audience or fellow researcher.

In the Nepalese context, infrastructure and resources available for research are less; and research culture is lacking especially in the field of dentistry. Very few health researches have been conducted by the individual researchers in their related areas. On the other hand, very few reports of research get published in the literature. Publications should help to disseminate new ideas and help make decisions based on the evidence.

In Nepal, the history of scientific medical journals began in 1963 with the publication of ‘Journal of Nepal Medical Association (JNMA)’. In dentistry, ‘Journal of Nepal Dental Association (JNDA)’ was first published in 1998. Then after, within a span of two decades, few scientific dental journals evolved from specialty societies; they include ‘Orthodontic Journal of Nepal (OJN)’ in 2011, ‘Journal of Nepalese Society of Periodontics & Oral Implantology (JNSPOI)’ in 2017, and ‘Journal of Nepalese Prosthodontic Society (JNPS)’ in 2018. The ‘Journal of Kantipur Dental College (JKDC)’; an official publication of Kantipur Dental College is on the verge of initiation, which is probably the first scientific dental journal among dental colleges of Nepal. It is biannual, peer reviewed, open access biomedical journal devoted to the science of dentistry and related interdisciplinary subjects. The journal is open to all dental students, faculties and experts in the field for submission of manuscript and publication of the article.

JKDC is just born, it has long way to go. It is bound to traverse through all the stumbling blocks that any biomedical journals have experienced in the past. Quality publication is perhaps the main challenge of the journal. Such challenges could vary from linguistic errors, syntax errors, flaws in research design, statistical methods, interpretation of the result and plagiarism. The journal is yet to embark the process of indexing, and receive public acceptance. Journal’s sustainability is another problem, which will solely depend on the publisher. We believe that, this journal shall prevail, as long as the support from college management remains.

The editorial board believes that peer review process will improve quality issues, and help in communication with the authors. It is also committed that, every good manuscript shall get a chance to publish. Young researchers often experience hard time in getting their articles accepted in a reputed journal; thus JKDC can be another platform to publish the article. The aim of this journal is to help students and budding researchers to produce good scientific papers.

I would like to congratulate all the editorial board members of JKDC and thank the college authority in entrusting us in shouldering this huge responsibility. The team is hopeful and optimistic that the journal will make best possible impact in the society.

Dear readers, we urge you all to trail in the movement of JKDC.



Reasons for Choosing Dentistry among First Year Dental Students : Choice or Chance

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Citation

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ABSTRACT

Introduction: For teachers as well as recruitment team; students' motivations for choosing career in the health sector are of great interest. Students may choose a career in dentistry for many reasons like; job security, flexible working hours, financial stability, obtain dental degree, serve the nation and people.

Objective: To assess the reasons for choosing dentistry as a career among the first-year dental students

Materials & Method: A cross sectional study was conducted for a period of three months in three different dental colleges affiliated to Kathmandu University. Data was collected using a predesigned closed ended questionnaire among 119 first year dental students. Prior to conducting the study permission was obtained from Institutional Review Committee of Kantipur Dental College and from the head of each institution. Prior consent was obtained from each student. The collected data was analyzed using statistical package for social sciences (SPSS) version 20.

Result: Altogether 119 students participated in the study out of which 73.9% were female and 26.1% were male. Only 48.7% of the participants fully agreed dentistry as their first career choice. Job security (42%), working independently (77.3%), flexible working hours (71.4%), desire to work in healthcare (81.5%), obtaining doctor's degree (54.6%) and improve the appearance of people (50.4%) were the reasons for choosing dentistry among the students.

Conclusion: It was found that only 48.8% students placed dentistry as their first career choice. The results of this study highlighted few important influential factors in choosing dentistry as a professional career.

Keywords: career, choice, dentistry

INTRODUCTION

For educators and admissions committees, student's motivations for choosing a career in the health sector are of great interest.¹ Dentistry is concerned with the diagnosis, prevention, and treatment of diseases of oral cavity.² Motivations of students for entering dentistry, as well as dental schools' requirements and selection processes, varies from country to country.³

Parents, relatives, friends, teachers, and counsellors affect the student's decision in general. The choice of career is a serious discussion that has an obvious impact on life.⁴

Motives for choosing dentistry as a career are complex and are not an exception. Many factors are responsible for deciding on career choice like working conditions and financial rewards, security and status, nature of occupation, working with people, use of personal or manual skills and interest in science and research.

Students entering dental profession can be divided into two categories-"Dentistry by choice", i.e. if they were interested in taking up the profession, and "Dentistry by chance", if they were forced to take up the profession. Various studies have been conducted regarding dentistry as a career option.⁵

In Nepal, study regarding choice of career among students was scarce. So, aim of the study was to determine factors that led to the choice of dentistry as a career option among the first year dental students.

MATERIALS AND METHOD

A cross sectional study was conducted among the 1st year BDS students of Kathmandu University for a period of three months. Ethical clearance was taken from the Institutional Review Committee of Kantipur Dental College before conducting the study. Prior consent was

obtained from head of institutions as well as from each student. A simple random sampling technique was used and three dental colleges were selected. All the students of BDS 1st year were included in the study. A pre designed self-administered questionnaire adopted from the previous study was used among 119 first year dental students to collect data. It consisted of 16 item questionnaires. The first section of the questionnaire sought to determine students' socio-demographic background such as age, gender, source of funding for study, institution name and type. The responses for each question was measured on three Likert scale i.e. Agree, neutral and disagree. The question was pretested among 2nd year BDS students of Kantipur Dental College. The Cronbach's alpha value was found to be >0.70

All the students of BDS 1st year, who were present on the day of data collection and who gave consent to participate in the study were included. Data was entered using SPSS version 20 and Chi square test was used to compare significant differences between the variables and $p \leq 0.05$ was considered statistically significant.

RESULT

Altogether 119 first year students; 88 (76%) female and 31(24%) male from three dental colleges participated in the study. Age group; 16-20 years were 86% and 14% were 21-27 years old. Among 119, only 48.7% agreed dentistry as their first career choice whereas 51.3% had other choices for career. Reasons for entering dentistry among the participants was; unable to enter medicine 25.2%, family pressure 1.7%, and previous dental work experience 0.8% (Figure 1).

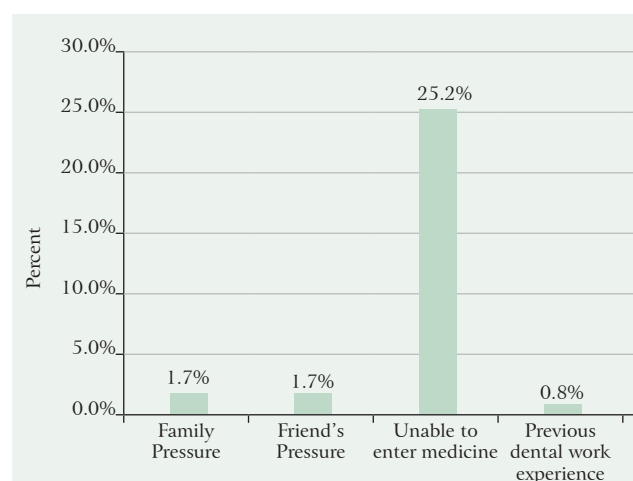


Figure 1: Personal reasons for choosing dentistry

Questions related to financial reasons; 42% believed that they will have job security, 26.1% high income and 5% pay better and will have high marriage profile. Chi square test showed a significant difference between the gender and pays better so improves marriage profile (Table 1). Professional reasons were; 83.2% joined dentistry so that they can take their own decision, 77.3% working independently, 71.4% due to flexible working hours and 54.6% for obtaining doctor's degree. Flexible working hours and working independently showed statistical significant among gender (Table 2). Vocational reasons; 81.5% had desire to work in health care and help people, 50.4% and 34.5% joined dentistry to improve the appearance of people and because they had practical skills respectively. Practical skills were found to be statistically significant when compared with gender (Table 3).

Table 1: Financial reasons for joining dentistry

Reasons		Gender		Total	p Value
		Male	Female		
High income	Agree	5(16.1%)	26(83.9%)	31 (26.5%)	0.342
	Neutral	20(29.4%)	48(70.6%)	68 (57.1%)	
	Disagree	6(30%)	14(70%)	20 (16.8%)	
Job security	Agree	15(30%)	35(70%)	50 (42%)	0.693
	Neutral	12(22.6%)	41(77.4%)	53 (44.5%)	
	Disagree	4(25%)	12(75%)	16 (13.4%)	
Pays better so improves marriage profile	Agree	3(50%)	3(50%)	6 (5%)	0.007*
	Neutral	10(50%)	10(50%)	20 (16.8%)	
	Disagree	18(19.4%)	75(80.6%)	93 (78.1%)	

*statistically significant

Table 2: Professional reasons for choosing dentistry

Reasons		Gender		Total	p Value
		Male	Female		
Can take my own decision	Agree	24(24.2%)	75(75.8%)	99 (83.2%)	0.581
	Neutral	5(33.3%)	10(66.6%)	15 (12.6%)	
	Disagree	2(40%)	3(60%)	5 (4.2%)	
For obtaining doctor's degree	Agree	16(24.6%)	49(75.4%)	65 (54.6%)	0.899
	Neutral	9(29%)	22(70.9%)	31 (26.1%)	
	Disagree	6(26%)	17(73.9%)	23 (19.3%)	
Flexible working hours	Agree	19(22.4%)	66(77.6%)	85 (71.4%)	0.017*
	Neutral	8(27.5%)	21(72.4)	29 (24.4%)	
	Disagree	4(80%)	1(20%)	5 (4.2%)	
Working independently	Agree	19(20.6%)	73(79.3%)	92 (77.3%)	0.017*
	Neutral	8(38%)	13(61.9%)	21 (17.6%)	
	Disagree	4(66.6%)	2(33.33%)	6 (5%)	

Table 3: Vocational reasons for choosing dentistry

Reasons		Gender		Total	p Value
		Male	Female		
I've practical skills	Agree	18(43.9%)	23(56%)	41 (34.45%)	0.001*
	Neutral	5(9.6%)	47(90.4%)	52 (43.7%)	
	Disagree	8(30.7%)	18(69.2%)	26 (21.8%)	
Improve appearance of people	Agree	16(26.6%)	44(73.3%)	60 (50.4%)	0.547
	Neutral	13(28.8%)	32(71.1%)	45 (37.8%)	
	Disagree	2(14.28%)	12(85.7%)	20 (11.8%)	
Desire to work in health care and help people	Agree	25(25.7%)	72(74.2%)	97 (81.5%)	0.164
	Neutral	3(17.6%)	14(82.4%)	17 (14.3%)	
	Disagree	3(60%)	2(40%)	5 (4.2%)	

DISCUSSION

As professional health care workers, dentists occupy an important position in society. They have opportunities to participate in dental education in many countries, especially in the developing ones.^{7,8} Dentists are potential for understanding the psychological make-up and subsequent job satisfaction therefore, studying dentistry have been subject of interest for students.

In this study, only 43.8% of the participants had dentistry as their first career choice. Similar type of findings were found in Bitar and Jaiswal studies.^{5,6} Other choices were; Medicine, Engineering and Information Technology among the participants. Some other reasons for joining dentistry were; not getting chance for medicine and family/ friend's pressure.

About financial aspect, 42% joined dentistry for job security and 26.1% for high income. Similar findings were found in Arabic and Indian students.^{2,6} This may

be because dentistry is one of the highest paid jobs in developed countries. Contrary to this study, economic reasons were not highly scored in another study.³

For vocational reasons, 81.5% had desire to work in health care and help people. Similar findings were reported in other studies.^{5,7,13}

Professional reasons for choosing dentistry like; flexible working hours and working independently were found to be statistically significant with gender which is similar to other studies.^{6,7} In dentistry, there are less emergency calls and don't have to rely on anyone i.e. can work independently. Especially for females dentistry is most preferred specialty since it has less flexible working hours.

CONCLUSION

The present study showed that there are many females compared to males in dentistry. Dentistry was not the first career choice among the majority of the study participants.

The students joined dentistry because they could not get selected in medicine, due to peer and family pressure. Motives for choosing dentistry was financial reasons, flexible working hours and to help people.

This study serves as a pilot study for further studies. Future studies can be planned related to career choice in larger group of students.

ACKNOWLEDGEMENT

We would like to thank dental colleges and study participants for giving opportunity to conduct the study.



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Comparison of Digital and Conventional Method for Age Estimation Measuring Root Dentine Translucency

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ABSTRACT

Introduction: Estimating the age from postmortem remains is an important step in identifying the deceased. Root dentine translucency is one of the parameters considered for dental age estimation. Conventionally, dentine translucency is measured using calipers. But, with the advancement of digital technology, it can be more easily measured by the aid of software programs.

Objective: To measure dentine translucency with the aid of digital software and its comparison with the conventional method.

Materials & Method: A total of 60 extracted permanent teeth were collected and were sectioned buccolingually to a thickness of 250µm. Translucency length was measured by a digital caliper in accordance with the description given by Bang and Ramm and by digital method as described by Acharya AB. Measurements were taken by three observers and their mean value was considered. The results thus obtained using both the methods were compared. The difference between estimated and known age using conventional and digital methods was also compared.

Result: The mean age of the patient was found to be 46.77 ± 15.741 . The correlation coefficients of dentine translucency between age and length of dentine translucency were statistically significant for both methods ($p < 0.01$). The paired t-test revealed significant difference in measurements between two methods ($p < 0.01$). Linear regression equations were derived for both methods which showed both the methods had similar findings assessing age within ± 5 and ± 10 years of chronological age whereas digital method was better in estimating age beyond 20 years of chronological age.

Conclusion: There was no difference between the two methods in dental age estimation. However, digital method was more accurate in estimating the age beyond 20 years of chronological age.

Keywords: Age assessment, computer software, dentinal translucency, forensic odontology

INTRODUCTION

Age estimation is one of the crucial steps in identification of the human body.¹ Teeth usually survive postmortem destruction and are considered to be better suited for estimating age.² Gustafson's method of age estimation by dentin translucency was found to be one of the best for age estimation when used alone.³ Vasiliadis et al. concluded in their study that sclerotic root dentine was a valuable criterion for age estimation.⁴ It required little experience for its use and is an objective measurement. Bang G and Ramm E reported that there was increase of root translucency with age and later, they put forward a more detailed method of measuring translucency length by developing tooth-specific formulae for age estimation on a Norwegian sample of 926 teeth.⁵

Age estimation with the help of human dentition have been successfully employed.⁶ There is continuous physiological change in the dentine after adolescence. The dentinal translucency is a result of this physiological change that is regarded as sclerosis.⁷ Traditionally, the measurement of dentine translucency was done by the aid of vernier calipers.⁵ Recently, use of digital aids have been proposed for the same purpose.⁸ A study based on computer assisted image analysis method concluded that the computer-based translucency measurements were best for age estimation.² With the advancement of digital technology, the evaluation of dentin translucency has been more easily measured. Hence, this study was undertaken to measure the root dentine translucency with the aid of a digital software and to compare measurements obtained digitally with measurements obtained conventionally.

MATERIALS AND METHOD

Tooth sampling and sectioning: 60 freshly extracted permanent teeth from 60 different individuals (30 males, 30 females) from the age group of 13 – 66 years (mean: 46.77 years) were obtained from the Department of Oral and Maxillofacial Surgery of Kantipur Dental College, Teaching Hospital and Research center, Kathmandu.

Inclusion criteria: Single rooted permanent teeth and multirooted permanent teeth (up to first molar) extracted for valid clinical reasons such as malocclusion/orthodontic treatment, periodontal disease and caries were included in the study. Carious teeth were included in the sample provided the roots of the teeth were macroscopically unaffected by the disease.

Exclusion criteria: Grossly decayed teeth, impacted teeth, teeth with severe attrition, root caries and internal resorption were excluded from the study.

The extracted teeth were thoroughly cleaned and soft tissue remnants were removed from the root surface with a scalpel. The extracted teeth were kept in 10% neutral formalin to prevent dehydration. All the teeth were sectioned longitudinally to 250 μm in the buccolingual plane as close as possible to the central axis using Micromotor, Carborundum disc and Arkansas stone (Figure 1). The thickness of sections was confirmed using digital vernier caliper (Figure 2). The sections were coded to ensure blind assessment of root dentin translucency length.

Conventional translucency measurement: Translucency length was measured in accordance with the description given by Bang G and Ramm E.⁵ Their method was based on use of manual caliper. However, digital caliper was used in our study (Figure 3).²

Digital translucency measurement: Assessment of dentin translucency was done with a newer digital translucency measurement method suggested by Acharya AB.² Tooth sections were placed adjacent to an American Board of Forensic Odontology (ABFO) (Tritech Forensics, Phoenix, AZ, USA) no. 2 reference scale on a flat-bed scanner Canon LiDE 120 (Canon Europa N.V., Vietnam) and scanned under a resolution of 600 dpi. The dentin translucency of root (TD length) was measured as described by Johansen and Bowers¹⁰ for digital analysis of bite mark evidence. Scanned images were imported into Adobe Photoshop 7 image-editing software program for measuring translucency length. For convenience in measuring, Photoshop's in-built "guides" were placed at the apical (TA) and coronal extent (TC) of translucency and length between the guides were measured using Photoshop's in-built measurement tool (Figure 4). The junction between translucent and non-translucent zones on the labial/buccal and lingual sides was depicted as a relatively even horizontal line. If this is not so, Bang and Ramm recommended separate measurements of translucency on the two sides.⁵ This would necessitate placement of two guides to represent the labial/buccal and lingual aspects of the coronal extent of translucency. The distances between the coronal and apical guide on each side was measured separately and their average was taken.

Statistical analysis: The results were subjected to regression analysis using the statistical package for Social Sciences Software (SPSS). Pearson's correlation coefficient obtained for both methods were documented and the regression equations derived were used to calculate age on a control sample of 10 sections (age ranged from 13-66 years). The control samples were not used in deriving the regression formulas. The difference between estimated and chronological age for both methods was compared using paired t-test.



Figure 1: All the teeth were sectioned longitudinally in the buccolingual plane using Micromotor, Carborundum disc and Arkansas stone



Figure 2: Confirmation of thickness of section (up to 250 μm) using digital vernier caliper



Figure 3: Conventional translucency measurement with digital vernier caliper

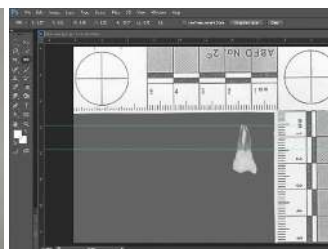


Figure 4: Measurement of dentine translucency using Adobe Photoshop. Upper and lower guides correspond to apical and coronal limits of translucent dentine

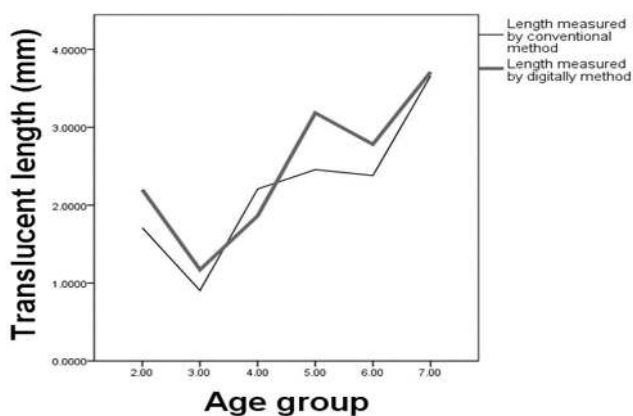


Figure 5: Graph showing the relationship between dentine translucency measured by both methods and age group

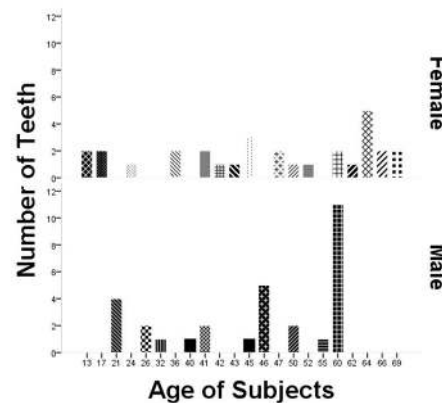


Figure 6: Diagram showing the relationship between number of teeth measured in and the age of subjects in each sex

RESULT

The study was cross sectional comparative study. The mean age of the patient was found to be 46.77 ± 15.741 years. The mean length of dentine translucency by conventional method and digital method was found to be 2.39 ± 1.41 mm and 2.78 ± 1.40 mm respectively. The correlation between age and length of dentine translucency was found to be statistically significant ($p < 0.01$). Figure 5 depicts the relationship between dentine translucency measured by both methods and age group, while Figure 6 depicts the relationship between number of teeth measured by both the methods and the age group in both male and female.

Pearson's correlation coefficient (r) and linear regression equations are shown in Table 1. The correlation coefficients of dentine translucency with age were statistically significant for both methods ($p < 0.01$).

Application of derived linear regression equations on the control sample ($n = 10$), which included the sections that were not used in deriving the regression formulas, showed that both the methods were similar in estimating age within ± 5 years of chronological age, the conventional method was better in estimating age within ± 15 years of chronological age and digital method was superior in estimating age beyond 20 years of chronological age (Table 2). Figure 7 and 8 depicts scatter plots showing correlation of chronological age to the estimated age for both conventional and digital methods respectively with no appreciable difference between the two methods. The paired t-test revealed significant difference in measurements of the root length as well as the estimated age between two methods ($p < 0.01$) (Table 3).

Table 1: Correlation coefficient (r) and regression equations derived from the conventional and digital translucency measurements

Methods	N	r	Regression equation
Conventional	60	0.456	age = $34 + (5.0995X \text{ translucency length})$
Digital	60	0.435	age = $33 + (4.869x \text{ translucency length})$

Table 2: Accuracy of age estimation of conventional and digital methods on a control sample

Methods	Control sample	Errors of estimated age			
		± 5 years	± 10 years	± 15 years	± 20 years
Conventional	10	2/10 (20%)	3/10 (30%)	8/10 (80%)	7/10 (70%)
Digital	10	2/10 (20%)	3/10 (30%)	6/10 (60%)	8/10 (80%)

Table3: Paired t-test between length and estimated age measured by caliper and digital method

Variables	Mean	Std. Deviation	p -value
Length measured by caliper – Length measured by digital	-.39217	.70138	.000
Estimatedage by caliper – Estimatedage by digital	-2.75241	4.32302	.000

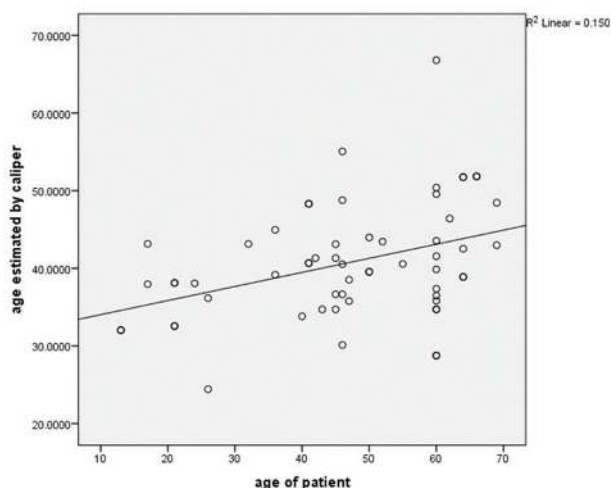


Figure 7: Scatter plots showing correlation of known age to the estimated age for the conventional method.

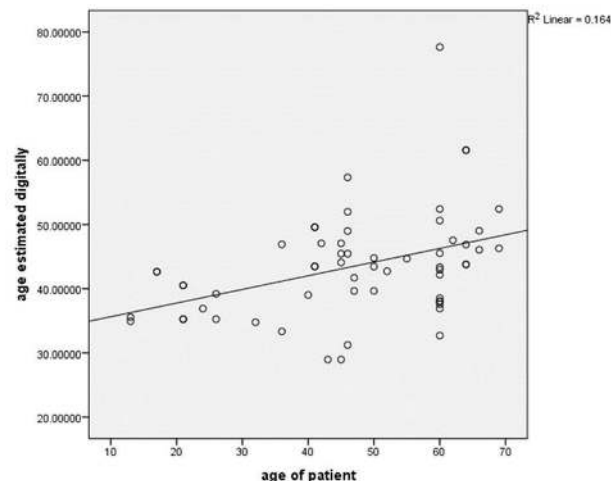


Figure 8: Scatter plots showing correlation of known age to the estimated age for the digital methods.

DISCUSSION

W. D. Miller, a bacteriologist, coined the term “transparency of dentin” as observed in ground sections.¹¹ The sclerotic or transparent dentine is altered normal dentine that occurs during aging.¹² It appears to form without trauma or caries and is regarded as a natural consequence of aging.⁴ The main physiological process behind translucency of dentine is fatty degeneration,¹⁸ deposition of increased amount of the calcific matter,¹⁹ consolidation of the dentinal tubules,¹ decreased diameter of dentinal tubules due to increased intratubular calcifications resulting in increased translucency of the affected dentin due to equalization of refractive indices between intratubular and extratubular inorganic material.²⁰ The physiologic transparent dentine is distinguishable from the pathologic in that the physiologic is often seen subjacent to caries. The peritubular dentine continues to form centripetally, eventually closing the lumen of the dentinal tubule. This phenomenon is accelerated by attrition as reported by Bradford (1958).¹³

Major factors in the production of the sclerotic dentine are the toxins from diseased periodontal tissues, absence of functional stimuli and smaller diameter of dentinal tubules in apical dentine.^{4,5} Vasiliadis (1983)⁴ found that sclerosis always appeared first in the zone of the dentine next to the cementum and advanced coronally and towards the root canal with increasing age. Gustafson (1966) reported that transparency only starts to appear after the age of 30 years. However, few studies have disapproved the occurrence after the age of 30 years, which was similar to our study.^{4,5,14}

Dentine translucency is considered best parameter to estimate dental age because of its accuracy and simplicity.²¹ It is not only least affected by environmental factor and the pathological process but also shows symmetrical distribution on both sides of jaws.^{15,21} The measurement of dentine translucency can be conducted by a relatively inexperienced examiner for the purpose of dental age estimation.⁵ Although the translucency can be visualized macroscopically in intact teeth, the tooth sections provide better results.⁵ Traditionally, translucency has been measured using calipers. But use of caliper for root dentine translucency measurement increases the risk of damage to the precious evidence from postmortem records. The thin teeth sections are at risk of breakage during handling and measuring procedures.² On the other hand, the digital method uses images of scanned teeth sections that can be viewed and measured by computer software and also can be stored for future references. The other advantage is the use of digital magnification of the image, rather than using a handheld magnifying glass.² Hence, Digital method has many advantages over conventional method for obtaining translucency measurements. Digital method allows better visualization of the junction between translucent and non-translucent zones giving “fine-tuning” of the measurements technique which prevents potential damage to thin tooth sections and the scanned images can also be stored for future use.^{2,22}

Bang and Ramm were the first to use only dentine translucency to estimate age.⁵ They measured the length of dentinal translucency in individuals of different ages

and reported that there was a predictable increase in root translucency with age. According to Kattappagari KK et al.,⁷ digital vernier caliper along with stereomicroscope has also shown good correlation of dentine translucency length with age.

In the present study, the ages ranges of the patients were from 13-69 years with the mean age of 46.77 ± 15.741 years. Out of the 60 sections of teeth 50% were of males and 50% were of females. Correlation between age and length of dentine translucency was statistically significant (<0.01) which was similar to the study conducted by Gupta et al.¹⁵ where they found that with increase in the age by 1 year, the length of translucency in the root also increases by 0.018 mm. They also concluded that gender has no role in the development of dentine translucency. However, in our study samples from younger individuals have shown increase of translucency, these findings were similar to the study done by Singhal A et al.¹⁶ This may be due to the presence of periodontal infections and diseases of the pulp. The chronic periodontal infection may stimulate far more mineralization resulting in the increased translucent zone in the root part of dentine.¹⁶

Minimal variation was observed in the measurement by two methods which was similar to previous studies.^{7-9,17} However, it was in contrast to results obtained by Acharya AB.² Minimal variation in Pearson's correlation coefficient between the two methods (Table 1) was noted. The results obtained showed that the digital method was better than conventional. It was in contrast to the study done by Chopra V et al.¹⁷ in 200 samples where they found that the translucency measurements obtained by the two methods were identical with no clear superiority of one method over the other. Although conventional measurements showed better correlation in a study done by Drusini A et al.,⁸ they suggested to prefer digital method because of

advantages of it over conventional method. Valenzuela et al.⁹ concluded that computer-based translucency measurements contributed best to estimate the age.

CONCLUSION

The present study showed dental age estimation using linear regression equations derived from the conventional and digital methods on the Nepalese population. However, the measurements obtained by the two methods were very similar, with no clear indication of superiority of one method over the other. Nevertheless, the digital method proved to be better in estimating age beyond 20 years of chronological age as against the conventional method. Hence, we recommend that further studies should be done in larger sample size to determine which method is more reliable in estimating the age.

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CONFLICT OF INTEREST

This study had been presented as poster by the authors and had been selected as best in poster category in 17th National Conference of Indian Association of Forensic Odontology on September 2019, Maulana Azad Institute of Dental Sciences, New Delhi.



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Attitude of Bachelor of Dental Surgery Students towards Specialization in Kantipur Dental College, Kathmandu

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ABSTRACT

Introduction: Specialization refers to becoming an expert in a particular subject or skill. The data collected from this survey helps to understand undergraduates and interns' career choices in dentistry and factors influencing their decisions for specialization.

Objective: To assess the attitude of Bachelor of Dental Surgery (BDS) undergraduate students and interns towards specialization.

Materials & Method: This is an observational, descriptive, cross-sectional study with a sample of 164 undergraduates from the third year to the final year and interns of Kantipur Dental College, Kathmandu. A self-administered questionnaire was given to the participants. Data were entered into Statistical Package for the Social Sciences (SPSS) and analyzed. Fisher's Exact Test was used to evaluate the relationships between categorical variables in the study.

Result: The majority of students were aged 20-24 years among which most of them were female (79.9%). Many belonged to Brahmin-Chettri (60.4%) ethnicity followed by Newar (22.6%). 93.9% of respondents wanted to pursue specialization and 63.6% wanted to pursue a career abroad. A factor motivating the decision to specialize was family expectations 26 (16.9%) and the reason for the choice of specialty was the passion for the subject 110 (71.4%). However, discouraging factor was found to be a high expense for higher studies 80 (51.9%). The first choice of the specialty was Oral Surgery 54 (35.1%), followed by Prosthodontics 31 (20.1%). After specialization, 53 (34.4%) of participants have responded to the private practice as their future placement plan.

Conclusion: Most of the undergraduate students and interns have a positive opinion to do specialization. Many want to pursue specialization by interest and amongst many branches of dentistry more than half of them were found to be interested in Oral Surgery and Prosthodontics subjects. Despite their willingness, undergraduates seemed to be discouraged to pursue specialization due to the high expenses.

Keywords: Attitude, Interns, Specialization, Undergraduates.

INTRODUCTION

The completion of Bachelor of Dental Surgery (BDS) is the gateway to post-graduation or specialization. The number of BDS graduates is increasing rapidly every year, which has led to the feeling of dilemma in the minds of undergraduates as they are not able to decide their future course they should take up to professionally.¹

Choosing a specialty branch after a bachelor degree is quite critical, as all the branches have their own importance and applicability.² Also, it has an obvious impact on individuals' future life patterns.³ Therefore, it is necessary to understand the factors which encourage the students towards specialization as well as the factors which discourage them from further studies.⁴

With the increasing trend for dental specialization, it is essential to study this area in order to help the students to

make better future plan and decision.⁴ Various studies²⁻⁴ are found regarding the attitude of medical personnel towards specialization; however, the present study is based on the attitude of dental students. The objectives of this study are to assess the attitude of BDS undergraduates and interns towards the specialization and determine the factors influencing their decision along with subject preference.

MATERIALS AND METHOD

The study was conducted after approval from the Institutional Review Committee of Kantipur Dental College and Hospital.

A cross-sectional survey was carried out in total of 164 samples including 134 BDS students studying third to final year during the academic year 2014 – 2016 and 40 interns of Kantipur Dental College. The study was done using a self-administered closed-ended questionnaire

which was provided to each participant. Written consent was taken prior to the study and confidentiality of the respondents was ensured. The sample size was collected using non-probability convenience sampling.

The study was conducted during May–September 2019. The questionnaire comprised of two sections; first was related to the respondents' background information including gender, parents occupations and permanent address, the second section comprised of questions regarding their choice of specialty, factors affecting their decision, mode of financing the study, time and place to pursue specialization and future placement plan. The data were analyzed using SPSS to carry out the statistical results. Fisher's Exact Test was used to evaluate the relationships between categorical variables in the study. The level of significance was set at $p < 0.05$.

RESULT

Questionnaires were completed by 164 respondents where 154 (93.9%) students wanted to pursue a specialty career in dentistry after BDS. While 6 (4.3%) wanted to work as a general practitioner. (Table 1)

The majority of respondents were female 131 (79.9%), age of the samples ranged from 20-24 years (Mean age = 23.04) and most of them belonged to Brahmin-Chhetri (60.4%) ethnicity followed by Newar (22.6%). There was an equal percentage of the respondents residing permanently and temporarily in Kathmandu valley. (Table 2)

The cross tabulation between aspiring participants to specialize and their permanent address did not have a significant influence on the decision to specialize ($p = 1.000$). However, gender had a significant influence on the decision to specialize ($p = 0.029$) (Table 2).

Further results analysis was done among 154 participants as 10 of the respondents do not want to pursue specialization.

After completion of BDS, 87 (56.5%) respondents intend to join specialization after few years and 97 (63%) prefer to study under scholarship. Among 154, (34.4%) participants responded to the private sector as their future workplace after specialization (Table 3).

The most common motivating factor for specialization was family expectations (26, 16.9%). Most reasoning for the choice of specialty was passion for the subject 110 (71.4%), whereas the most discouraging factor was the high expense of higher studies 80 (51.9%) (Table 4).

The first choice of specialty among participants was Oral Surgery 54 (35.1%), and the second choice was Prosthodontics 31 (20.1%) (Table 5).

Among respondents, 98 (63.6%) wants to pursue a career abroad, whereas 56 (36.4%) in the country. Likewise, 95 (61.7%) will be willing to pursue specialization even if they fail to get their subject of choice and 57 (37%) of respondents are willing to bond or be sponsored to pursue specialization.

Table 1: Frequency and percentage regarding participant's intention to pursue specialty and future career choice

Research question		Gender		
		Male (n=33)	Female (n=131)	Total (n=164)
Intension for specialty	Yes	28	126	154 (93.3%)
	No	5	5	10 (6.1%)
Future career option	Dental Specialist	28	126	154 (93.3%)
	General Practitioner	3	3	6 (4.3%)
	Others	2	2	4 (2.4%)

Table 2: Demographic data of participants according to gender, residence and their relation with students' desire to pursue a specialization

Demographic parameters		Intension for specialty			Fisher's Exact Test
		Yes	No	Total (%)	
Residence	Kathmandu valley	77	5	82 (50%)	$p = 1.000$
	Out of Kathmandu valley	77	5	82 (50%)	
	Total	154	10	164 (100%)	
Gender	Male	28	5	33 (20.1%)	$p = 0.029^*$
	Female	126	5	131 (79.9%)	
	Total	154	10	164 (100%)	

* Significant at $p < 0.05$

Table 3: Frequency and percentage related to time period to join in specialization, preference for financing it and future placement plans after specialization

Research question		Male (n=28)	Female (n=126)	Total (n=154)
Time to start specialization	As soon as possible	5	62	67 (43.5%)
	After few years	23	64	87 (56.5%)
Finance for specialization	Scholarship	23	74	97 (63%)
	Self-payment	2	33	35 (22.7%)
	Education loan	3	19	22 (14.3%)
Future placement plan	Private sector	13	40	53 (34.4%)
	Medical Research	3	12	15 (9.7%)
	Settle abroad	1	35	36 (23.4%)
	Work in rural area	-	4	4 (2.6%)
	Academic sectors	1	8	9 (5.8%)

Table 4: Factors motivating, discouraging decisions and reason for the choice of specialty with their frequency and percentages

Research questions		Male (n=28)	Female (n=126)	Total (n=154)
Reason for choice of specialty	Passion	17	93	110 (71.4%)
	Well-paid income	17	41	58 (37.7%)
	Knowledge	3	19	22 (14.3%)
Motivating factors	Family expectations	5	21	26 (16.9%)
	Social status	3	20	23 (14.9%)
	Financial reasons	3	18	21 (13.6%)
	Subject demand	4	13	17 (11%)
Discouraging factors	Cost	14	66	80 (51.9%)
	Duration	11	32	43 (27.9%)
	High Competition	8	31	39 (25.3%)

Table 5: Frequency and percentages of participants' first choice and second choice of subjects

Subject of choice	First choice			Second choice		
	Male (n=28)	Female (n=126)	Total (n=154)	Male (n=28)	Female (n=126)	Total (n=154)
Oral Surgery	15	39	54 (35.1%)	6	13	19 (12.3%)
Orthodontics	1	10	11 (7.1%)	10	16	26 (16.9%)
Pedodontics	-	15	15 (9.7%)	-	5	5 (3.2%)
Periodontics	1	4	5 (3.2%)	-	10	10 (6.5%)
Prosthodontics	6	15	21 (13.6%)	5	26	31 (20.1%)
Oral Medicine and Radiology	1	9	10 (6.5%)	2	15	17 (11%)
Public Health Dentistry	-	6	6 (3.9%)	1	10	11 (7.1%)
Oral Pathology	1	2	3 (1.9%)	1	6	7 (4.5%)
Conservative Dentistry and Endodontics	2	22	24 (15.6%)	4	22	26 (16.9%)
Basic Science	1	4	5 (3.2%)	-	2	2 (1.3%)

DISCUSSION

Most of the Nepali participants' future career option was to work as a specialist whereas the students of Japan, Sweden, and Pennsylvania opted as a general practitioner.^{5,6} The majority of the participants had an interest in pursuing a specialty career in various fields, among which Oral Surgery was their first choice which is similar to other previous studies.^{4,7} Contrary to this, a study conducted

by Puryer et al. showed that restorative dentistry was the first choice.⁶ The family expectation is the key factor that would motivate to pursue specialization whereas financial reasons were the motivating factor among the students of Kinshasa University and the undergraduates studying in Karachi.^{7,4} Likewise, a study in United Kingdom (UK) showed that the motivating factor was talent in the field whereas family expectations were the motivating factor

among Japanese students according to a study by Karibe et al.^{6,5} The discouraging factor among the participants was found to be the high expense of the study, similar to the study in Kinshasa University in Congo.⁷ Protracted time was the discouraging factor among the participants in Karachi.⁴ Most of the participants are willing to pursue specialization abroad; this might be due to lesser number of seats with high competition, whereas the Japanese students were unwilling to go abroad according to study by Karibe et al.⁵ Our country produces about 500 BDS graduates every year but when it comes to specialization after BDS, the number of seats is less as compared to the number of BDS seats.⁹

The present study dealt with the choice of specialty and the factors of various origins that influence the decision to pursue specialization. This study has some limitations as the participants were from a single dental college of Kathmandu, Nepal. Thus, the results cannot be generalized.

CONCLUSION

Most of the undergraduates have a positive opinion about specialization. Most of them want to pursue specialization by interest and amongst many branches of dentistry more than half of them were found to be interested in Oral Surgery. Despite the willingness to study further, most of the undergraduates seem to be discouraged to pursue specialization due to the high expense of the study.

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Correlation between Vital Capacity and Maximum Chest Expansion among Nepalese Young Adults

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ABSTRACT

Introduction: Vital capacity (VC) is one of the most important parameters of pulmonary function test. Measurement of chest expansion (CE) could be also important when exploring impaired pulmonary function.

Objective: To correlate the vital capacity with maximum chest expansion among the Nepalese healthy young adults.

Materials & Method: A cross-sectional, observational study was conducted on first and second year medical and dental students of Nepal Medical College, Jorpati, Kathmandu, Nepal. Vital capacity and chest expansion were measured and correlated.

Result: Of the total 223 students, 152 were males and 71 were females; age ranged between 17- 23 years. Mean VC was 4.15 ± 0.53 L for males and 2.80 ± 0.34 L for females. Mean CE was 8.71 ± 1.72 cm for males and 5.57 ± 1.39 cm for females. Both VC and CE measurements were higher in males than females ($p < 0.01$). There was a strong positive correlation between VC and CE ($r = +0.71$, $p < 0.01$). Similarly, there was significantly strong correlation of height with VC ($r = +0.80$, $p < 0.01$) and CE ($r = +0.57$, $p < 0.01$) but not with the body mass index (BMI) of the participants.

Conclusion: There is a strong correlation between VC and CE among the Nepalese young adults. Chest expansion measurement is cheap, easily obtainable, easy to learn, and appropriate for use in clinical settings. Hence, it can be used as an alternative tool in place of vital capacity measurement.

Keywords: Chest expansion, Correlation, Vital capacity, Young adults

INTRODUCTION

Pulmonary function test (PFT) is one of the usual approaches to assess respiratory health status of an individual.¹ Functional impairment caused by various diseases affecting the respiratory system can be assessed by PFT.¹ Currently, PFT has become a part of routine health examination in occupational, sports medicine and public health screening in most parts of the world.²

Vital capacity (VC) is defined as the maximum volume of air that can be expired after maximum inspiratory effort. It is regarded as the most important parameter of PFT. It gives precise and useful information about the strength of respiratory muscles.³ Vital capacity depends on a number of factors such as sex, height, body size, ethnicity, physical activity, environment, socio-economic conditions and life style of individual.⁴⁻⁸ Recently, VC is being used for documenting the progression of restrictive and obstructive respiratory diseases. It is also used for

assessing the effectiveness of therapeutic intervention, e.g. bronchodilator.⁹ VC has not only diagnostic value, but also useful to study the course of a disease during treatment; therefore, it has prognostic value as well.¹⁰ Measurement of VC is the most widely used technique for lung function evaluation because of its sensitivity, reliability, and specificity. However, this maneuver is highly dependent on subject cooperation and effort.¹

Chest expansion (CE) is defined as the difference between chest circumferences at maximal inhalation and maximal exhalation.¹¹ It is one of the simplest techniques used to evaluate respiratory function.¹² Normal chest wall mobility is often assessed by chest expansion measurement. CE measurement is quick, simple and cheap, method of diagnosing pulmonary function impairment which only requires a measuring tape. It is commonly used for screening purposes in a large population. Bockenbauer et al. studied the reliability of the cloth tape measure technique in healthy male subjects by measuring thoracic excursion

at two levels of chest and concluded that the tape measure method could be reliable and useful in a clinical setting.¹³

Although VC and CE are used mostly in different clinical settings and with different purposes, it may be possible that CE measurement be used in place of VC in circumstances when VC measurement is unsuitable due to lack of skill, equipments or patient's co-operation.¹⁴ Studies regarding correlation between vital capacity and chest expansion have been performed in many countries.¹⁵⁻¹⁸ However, due to the different study population, techniques and procedures, a uniform correlation between these two has not been reported. In Nepali population, no study has been reported to determine the relationship between vital capacity and chest expansion. So, the present study was undertaken to establish the correlation between the vital capacity and chest expansion of healthy Nepali young adults.

MATERIALS AND METHOD

A cross-sectional, observational study was conducted at the Department of Physiology of Nepal Medical College Teaching Hospital (NMCTH) Kathmandu, Nepal. The ethical clearance was taken from the Institutional Review Committee (IRC) of the NMCTH. A total of 223 students were studied. Informed written consent was taken from the students prior to the study. Medical and dental students of NMCTH were included in the study. Participants who were smokers, who have stress incontinence, participants suffering from common cold and other respiratory illness, musculoskeletal problems of chest wall, oral and facial pain, and participants engaged in meditation and yogic breathing exercise were excluded.

Measurement of chest expansion:¹⁹ Chest expansion (CE) was measured by the inelastic measuring tape. The subject was asked to stand with the feet, five centimeter (cm) apart and hands on the waist. Upper limbs were held at the sides with the shoulder abducted, the elbows in semi flexion, and hands resting on the waist. For measurement of thoracic circumferences, the student was instructed to inflate chest maximally and deflate maximally. Two measurements were taken: at the end of maximum inflation, for maximum thoracic circumference and at the end of maximum deflation for minimum thoracic circumference. Three readings were taken for each instruction with the highest value recorded used in the analysis. For both maximum and minimum circumferences, measurement

was taken at two levels: upper and lower. For the upper thoracic excursion, the measuring tape was placed at the level of the 5th thoracic spinous process at the back and the 3rd intercostals space at the mid-clavicular line in the front. For the lower thoracic excursion, a tape measure was placed at the level of the 10th thoracic spinous process at the back and tip of the xiphoid process at the front. The average of the two levels readings were used as maximum and minimum chest circumferences. Then CE was calculated as the difference between maximum and minimum chest circumferences. Each chest measurement was made after allowing five minutes of rest.

Measurement of vital capacity:²⁰ Forced Vital Capacity (FVC) was recorded in computerized spirometer (PC based Pulmonary Function Test: MedicAid® System 2003, Chandigarh, India). Three satisfactory readings were taken at intervals of five minutes and the highest value among the three was regarded as VC. The mouthpiece of the spirometer was cleaned and disinfected each time for each of the subjects.

All the collected data were compiled and analyzed by using Microsoft Excel and Statistical package for social sciences (SPSS16.0). Descriptive statistics was used to compute means, percentiles, ranges and standard deviations. Pearson product moment correlation analysis was used to test the relation between vital capacity and chest expansion. Independent t- test was used to test the difference in vital capacity and chest expansion measurement between males and females. Level of significance was set at 95%.

RESULT

General Characteristics

Of the total participants (n= 223), 152 were male and 71 were female; age ranged between 17- 23 years (Table 1).

Vital capacity and chest expansion

The result showed that males had significantly greater mean vital capacity (4.15 ± 0.53 L) than females (2.80 ± 0.34 L). Similarly, the males also had significantly greater average chest expansion (8.71 ± 1.72 cm) than females (5.57 ± 1.39 cm). In addition, the chest expansion in males was found to be greater at the lower level (8.79 ± 1.84 cm) whereas in females it is found to be greater at the upper level (6.07 ± 1.84 cm).

Table 1: General characteristics of the participants

Parameters	Male (n=152)			Female (n=71)		
	Mean±SD	Min.	Max.	Mean±SD	Min.	Max.
Age (years)	19.62±1.20	17	23	18.45±1.05	17	21
Height (cm)	172.96±8.33	152	233	159.97±5.77	147	172
Weight (kg)	65.77±10.63	43.5	102.5	54.54±8.31	42.20	77.60
BMI (kg/m ²)	21.94±2.96	13.10	32.20	21.30±3.01	16.10	29.50

Table 2: Relationship between vital capacity and chest expansion with general characteristics of the participants

Variables	Vital capacity (VC)		Chest expansion (CE)	
	Coefficient of correlation (r)	p value	Coefficient of correlation (r)	p value
Age (years)	+ 0.27	<0.01	+0.25	<0.01
Height (cm)	+ 0.80	<0.01	+0.57	<0.01
Weight (kg)	+ 0.56	<0.01	+0.26	<0.01
BMI (kg/m ²)	+ 0.11	>0.05	-0.005	>0.05

Correlation of vital capacity and chest expansion with general characteristics

Vital capacity had strongest correlation with height. Chest expansion had highest correlation with height. Chest expansion had insignificant negative correlation with body mass index (Table 2).

Correlation between vital capacity and chest expansion

The vital capacity had strong positive correlation with chest expansion both at lower level ($r = +0.71$), upper level ($r = +0.65$) and average chest expansion ($r = +0.71$), which is statistically significant ($p < 0.01$). However, vital capacity is strongly correlated with chest expansion at lower level compared to upper level.

DISCUSSION

This study recorded significantly ($p < 0.01$) higher values of vital capacity in males than in females. The result corroborated with the previous studies.²¹⁻²³ Harms and Rosenkranz reported that women tend to show reduced lung size, reduced airway diameter, decreased maximal expiratory flow rates, and a smaller diffusion surface than age and height matched men.²² Hormones namely progesterone and oestrogen, are known to modify and influence the pulmonary system.²² The values of VC obtained from this study were higher than the previously reported values among medical students.^{21,23} This might be due to the physical and anthropometric variation in study subjects. The mean chest expansion was significantly ($p < 0.01$) higher in males than in females. The difference between males and females chest expansion could be

explained by differences in chest dimensions and power of respiratory muscles.

The principal finding of this study is the strong correlation between vital capacity and chest expansion ($r = +0.71$, $p < 0.01$). Both chest expansion and forced vital capacity maneuvers are performed at the level of maximal inspiration and maximal expiration. The difference between maximal inspiration and expiration is created by the breathing muscles. During maximal inspiration diaphragm, external intercostals and other accessory inspiratory muscles contribute to the inspiratory effort. The combined action of these muscles increases the volume of the thoracic cage and chest cavity expands. Expansion of the chest cavity generates more negative pressure in the lungs increasing chest expansion, intra-thoracic lung volume; hence contributing to increase the ventilator capacity. During a maximal expiration, the combined action of the abdominal and internal intercostals muscles decreases the volume of the thoracic cage, producing more positive pressure in the lungs. As a result, air moves out of the lung and the lung volume decreases.^{24,25} Studies conducted by Whitefield et al.¹⁶ and Fisher et al.¹⁸ ascertained the correlation values somewhat nearer to our study ($r = +0.70$ and $r = +0.68$ respectively). However, study done by Jackson and Lees showed correlation value lower than this study ($r = +0.32$).¹⁵ This may be due to the variation in study population and places, as lung function varies from individual's characteristics to environmental parameters as well as wide variations in socio-economic, geographical and nutritional conditions.^{4,7,8,26}

As in previous studies, this study also confirmed the influence of height on VC showing a strong positive correlation ($r = +0.80$, $p < 0.01$).^{8,20} This might be due to the increased surface area of the lungs in relation with increasing height. With increasing height, chest girth and thoracic area also increase. Therefore, greater amount of air can exchange in and out and this causes an increase in vital capacity of taller people.²⁷

VC also exhibited significant positive correlation with weight ($r = +0.56$, $p < 0.01$). In the present study, participants had normal mean weight for their height and gender. A study done by Schoenberg et al. found that pulmonary function initially increased as weight increased and then decreased as weight continue to increase. They considered that the increase of pulmonary function with weight may reflect increasing muscle force, and then decrease with further weight gain may be due to obesity which limits the mobility of the thoracic cage.²⁸

The insignificant correlation ($r = +0.11$, $p > 0.05$) of VC with BMI in this study can be explained by the fact that subjects participated in this study were within normal range of BMI for their age and sex. In fact, extra adipose tissue deposition in the chest wall and abdominal cavity can result in decrease in lung volume and decrease in chest and lung compliance.²⁹

Chest expansion was found to be significantly correlated with height ($r = +0.57$, $p < 0.01$) and age ($r = +0.25$, $p < 0.01$). This may be due to the proportion of chest cavity based on height and participation of young age adult in

the study. These findings are supported by the study of Adedoyin which reported chest expansion increases with age until 3rd decade of life, and then steadily declines after this.¹⁹ One possible mechanism of age related declines in chest expansion could be due to the diminution in mobility and distensibility of thoracic cage with ageing. The correlation of CE with weight ($r = +0.26$, $p < 0.01$) indicates that increase of chest expansion with weight reflects increase in respiratory muscle strength.

The present study was conducted on healthy individuals and those with pulmonary diseases were not considered. Hence, similar studies with diseased individuals should be explored further.

CONCLUSION

This study established the strong correlation between vital capacity and chest expansion among the Nepalese young adults ($r = +0.71$). So, chest expansion measurement can be used in place of vital capacity measurement as an alternative tool.

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Lesions Associated with Impacted Tooth

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ABSTRACT

Impacted teeth have been associated with various pathological conditions such as cysts, tumors, pericoronitis, periodontitis, and pathological root resorption. This review is intended to introduce lesions associated with the impacted tooth. From the literature review following 12 lesions was found to be associated with impacted tooth which are dentigerous cyst, odontogenic keratocyst, calcifying odontogenic cyst, central mucoepidermoid carcinoma, unicystic ameloblastoma, calcifying epithelial odontogenic tumor, adenomatoid odontogenic tumor, squamous odontogenic tumor, ameloblastic fibroma, ameloblastic fibro odontoma, odontoma, central odontogenic fibroma. These entities can be considered in differential diagnosis when clinicians encounter a lesion in intimate association with impacted tooth thus helping in formulation of diagnosis and to develop an appropriate treatment plan.

Keywords: associated lesions, impacted tooth, unerupted tooth

INTRODUCTION

Peterson characterized impacted teeth as those teeth that fails to erupt into the dental arch within the expected time.¹ Lack of an adequate dental arch length and space in which tooth erupts into is the main reason for impaction.² The maxillary and mandibular third molars are most commonly impacted teeth which account for 98% of all impacted teeth. This is followed by the maxillary cuspids, premolars and supernumerary teeth.^{3,4} According to the literature, the prevalence of impacted tooth has been estimated to be between 8% and 33% in different countries.⁵⁻⁷

Disease associated with impacted teeth may be clinically obvious or occult.⁸ Impacted teeth have been associated with various pathological conditions such as cysts, tumors, pericoronitis, periodontitis, and pathological root resorption along with adverse effects on the neighboring teeth and bone. According to different studies the prevalence of cystic and neoplastic changes associated with impacted teeth ranges from 3 to 16%.^{4,9} The objective of this review is to identify different lesions associated with impacted teeth.

MATERIALS AND METHOD

Literature were reviewed through various search engines like Google, Google Scholar, PubMed, Med-Line as well as standard textbooks to find relevant studies using keywords such as “impacted tooth”, “associated lesions”, “unerupted tooth”. Among the obtained result, approximately 70

papers broadly suitable to the topic were found. We ultimately integrated 33 articles that were closely related to the topic of interest. Following 12 lesions were found to be associated with impacted tooth: dentigerous cyst, odontogenic keratocyst, calcifying odontogenic cyst, central mucoepidermoid carcinoma, unicystic ameloblastoma, calcifying epithelial odontogenic tumor, adenomatoid odontogenic tumor, squamous odontogenic tumor, ameloblastic fibroma, ameloblastic fibro odontoma, odontoma, central odontogenic fibroma.

RESULT

Dentigerous cyst : Dentigerous cyst can be defined as an odontogenic cyst that surrounds the crown of an impacted tooth.³ It is the second most common cystic lesion of the jaw, after radicular cysts. They usually present in the second or third decade of life with a slight male predilection and are rarely seen in childhood.¹⁰ Dentigerous cysts most often involve the mandibular third molars (65%), followed by the maxillary canines.¹¹ Study has shown that 93% of cysts associated with the mandibular third molar comprise of dentigerous cyst.¹² Most dentigerous cysts are solitary. Bilateral and multiple cysts are usually found in association with syndromes like Cleidocranial dysplasia and Maroteaux-Lamy syndrome.³

On radiographic examination, dentigerous cysts appear as unilocular radiolucent cysts of varying sizes, with well-defined sclerotic borders, associated with the crown of an

unerupted tooth. A critical diagnostic fact is that this type of cyst attaches at the cemento-enamel junction.¹³ The relationship between dentigerous cysts and the crown of the impacted tooth shows 3 types of radiographic patterns: central, lateral, and circumferential. The central variety is the most common type. The lateral variety is usually associated with a mesioangular impacted mandibular third molar. In the circumferential variant, the dentigerous cyst surrounds the crown and extends for some distance along the root. Displacement of the involved tooth and root resorption of the adjacent erupted tooth have been reported.¹³ Histologically, dentigerous cysts are lined by a layer of nonkeratinized stratified squamous epithelium, with a surrounding wall of thin connective tissue containing odontogenic epithelial rests. Tumors such as ameloblastoma, mucoepidermoid carcinomas or squamous cell carcinoma occasionally arise from the lining of the dentigerous cyst.¹¹

Odontogenic keratocyst (OKC): Odontogenic keratocyst was first described by Philipsen in 1956 which shows bimodal age distribution with the peak incidence occurring in the second and fifth decades of life. The mean age of patients is 42 years with a slight male predilection.^{9,14} More than 80% of cysts have been reported in the mandible, most commonly in the body (20%), angle (18%), and vertical ramus (10%). Only 16% of cases have been reported to occur in the maxilla, frequently in the posterior region.^{14,15} Approximately 82% of these lesions occur in tooth bearing areas and roughly 27% of cases show an association with impacted tooth especially impacted third molar. Multiple OKCs are found to be associated with nevoid basal cell carcinoma syndrome (NBCCS).³

Radiographically, Odontogenic keratocyst demonstrate a well-defined unilocular or multilocular radiolucency with smooth or scalloped and often corticated margins. OKC tend to grow in an anteroposterior direction within the jawbone without causing considerable cortical plate expansion.³

The histopathological feature of OKC is a characteristic thin epithelial layer, composed of 8 to 10 cell layers. The basal layer shows palisade organized cells with a uniform nucleus. These cysts are lined by stratified squamous epithelium that produces orthokeratin (10%), para keratin (83%), or both types of keratin (7%). No rete ridges are present; therefore, the epithelium often sloughs from the connective tissue (94% of the time).³ The connective

tissue wall often shows small islands of epithelium similar to the lining epithelium; some of these islands may be small daughter cysts.¹⁴

Calcifying odontogenic cyst (COC): Calcifying odontogenic cysts (COC) is an uncommon odontogenic lesion accounting for about 3% of oral lesions and 1% of jaw cysts.¹⁶ COC may be seen in any decade of life, but common in second and third decade. Approximately 65–67.5% of cases are seen in the anterior jaws with equal frequency in maxilla and mandible.^{17,18} Male and female are affected with almost equal frequency. COCs are associated with impacted teeth (mostly canines) in 10%-32% of cases.¹⁶

Radiographically, radiolucent unilocular occasionally multilocular images are seen with well circumscribed limits containing diffuse opacification areas, associated to impacted or unerupted teeth or another odontogenic tumor.¹⁷ Histologically, COC is usually composed of a cystic cavity with fibrotic capsule lined by an odontogenic epithelium. The typical microscopic feature of this lesion is the presence of variable amount of aberrant epithelial cells without nuclei, which are called “ghost cells. At times, a “product” may be identified in juxtaposition to the proliferative lining epithelium or intermixed with the ghost cells called “dentoid.” The COC often is encountered in association with an odontoma.¹⁹

Central Mucoepidermoid carcinoma: Mucoepidermoid carcinoma generally arises from salivary glands, representing 5-10% of all salivary gland tumors.²⁰ Central mucoepidermoid carcinoma represents 4.3 percent of mucoepidermoid carcinomas from all sites.²¹ It affects females twice more frequently than males and involves the mandible twice more often than the maxilla.^{20,21} The most common site of occurrence is the premolar-molar area and the angle of the mandible.²⁰ It has been reported in ages ranging from 1 to 78 years, with the majority of cases occurring in 4th and 5th decades of life. Eversole et al. found approximately 50% of the mandibular tumors associated with dental cysts and/or impacted teeth, while Brookstone and Huvos reported a rate of 32% association with impacted tooth.²⁰ Previous history of a cyst or impacted tooth gives acceptance to the theory that odontogenic epithelium is capable of giving rise to mucous secretory cells which may undergo neoplastic transformation to mucoepidermoid carcinoma.²⁰ The radiological features are well circumscribed unilocular or multilocular radiolucent

lesions.²¹ Most central mucoepidermoid carcinomas are low grade lesions but only few cases with long term follow up have been reported to confidently characterize their clinical behavior.²¹

Unicystic ameloblastoma: Unicystic ameloblastoma (UA) is a rare growth pattern seen in intraosseous ameloblastoma. This growth pattern is seen in approximately 6% of ameloblastomas. It tends to occur in a younger population with an average age of 25 years.^{9,22} UA shows a male to female ratio of 1.6:1. 50-80% of UA are associated with an impacted tooth.^{9,23} More than 90% of lesions are found in the posterior mandible with mandibular third molar being most commonly involved tooth.⁹ The etiology is unknown and the pathogenesis is poorly understood. They may arise from preexisting odontogenic cysts, in particular a dentigerous cyst or may arise de novo.²³ The predominant radiographical patterns of unicystic ameloblastoma are unilocular, scalloped multilocular, pericoronal, interradicular, or periapical radiolucencies.²²

The unicystic ameloblastoma grows predominantly as a cystic lesion. The epithelium lining the cystic cavity shows typical cytomorphic features that are recognizable as ameloblastoma, with a basal cell layer composed of columnar cells displaying hyperchromatic palisaded nuclei with reverse in polarity, and a subnuclear vacuole usually is noted. Ackermann et al. have described three histological variants luminal, intraluminal and mural.²³ In some instances, the ameloblastic epithelium may be proliferative, with extension of the ameloblastic epithelium into the lumen of the cystic cavity termed intraluminal proliferation. The epithelium may remain in direct contact with the cystic lining known as luminal or it may appear as separate islands of tumor in the connective tissue wall termed as mural (or intramural) growth.^{22,23}

Calcifying epithelial odontogenic tumor (CEOT): The calcifying epithelial odontogenic tumor or Pindborg tumor is generally considered as uncommon to rare odontogenic neoplasm that accounts for less than 1% of all odontogenic tumors.⁹ The average patient age for this lesion is variable within the range of 37-43 years with slight male predilection.²⁴ Pindborg tumor presents most often (75%) as an intrabony mandibular lesion and when in the mandible 60% cases is found in the posterior body to ascending ramus.²⁴ About 53%, CEOTs have a definite association with an unerupted tooth (or odontoma) and

among these 52% of the teeth are mandibular molars.²³ A mixed radiolucent radiopaque pattern is the most common pattern (65%), followed by radiolucent areas (32%), and radiopaque cases (3%).^{9,24}

Histologically, Pindborg tumor is characterized by proliferation of a squamous odontogenic epithelium with well-defined individual cell morphology and intercellular bridging. Some tumor cells vary from polygonal to round to oval in shape, while others may be highly irregular, pleomorphic, and ominous in morphology which still remain consistent with a benign diagnosis. A characteristic feature is an amyloid like material formed intraepithelially that may become calcified and may be liberated as the cells break down.²³

Adenomatoid odontogenic tumor (AOT): AOT accounts for approximately 3-7% of odontogenic tumor which makes it the fourth most frequent odontogenic tumor.^{23,25} It is unique among odontogenic tumors and unexplainable that 88% are diagnosed in the 2nd and 3rd decades.²⁵ They are more common in female.²³ AOTs are asymptomatic; however patients may be aware of a gingival swelling or an area of jaw enlargement. Maxillary anterior region is the most common site of occurrence.²⁵ AOT occurs in intraosseous and peripheral forms. Intraosseous tumors account for 95.6% of all AOTs. Intraosseous variant can arise in follicular and extrafollicular forms. The follicular variant is three times as frequent as the extrafollicular variant. The follicular variety of central AOT is associated with unerupted tooth.²³

Radiographically, it is seen as unilocular radiolucency associated with the crown and often part of the root of an unerupted tooth which mimics dentigerous cyst. Among the impacted or unerupted teeth associated with AOT all four canines account for 59% cases, maxillary canines alone accounts for 40% cases while unerupted first and second molars are rarely involved. Unerupted deciduous teeth involvement is rare with only two cases been published.²³ AOT is microscopically defined by the WHO (1992) as a tumor of odontogenic epithelium with duct like structures and with varying degrees of inductive change in the connective tissue. The tumor may be partly cystic, and in some cases the solid lesion may be present only as masses in the wall of a large cyst.²⁵

Squamous Odontogenic tumor (SOT): Squamous odontogenic tumor (SOT) is a benign but locally infiltrative

neoplasm which belongs to the family of epithelial odontogenic tumor.²³ Mobility of the teeth, swelling of the alveolar process and moderate pain are the possible clinical features of underlying disease.^{23,26} SOT occurs over a wide age range, with the reported incidence peak in the third decade of life. There is a slight male preponderance.²⁷ However, lesions of the maxilla tend to occur more often in the anterior regions, while mandibular cases are more often found in the posterior areas.²⁶ The radiographic lesion is usually described as well-defined unilocular and triangular radiolucency between the roots of the adjacent teeth.^{26,27} SOT seems to be rarely associated with impacted teeth compared to other odontogenic tumors. Few cases have been reported to be associated with erupting maxillary canine and impacted mandibular third molar.²⁶

Histologically, SOT consists of numerous islands of proliferative squamous epithelium dispersed uniformly in a connective tissue stroma. The islands are numerous and easily recognized, being sharply demarcated from the surrounding stroma by a flattened layer of cells at their periphery. They tend to vary somewhat in shape, but, as a rule, round to oval islands are always seen. The epithelium in these rounded islands often shows a swirling or “whirlpool” pattern to the central squamous cells. Areas of cystic change centrally within the islands are also a frequent finding, and keratinization of the central cells may be present too.^{23,27}

Ameloblastic fibroma (AF): Ameloblastic fibroma (AF) is a relatively rare true mixed odontogenic tumor characterized by the simultaneous neoplastic proliferation of mesenchymal and epithelial components without formation of dental hard tissues.²⁸ These neoplasms occur predominantly in children and young adults usually within an age range of 6 months to 42 years (mean 14.6–15.5 years) with slight male predilection. The posterior mandible is the most common site, and about 80% of cases are located in the first permanent molar and second primary molar area.²⁸ Impacted or unerupted teeth are associated with AFs in three quarters of the cases. AF can also develop in the areas of congenitally missing teeth.²³

The neoplasm appears as a well-defined, unilocular or multilocular radiolucency with a smooth, well-defined outline and often with a sclerotic opaque border radiographically. Smaller lesions reveal unilocular patterns while larger lesion tends to have multilocular appearance. Histopathologically, the epithelial component

is characterized by proliferating islands, cords, and strands of odontogenic epithelium exhibiting a peripheral layer of cuboidal or columnar cells, and the central area resembles the stellate reticulum of the embryonic enamel organ. The ectomesenchymal component is that of an embryonic, cell rich mesenchyme that mimics the dental papilla.^{23,28}

Ameloblastic Fibro-odontoma (AFO): According to World Health Organization (2005), AFO is a neoplasm composed of proliferating odontogenic epithelium embedded in cellular ectomesenchymal tissue that resembles dental papilla, with varying degrees of inductive change and dental hard tissue formation. AFO usually is diagnosed in the first two decades of life, and about 98% occur before the age of 20 years. There is a slight male predilection. Most tumors are found in the posterior mandible; the second most popular location being the posterior maxilla.²⁸ It usually presents as a painless, slow growing, expansile swelling and may inhibit tooth eruption or displace involved teeth without altering their vitality.^{28,29} In majority of cases (83%) AFO is associated with an unerupted tooth.²³ Radiographically, AFO presents as a uni or multilocular radiolucency with a well delineated radiopaque border. The central part of the tumor reveals radiopacity, the density of which resembles that of dental hard tissue. In cases of association with an unerupted tooth the AFO is usually located coronally to the crown of the tooth.^{23,29}

Histologically, AFO show the characteristic structure of an immature complex odontoma consisting of irregularly arranged enamel, dentinoid, cementum, and pulplike ectomesenchymal tissue. At the tumor periphery next to the fibrous capsule, there is a zone of strands and islands of odontogenic epithelium embedded in cell rich ectomesenchyme. The dentin may vary structurally from dentinoid to tubular dentin. Approaching the tumor center, enamel matrix is laid down by the odontogenic epithelium and may appear columnar or preameloblast like. The amount of ectomesenchyme gradually decreases as the hard tissue mass dominates the central part of the lesion.²³

Odontoma: Odontomas are most common variety of mixed odontogenic tumors, in which enamel and dentin are formed when both the epithelial and mesenchymal components undergo functional differentiation. The abnormal pattern of enamel and dentin are laid down because the organization of the odontogenic cells fails to

reach a normal state of morphodifferentiation.³⁰ They are hamartomatous lesions rather than true neoplasms.^{23,30} Two types of odontomas have been identified the complex and compound odontoma. The distinction between the two types is based on either the appearance of well-organized tooth like structures (Compound odontomas) or a mass of disorganized odontogenic tissue (Complex odontoma). Compound odontomas appear twice more frequently than complex odontomas.³⁰ They are more commonly seen in the second decade of life (75% of cases) with slight male predilection.^{9,23} They occur predominantly in the anterior maxilla and mandibular molar areas. In 40-50% of cases, an impacted permanent tooth is associated with the compound odontoma. Complex odontomes are located in the mandible especially in the posterior areas.³⁰

On radiographic examination, odontomas exhibit three characteristic stages of development. In the first stage, they exhibit radiolucency due to a lack of calcification, in the intermediate stage partial calcification may be observed, and in the third stage, the lesion usually appears as radiopaque masses surrounded by radiolucent areas.^{9,30} Histopathologically, odontomas are composed essentially of mature dental tissues that is enamel, dentin, cementum, and pulp tissue and may be arranged (compound odontoma) or unstructured sheets (complex odontoma).³⁰

Central Odontogenic fibroma (COF): Central odontogenic fibroma (COF) has been defined as a benign neoplasm in the jaw bones, representing the intraosseous counterpart of a peripheral odontogenic fibroma.^{31,32} COF appears as an asymptomatic expansion of the cortical plate of the mandible or maxilla with equal frequency. The lesion may evolve from a dental germ (dental papilla or follicle) or from the periodontal membrane, and therefore is invariably related to the coronal or radicular portion of teeth.³³ The most common site of presentation in the mandible is the posterior area, while in anteriorly in the maxilla. It seems to arise in a wide age group with predilection for females. In an extensive review of the literature regarding odontogenic fibromas, Kaffe and Buchner found that 27% were associated with the crown of an unerupted tooth.³²

COF radiologically presents as uni or multilocular radiolucencies with well-defined borders. In some rare cases, it might present mixed radiolucent and radiopaque features and ill-defined borders. Root resorption and displacement have been reported in cases of more severe lesions.³³ Histologically, COF is a non-encapsulated tumor

characterized by the admixture of connective tissue (acellular, loose, myxomatous or markedly cellular) and islands of odontogenic epithelium associated dysplastic dentin, amorphous ovoid cementum like calcifications and trabeculae of osteoid. Sometimes it is associated to a prominent giant cell granuloma like histopathologic component.³³

DISCUSSION

This review proposes a group of jaw lesions that occur in association with impacted tooth. There are 12 lesions which include cysts and tumors of odontogenic origin and salivary gland tumors. General features of these lesions are given in Table 1.

Among these lesions' highest frequency of association with an impacted tooth is seen in ameloblastic fibro odontoma, unicystic ameloblastoma, dentigerous cyst and adenomatoid odontogenic tumor. Lowest frequency of association is seen in squamous odontogenic tumor, odontogenic keratocyst and central odontogenic fibroma. Mandibular third molar is most commonly associated tooth in these lesions except for adenomatoid odontogenic tumor, calcifying odontogenic cyst and compound odontoma for which the anterior maxillary teeth are most commonly involved. Adenomatoid odontogenic tumor has unique tendency of most commonly being associated with impacted cuspids.

These lesions usually occur in 2nd and 3rd decade of life except for central mucoepidermoid carcinoma and calcifying epithelial odontogenic tumor which occurs in 4th and 5th decades of life. Odontogenic keratocyst has bimodal distribution of age occurring in 2nd and 5th decade of life.

Most of the lesions associated with impacted tooth are commonly seen in male while adenomatoid odontogenic tumor, central mucoepidermoid carcinoma and central odontogenic fibroma are more common in females. There is no gender predilection in calcifying odontogenic cyst and odontoma.

Although various radiographic features have been described in jaw lesions associated with impacted tooth, most of them first appear as unilocular radiolucency with the potential to evolve into multilocular lesions with well-defined borders. Some lesions like calcifying odontogenic cyst, adenomatoid odontogenic tumors,

Table1: General features of the lesions associated with impacted tooth

Lesion	Age	Sex	Association with impacted tooth	Predominantly impacted tooth	Predominantly associated jaw	Common location
Dentigerous cyst	2nd and 3rd decade	M>F	65%	Third molars	Mandible	Posterior
Odontogenic Keratocyst	2nd and 5th decade	M>F	27%	Third molars	Mandible	Posterior
Calcifying Odontogenic Cyst	2nd and 3rd decade	M=F	10-32%	Canine	Mandible = Maxilla	Anterior
Central Mucoepidermoid carcinoma	4th and 5th decade	M<F	32-50%	Premolar and Molar	Mandible	Posterior
Unicystic ameloblastoma	2nd decade	M>F	50-80%	3rd molar	Mandible	Posterior
Calcifying epithelial odontogenic tumor	4th and 5th decade	M>F	53%	Molars	Mandible	Posterior
Adenomatoid odontogenic tumor	2nd decade	M<F	53%	Canine	Maxilla	Anterior
Squamous odontogenic tumor	3rd decade	M>F	Rare	Canine and 3rd molar	Mandible	Maxilla-Anterior Mandible-Posterior
Ameloblastic fibroma	2nd decade	M>F	75%	1st permanent molar Second primary molar	Mandible	Posterior
Ameloblastic fibro odontoma	1st and 2nd decade	M>F	83%	None	Mandible	Posterior
Odontoma	2nd decade	M=F	40-50%	None	Maxilla(Compound Odontoma) Mandible(Complex Odontoma)	Maxilla-Anterior Mandible-Posterior
Central Odontogenic fibroma	Wide age group	M<F	27%	Molar, Premolar, Incisor	Mandible	Maxilla-Anterior Mandible-Posterior

calcifying epithelial odontogenic tumors, ameloblastic fibro odontomas and odontomas contain radiopaque foci within the radiolucency.

These entities can be considered in the differential diagnosis whenever clinicians encounter a lesion in intimate association with impacted tooth which might

help in making more accurate diagnosis based on clinical and radiographical features as well as in forming proper treatment plan.



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Obstructive Sleep Apnea Syndrome - A Scoping Review

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ABSTRACT

Obstructive sleep apnea syndrome (OSAS) is possibly a life-threatening syndrome which is characterized by episodes of complete or partial upper airway obstruction and frequent decrease in blood oxygen saturation. Herein we present an article about the overview to OSAS, which materialized after reviewing related articles available on internet. It discusses general introduction, pathophysiology, risk factors, diagnosis, classification, management and consequences relating to OSAS. As airway is an integral part of orthodontics, oral appliances for management of OSAS are also discussed with one case presentation along with two designs of mandibular advancement devices (MAD). Different studies about oral appliances used in the management of OSAS along with their inference are presented in a tabulated form.

Keywords: Airway, apnea, hypopnea, mandibular advancement device, polysomnography

INTRODUCTION

How many a times have you heard your friend saying “You do not let me sleep because of snoring, I shall not sleep in the same room with you”, or your teacher tells you “Did you have proper sleep last night? You look sleepy” or you being nicknamed as sleepy-head in your group. You definitely might have seen your father/uncle doze off while watching TV or your friends having nap in the middle of an interesting lecture. Or, in the worst case you must have read the news headline reading as “reason behind the accident is driver fell asleep while driving”. Well, if you ask the reason for above mentioned cases, you will find the same answer that they were not aware of it or they cannot help the situation for feeling sleepy. The most likely reason is a condition called Obstructive Sleep Apnea/Apnoea Syndrome (OSAS).

OSAS was initially referred to as Pickwickian syndrome by Charles Dickens in 1837 and was clinically described by Guilleminault, Tilkian and Dement in 1976.¹ OSAS is a clinical disorder with the presence of cessation of breathing in spite of inspiratory effort during the sleep.² There are other sleep-related breathing disorders (SRBD) as well. However, OSAS comprises majority of SRBDs³ which has been discussed in this article.

Apneas can be of three different types: central, obstructive and mixed. In central apnea, cessation of both breathing and breathing movements are present. In

obstructive apnea, although there is persistent respiratory effort cessation of breathing occurs because of airway obstruction, where breathing movements typically become even more pronounced. Combination of these two conditions is termed as mixed sleep apnea.⁴

Clinical History and Examination

Clinician should obtain detailed medical history and perform clinical examination of the patient. Patient should preferably be accompanied by a person who is aware about the nocturnal behavior of the patient. These includes proper evaluation of nose, oropharynx and hypopharynx (NOH), height, weight and BMI evaluation. Assessment of oral airway patency is done using modified Mallampati score.⁵ Other predictors of OSAS are Friedman tongue/tonsil size, measured thyroid-mental distance (TMD) and hyoid-mental distance (HMD).^{6,7}

Self-assessment questionnaires are available to check if one requires medical consultation. Some of these questionnaires are as follows:

1. Epworth Sleepiness Scale (ESS)⁸
2. Berlin Questionnaire⁹
3. STOP BANG Questionnaire¹⁰

Clinical Findings^{2,3}

Nocturnal symptoms include loud snoring, witnessed apneas, gasping for breath during sleep, abnormal motor activity during sleep, nocturnal enuresis and insomnia.

Diurnal symptoms include unexplained excessive daytime sleepiness, sudden excessive drowsiness occurring at inappropriate times causing an irresistible urge to sleep (in the middle of conversation or during meal), restless sleep, trouble in concentrating, difficulties at work or study, gradual intellectual deterioration, performance deficit, deterioration of memory and judgement, mood swings, irritability, nasal obstruction, morning headaches, fatigue, anxiety, depression and sexual dysfunctions.

Cephalometric characteristics of OSAS patient include retruded mandible, retruded maxilla, posterior vertical height deficiency and backwardly placed tongue.^{11,12}

Diagnosis

Polysomnography (PSG) is the gold standard investigation to diagnose and classify any SRBD. Polysomnography can measure heart rate, respiratory rate, air passage through the nostrils, movements of the chest and abdomen, movement of the limbs, oxygen saturation, activity of the extraocular muscles and electroencephalography.²

Apnea is defined as the transient or complete cessation of respiration for at least ten seconds. Hypopnea is defined as an inspiration with a reduction of 50% or more of the tidal volume of the same patient during a normal quiet inspiration when he/she is asleep¹ or reduction in tidal volume accompanied by a 4% or greater fall in blood oxygen saturation lasting for more than ten seconds.² The number of episodes of apnea or hypopnea per hour during sleep is termed as apnea/hypopnea index (AHI). OSAS is diagnosed if episodes of apnea/hypopnea is above four score as shown in PSG.¹

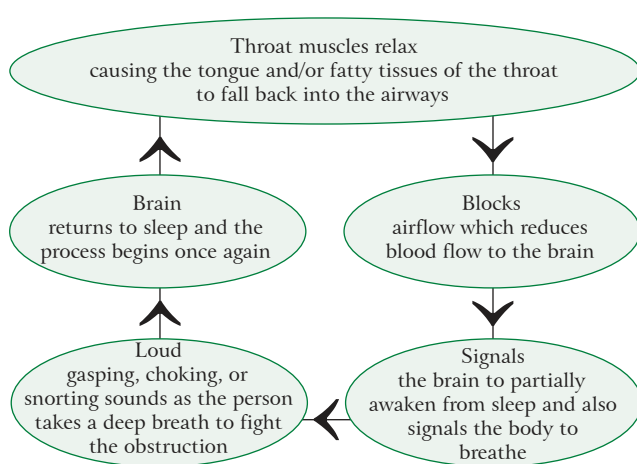


Figure 1a: Pathophysiology of OSAS

Classification

According to Messiha et al. OSAS can be classified as follows.^{1,4}

1. Mild OSAS: AHI 5–15 events/hour
2. Moderate OSAS: AHI 15–30 events/hour
3. Severe OSAS: AHI >30 events/hour

Prevalence

In USA, 2% female and 4% male suffer from sleep apnea.¹³ In Germany about two million people were assumed to be suffering from OSAS.³ One study has shown OSAS to affect 10% adults¹⁴ and another study shows that at least 75% of adult OSA-patients are not yet diagnosed.¹⁵ In a study conducted in North India, OSA was found to be prevalent in 9.3% individuals.¹⁶

Pathophysiology

Upper airway is composed of various muscles and soft tissue but lacks bony support, which is collapsible because of the lack of rigidity.¹⁷ Thus, it predisposes to OSAS. Pathophysiology behind the events of apnea and hypopnea repeating throughout the patient's sleep is shown in Figure 1a. Biochemical basis behind the pathophysiology is shown in Figure 1b.

Another hypothesis is the role of nocturnal rostral fluid shift. Higher prevalence of OSAS in fluid retaining disorders like heart failure suggests the role of fluid retention. Fluid retention occurs in intravascular and interstitial spaces of legs due to gravity at the day period which distributes rostrally during sleep. Some of these fluid accumulate in the neck, causing airway to narrow/close causing OSAS.¹⁸

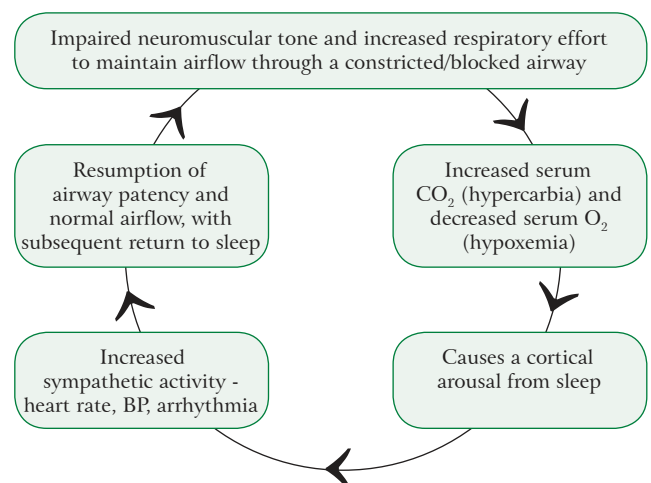


Figure 1b: Biochemical basis of OSAS

Risk Factors

Risk factors for OSAS include middle aged male, pregnant female, postmenopausal female, use of sedatives, smoking, alcohol, obesity, overweight, hypertension, chin throat angle greater than 110°, increased neck circumference,¹ retrognathic mandible, large tongue, enlarged tonsils and narrow upper/middle/lower pharyngeal space. Hypothyroidism, hyperlipidemia,¹⁹ upper airway sensory neuropathy and impaired sensory processing¹⁷ are also consistent risk factors in developing OSAS.

Management

Management of OSAS can be divided into following headings:

- a) Treatment of the cause
- b) Lifestyle modification
- c) Respiratory support
- d) Intra-oral appliance
- e) Surgery

a) Treatment of the cause

Treatment should focus on elimination of the cause whenever identifiable.

b) Lifestyle modification

1. Weight Reduction: Weight reduction can have beneficial effect on management of OSAS patients as high BMI is associated with OSAS.⁴
2. Positional Therapy: Supine position is associated with greater frequency of apneas as it affects the position of tongue and soft palate due to gravity. Postural therapy prevents the patient from sleeping in supine position. Postural therapy can be obtained with a) two or three tennis ball sewed at back of patient's sleeping dress, b) supine alarm devices, or c) positional pillows.²⁰
3. Exercise: Recent meta-analysis suggested proper exercise for 3-6 months reduces the AHI by ~32% in adults with OSA.²¹
4. CNS depressants are considered to be predisposing factors for OSAS. Avoiding such factors like alcohol, smoking, sedatives, etc. plays important role in the management of OSAS.²
5. Musical/Singing exercise: Singing or playing musical instruments (such as flute, harmonica, pianaika) will improve muscle tone making the palatal and pharyngeal musculature less prone to collapse.²

c) Respiratory support

Positive airway pressure (PAP) provide pneumatic support by increasing the upper airway pressure above 'critical value' (below which airway collapses). The air-pressure is applied to the patient through nasal or oronasal mask. Continuous PAP (CPAP), autotitrating CPAP and bilevel PAP are the newer modalities of PAP therapy. These are considered to be the gold standard in the treatment of OSA.²²

d) Intra-oral appliances

Oral appliances are preferred in patient with mild to moderate OSAS. In severe OSAS patient, oral appliances are only preferred in cases who are intolerant to CPAP. The most commonly used oral appliances are mandibular advancement devices (MAD). Other oral appliances are soft-palate lifters and tongue-retaining devices.²³ MAD advances lower jaw in relation to upper jaw which will cause pharyngeal fat pad to be relocated laterally and tongue base will move forward.²² This will consequently widen the pharyngeal airway. Functional appliances may be considered in certain cases who have craniofacial anomalies increasing the risk of development of OSAS. These appliances hold the lower jaw forward which then enlarges the airway improving the respiratory function.^{24,25}

e) Surgery

Surgeries such as uvulo-palatopharyngoplasty (UPPP), maxillo-mandibular advancement osteotomy, advancement and repositioning of hyoid bone, surgically assisted rapid maxillary expansions, genioglossus advancement, hypoglossal nerve stimulation augment the increment of dimensions of pharyngeal airway which consequently manage the OSAS.^{2,22}

Case Report

A 30-year-old male presented with the chief complaint of loud snoring and excessive day time sleepiness. PSG test showed AHI of 42 events/hour. As he was diagnosed with severe OSAS, auto-CPAP along with lifestyle modifications were advised. Patient could not tolerate wearing CPAP machine (average wear time for 15 consecutive nights was around 2 hours). Hence, patient was referred for intra-oral appliance.

Patient's lateral cephalograms on centric occlusion and edge-to-edge bite revealed increment in lower pharyngeal



Figure 2: Lateral cephalogram showing increased pharyngeal dimensions when mandible is advanced



Figure 3: MAD made from vacuum forming sheets



Figure 4: MAD with bilateral jack-screws (frontal and lateral views)

airway space (Figure 2). MAD was fabricated with a vacuum forming sheets. Lower portion of the appliance was attached to upper portion on edge-to-edge bite (Figure 3). This allowed the patient's lower arch to lie forward while the patient sleep, consequently improving OSAS. After 2 weeks of appliance use, PSG test with the appliance showed AHI of 14 events/hour. Another MAD was fabricated with bilateral expansion screws to further advance the mandible (Figure 4). Contraindications and side effects of MAD should be evaluated before prescribing MAD.²⁶ In the absence of any contraindications, lower arch can be advanced 50-70% of the maximum protrusive limit of the patient.²⁷

DISCUSSION

The Sleep Heart Health Study reported that prevalence of hypertension increases as sleep disordered breathing severity increase.²⁸

Cardio-vascular and pulmonary complications caused by OSAS adversely affects the quality of life of patient and his/her near ones. A study found that sleep apnea can raise the risk of stroke by two to three times.²⁹

Hypoxaemia leads to inadequate tissue oxygenation and if prolonged causes hypertension and other cardiac problems. Cardio vascular complications are mainly related to

repetitive hypoxia, sympathetic nervous system activation and systemic inflammation caused by OSAS.¹⁸

If untreated, OSAS can cause health consequences like hypertension, stroke, heart failure, coronary artery disease, cardiac rhythm problems, Type 2 diabetes, gastroesophageal reflux disease, nocturnal angina, hypothyroidism, or neurocognitive difficulties. Exacerbation and difficulty in controlling of existing cardiovascular disease is another complication of OSAS. Arrhythmias, angina and myocardial ischaemia may occur.

A study has shown that OSA patients have more accidents than age- and sex-matched control subjects, especially when severe OSA is present.²⁸ Childhood growth interruption, pregnancy-induced hypertension, fetal growth retardation, and disruption of the patient's bed-partner's sleep quality are its other consequences.²⁸ Untreated OSA are 10 times more likely to die from a motor vehicle accident compared with the general population because of impaired driving performance.³⁰⁻³²

Figure 5 demonstrates the flow-chart for treatment approach for patient suffering from OSAS. Studies have shown majority of OSAS patients prefer oral appliances to CPAP, and compliance being better for oral appliances. Oral appliances have a definite role in the management

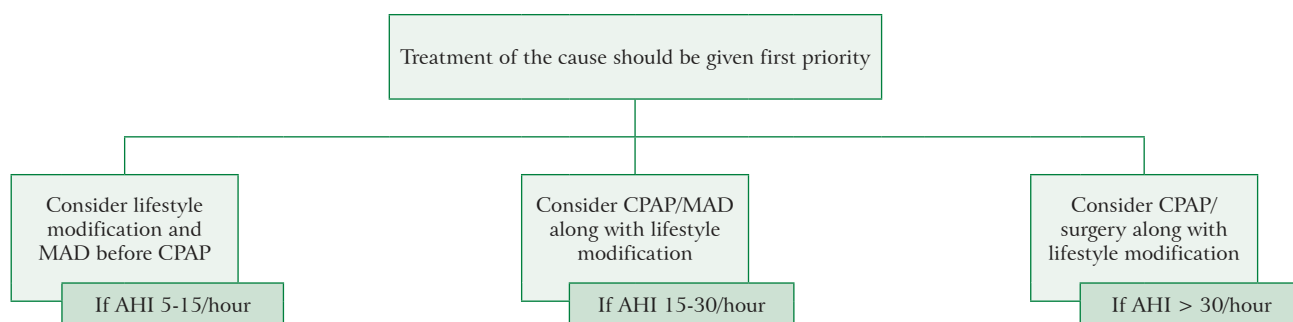


Figure 5: Flow-chart for treatment of OSAS

Table 1: Studies related to intraoral appliances used for the management of OSAS

Study	Inference
Battagel (1996) ²	Different designs of MAD generally resemble a functional appliance: full coverage upper part with lower part constructed in a protrusive working bite. MAD must have good retention, sufficient protrusion and as little vertical opening as possible.
Gale et al (2000) ³⁵	There was significant increase in minimal pharyngeal cross-sectional area following insertion of mandibular advancement devices. All patient being treated with mandibular advancement devices should be investigated by PSG test before and after advancement.
Petit et al. (2002) ²⁶	MAD are contraindicated if there are insufficient number of teeth to support the device, mobile teeth, periodontal problems, active temporomandibular joint disorder or limited maximum protrusive distance (<6mm). Multidisciplinary approach is needed for an attainment of optimal treatment results from MAD.
Andrew et al. (2003) ³⁶	Intraoral mandibular advancement appliances were associated with significant improvements in AHI and upper airway closing pressure. Oral appliances are emerging as an alternative to CPAP for treatment of OSAS.
Ferguson et al. (2006) ³⁷	Compared to CPAP, intraoral appliances though less efficacious in reducing AHI, appear to be used more and were preferred over CPAP. Minor adverse effects were expected with intraoral appliances whereas major adverse effects were uncommon.
Hoffstein (2007) ³³	Oral appliances successfully “cure” mild/moderate OSA in 40–50% of patients, and significantly improve it in additional 10–20%. Individual responses to oral appliance therapy varies, and therefore it is necessary to approach each patient on an individual basis.
Lazard et al. (2009) ²³	Tongue-retaining device performance tended to be similar to that of the mandibular advancement device. Nasal obstruction should be taken into considerations as its contraindication.
Spicuzza et al. (2015) ²²	Continuous positive airway pressure (CPAP) is still recognized as the gold standard treatment. Custom made MAD are effective in mild to moderate OSA and provide a viable alternative for patients intolerant to CPAP therapy.
Mageet et al. (2015) ³⁴	Mandibular Repositioning Appliances improves the inspiratory and expiratory total air after wearing the appliance. Intraoral appliances may be useful alternative or adjunct to CPAP device in selected patients with snoring and mild to moderate OSA.
Agarwal et al. (2016) ³⁸	Orthodontists are well suited for treatment of OSAS due to their expertise in growth and development of oro-facial/dento-facial structures as well as orthopedic, orthodontic and surgical correction of the jaws and supporting tissues.
Basyuni et al. (2018) ³⁹	In mild to moderate OSAS, use of MAD is beneficial and cost-effective. In severe OSAS, MAD should be considered for only those who decline or cannot tolerate CPAP.
Sato et al. (2019) ⁴⁰	Under-graduate and post-graduate education on sleep medicine should be enhanced in order to enable the dentists to participate actively in management of OSAS.
Venema et al. (2020) ⁴¹	CPAP and MAD demonstrate stable effects after a 10-year follow-up period for management of OAS.
Tong et al. (2020) ⁴²	A novel oral appliance with an in-built oral airway reduces OSA severity, including in those with high nasal resistance.

of snoring and sleep apnea though not as effective as CPAP.^{33,34} Table I enlists different studies about mandibular advancement devices (MAD) along with their respective inference.

It is well known that sleep may regain its restorative function and daytime performance may improve after treatment. Risk of cardiovascular diseases and accidents can be reduced if OSAS is diagnosed in time and treated successfully.

PSG of an OSAS patient can show the cardiac and cerebral functional activity to be similar to that of an athlete during a race. So, the heart and mind might be running 100 meter race while the patient is sleeping. And this will occur every

night until treatment is done. This happens while the patient is sleeping. So, wake up and ask yourself “Are you really sleeping while you think you are sleeping?”

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Management of Complicated Crown-root Fracture by Reattachment- A Case Report

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ABSTRACT

Traumatic injuries of teeth involve varying degrees of damage to the supporting soft tissues or the tooth itself. Complicated crown root fractures in permanent teeth extending sub-gingivally present both endodontic and restorative problems. This paper describes treatment of oblique crown root fracture of maxillary lateral incisor with re-attachment procedure using metal post and glass ionomer cement. Re-attachment of coronal tooth fragment offers a relatively simple and low-cost technique protocol.

Keywords: Biologic width, Crown-root fracture, Re-attachment.

INTRODUCTION

Crown-root fracture is defined as a fracture involving enamel, dentin and cementum and is classified as complicated or uncomplicated, according to the pulpal involvement and comprises 5% of the traumatic injuries affecting the permanent dentition.¹ The teeth most susceptible to fractures caused by trauma are maxillary incisors. Traumatized incisors usually show fracture line proceeding in an oblique direction extending from labial to lingual surface. These fractures subsequently lead to esthetic, functional and phonetic problems causing a severe impact on the social and psychological well-being of the patient.² One of the options for managing coronal tooth fractures is the reattachment of the crown fragment when it is available. The reattachment of the fractured tooth fragment has advantages including the preservation of the remaining tooth structure, reproducibility of the tooth contour and natural colors, and the most well

preserved incisal translucency.^{1,3,4} This article reports a case of complicated crown-root fracture of maxillary lateral incisor treated by reattachment of the fractured coronal segment.

CASE REPORT

A 25 years old male patient reported to the clinic with the chief complaint of broken upper right front tooth due to an accidental blow to the face two days ago. His medical and dental history was non-contributory. Clinical examination revealed fracture in the cervical third of the maxillary right lateral incisor, exposing the pulp (Figure 1). The fracture line was oblique extending in apical direction from the labial to palatal surface. The fractured fragment was loosely attached to the root. The margin on the palatal surface was located 2 mm subgingivally. Upon probing, it was found that the biological width was being encroached on the palatal aspect. It was determined that the biological



Figure 1: Fractured crown of maxillary left central incisor in the cervical third



Figure 2: Retrieved fractured fragment



Figure 3: Fracture fragment removal and gingivectomy performed to expose the margins



Figure 4: Post endodontic treatment radiograph



Figure 5: Intraoral periapical radiograph showing the selection of post



Figure 6: Groove made in fractured fragment



Figure 7: Post cementation in the involved tooth



Figure 8: Groove made in fractured fragment

width was only minimally invaded and crown lengthening alone in the palatal aspect would be sufficient for access and isolation during the reattachment procedure. Periapical radiograph revealed an intact periodontal ligament space, without any horizontal root fracture.

Of the various treatment options explained to the patient, he preferred to retain the fractured fragment. The fractured tooth fragment (Figure 2) was removed and stored in physiologic saline to be used at a later stage. Isolation was achieved using cheek retractor, cotton rolls and saliva ejector. Crown lengthening was done using electro cautery and 2 mm of palatal tissue was excised (Figure 3). Single visit root canal treatment was done (Figure 4). Post space was prepared and a prefabricated metal post was tried in the canal (Figure 5). A groove was made on the fragment to provide space for the post to fit (Figure 6). The metal post was luted using type IX glass ionomer cement (Figure 7). The coronal fragment was filled with the same cement and it was repositioned correctly and was held in position till the initial set of glass ionomer cement. Excess cement on the fracture site was removed. After the tooth fragment was attached, 1 mm depth chamfer was placed in the

fracture line on the buccal surface with a diamond round bur. After the superficial etching and bonding, a layer of resin composite was applied to the chamfer surface and light cured for 40 seconds. Later, the repaired surface was finished, polished and the esthetic result was obtained (Figure 8). The occlusion was carefully checked and adjusted. Instructions were given as to avoid heavy forces on the tooth and to follow regular oral hygiene practices. The patient returned after 1 week for follow-up, and restorative treatments remained clinically and aesthetically acceptable, long-term follow-up is awaited.

DISCUSSION

Traumatic injuries involving the tooth fracture can be treated by reattachment to provide what is considered to be the most conservative form of restoration.⁵ Survival rates for such restoration have shown to be good with failure often resulting from subsequent trauma. Factors influencing the extent and feasibility of such repair include the site of fracture, size of fractured remnants, periodontal status, pulpal involvement, maturity of root formation, biological width invasion, occlusion, time and resources of the patient.^{4,6} If the fracture involves two-third or more

of the crown a post reattachment is more commonly used. The use of posts increases retention and distributes stress along the root. The advantages of using the original tooth fragment over other materials include better color match, morphology, translucency, physiochemical characteristics, patient acceptance and economical status. Other treatment options possess limitations like multiple visits, stabilization and are less conservative in nature. The psychological trauma caused to the individual due to loss of aesthetics can be managed by this procedure successfully.²

The treatment of complicated crown-root fractures in many cases is compromised by fracture margin that are well below the gingival margin or bone. Presently, numbers of different approaches are available from which to choose when treating fractured teeth, depending on the location of the fracture. If the fracture line is supragingival, the procedure for reattachment will be straightforward. However, when the fracture site is subgingival or intraosseous, orthodontic extrusion with a post-retained crown may be necessary. Alternatively, surgical techniques such as electrosurgery, elevation of a tissue flap, clinical crown-lengthening surgery with removal of alveolar bone and removal of gingival overgrowth for access to the fractured site all are viable methods.^{7,8}

If the extra-oral time of the fractured fragment increases, dehydration of the fragment can occur. Therefore, in order to prevent this case, it is recommended that the fragment be kept in a medium such as physiologic saline. According to Toshihiro and Rintaro, if the fractured fragment that was reattached is dehydrated, the fragment recovers its original color and translucency without any negative changes. It is generally expected that fragment dehydration and

discoloration will not have a significant impact on the final reattachment outcome.^{3,9}

The clinical importance of an intact biological width is in the maintenance of periodontal health. Once the biologic width is compromised due to fracture, surgical correction must be performed to reconstitute the area. In this case, fracture line invaded biologic width on the palatal aspect but this was supraosseous. Hence, crown lengthening by electro cautery was done to achieve isolation and better marginal finish.¹⁰

Type IX glass ionomer cement was chosen for reattaching fractured fragment. The biocompatibility of glass ionomer cement is attributed to their excellent biological response when applied to cavities with invasion of the biologic width, which decreases bacterial penetration. It has the added advantages of having an antibacterial effect, chemical adhesion to the tooth structure, adequate sealing ability and promoting epithelial and connective tissue attachment.¹¹

CONCLUSION

Reattachment technique is the most conservative and biological method for restoring a fractured anterior tooth. Reattaching a tooth fragment may be successfully used to restore fractured teeth with adequate strength. This procedure helps us to preserve maximal natural tooth structure. Patient cooperation and understanding of the limitations of the treatment is of utmost importance for good prognosis. Long-term follow up is necessary in order to predict the durability of the tooth-adhesive fragment complex.



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An Eye for a Lost Eye: A Case of Customized Ocular Prosthesis

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ABSTRACT

The loss of facial structure especially the eye affects the physical, social and psychological well-being of a person. The treatment modalities include implants-supported or acrylic resin prosthesis. A 30-year old female with a history of trauma 15 years back reported with ocular defect of right eye and needed replacement of the same for esthetic concerns. The primary and final impressions of the socket were made with light body impression material using stock and custom trays respectively. Scleral wax pattern was made on the cast obtained. Iris was matched from a stock eye and attached to the scleral wax pattern. The final prosthesis was processed with acrylic resin of matching color after the try-in. A well-crafted customized ocular prosthesis along with exact fit and esthetics can encompass the cosmetic requirements to a great extent and can help to mitigate social and psychological trauma to the patient..

Keywords: Customized; impression; ocular prosthesis; rehabilitation

INTRODUCTION

Eye is an important organ not only for vision but it also influences the facial expression. Loss of the eye affects the physical, emotional and psychological well-being of a person.¹ The causes may be either trauma, congenital defects or tumors. The ocular defects can range from en bloc removal of entire orbit (exenteration) to removal of only eyeball (enucleation).² Surgical procedures for ocular defects have been classified by Peyman, Saunders and Goldberg as: enucleation, evisceration and exenteration.³ The rehabilitation of enucleated eyes can be relatively easy if an impression of socket is made properly whereas in exenterated cases prosthesis cannot be retained like the former, so other retentive means such as spectacle, magnetic buttons, adhesive, pin and sockets etc. are needed.¹

Treatment options for ocular defect include implants or acrylic resin prosthesis. Implants replace the volume lost by enucleated eye and promote the motility of the ocular prosthesis but fabricating implant prosthesis may require high technical skills because of thin bone in the region and difficulty in its placement.^{4,5}

The ocular prosthesis can be customized according to the defect for that particular patient. An accurate impression of the defect is the key to an accurately fitting and retentive prosthesis. A stock eye prosthesis commonly used as a

substitute may not perfectly adapt to the tissue bed of the eye and may lead to significant discomfort. In such cases, more than 90% of patients reported mucoid discharge due to irritation and bacterial growth.⁶

This case report describes fabrication of an ocular prosthesis with a simplified approach with minimally available materials and techniques.

CASE REPORT

A 30 year old female was referred to the Department of Prosthodontics, Kantipur Dental College and Hospital for rehabilitation of an ocular defect. The patient's chief complaint was unesthetic appearance of her right artificial eye in terms of color and size as compared to that of her natural eye. The patient's past medical history revealed that the right eye globe was severely traumatized approximately 15 years back, followed by surgery. She was not aware of treatment modalities and was wearing black spectacle to hide her defect much to her social discomfort. About 7 years back, she received 2 sets of prosthesis at her native place but was highly unsatisfied with both and reported to the hospital for fabrication of better ocular prosthesis.

On examination, the socket was found to be free of any active inflammation but there was presence of ptosis and the floor of the eye socket was very shallow. Patient had no relevant medical history.



Figure 1A, B, C: Primary impression of eye socket

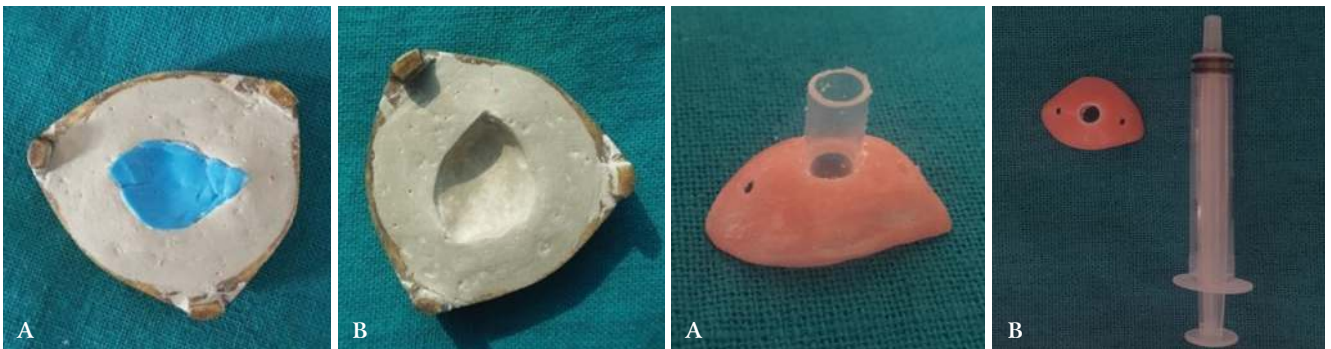


Figure 2A, B: Obtaining the primary cast

Figure 3A, B: Custom tray with hollow tube



Figure 4A, B, C: Obtaining final impression

It was decided that a custom-made ocular prosthesis would be best to meet the needs of the patient. The treatment plan and technique involved were explained to the patient.

Procedure: Primary Impression of Eye Socket: Patient was asked to gaze straight at a fixed point at about 6 feet away. An impression was made with light-bodied silicone material injected from a syringe. The material was slowly filled into the socket while an assistant helped to retract the eyelids. The patient was instructed to look right, left, up and down for functional impression of the socket. The impression was gently removed after material had set (Figure 1 A,B,C).

Primary Cast: Flasking of the impression was done in one

half of the flask to obtain primary cast, rather than making a wax boxing. (Figure 2- A,B).

Custom Tray Fabrication: Using the primary cast, a custom tray with self-cure acrylic resin was fabricated with a hollow tube handle attached at the center of the custom tray for injecting the impression material. Tray adhesive was applied to the tray. (Figure 3- A,B).

Final Impression: Custom tray was carefully seated in patient's eye socket, final impression of the socket was made with light body impression material by holding the hollow tube handle with left hand and injecting the impression material through the tube with a syringe. Once set, the tray was gently removed from the eye socket. (Figure 4-A,B,C).

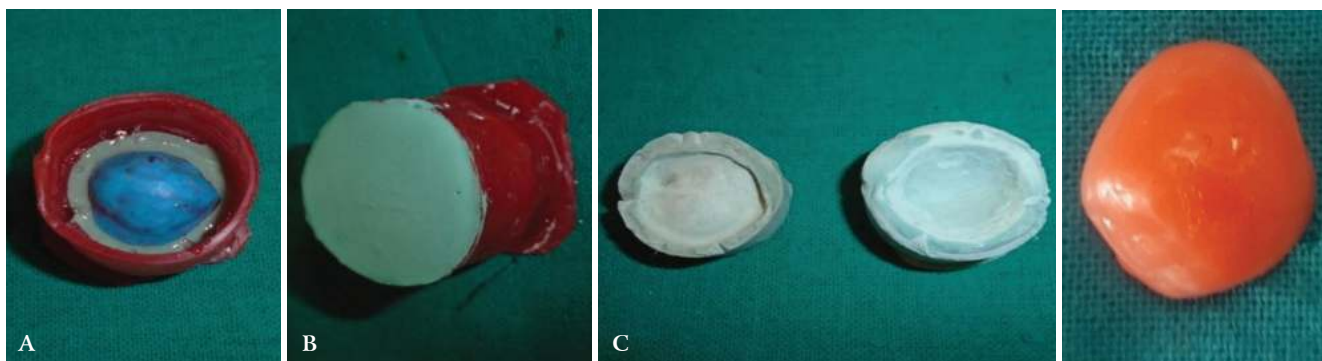


Figure 5A, B, C: Fabrication of split cast mold

Figure 6: Scleral wax pattern

Fabrication of Split Cast Mold: A cylindrical box with a base was made with modelling wax. Half of the box was filled with mixed dental stone and inner surface of final impression was gently placed on it (Figure 5 A). After setting of the stone, notches were made and separating medium was applied, and remaining half of the wax box was poured with dental stone (Figure 5 B). Later, two halves of the cast were separated and the final impression was retrieved to obtain a mold space for fabrication of scleral wax pattern (Figure 5 C).

Scleral Wax Pattern Fabrication: The mold space was filled with molten modelling wax and the cast reassembled. When cooled, the two halves of the cast mold were separated and the wax pattern was retrieved (Figure 6).

Scleral Wax Pattern Try In: The contours of the wax pattern eye ball were developed by addition and subtraction of modelling wax in small increments so as to simulate contours and position of the eyeball of the natural eye. The scleral wax pattern was evaluated with patient's eyes open (Figure 7 A), closed (Figure 7 B) and also compared with the natural eye from the profile view (Figure 7 C, D).

Placement of Iris: Using the natural eye as guide, the shade and size of the iris was selected and obtained by

trimming a commercially available stock eye (Figure 8 A,B). The position of iris was determined by using a tissue tape where the inter-canthal distance, distance from pupil of healthy eye to midline of nose was marked (Figure 9 A). The probable position of iris was obtained over the wax pattern and was further confirmed with grid lines (Figure 9 B).

Final Scleral Wax Pattern With Iris: Scleral wax pattern was finished to obtain a smooth surface free from dust and debris (Figure 10 A,B).

Processing: The final scleral wax pattern with iris was flaked and de-waxed. In between, the prosthetic iris part was secured with the help of 4 small self-cure studs (Figure 11-14)

Blood vessels were simulated using the red threads from the self-cure acrylic resin which was placed with a thin layer of clear acrylic mix. Tooth color acrylic resin polymer and monomer were mixed in the ratio 3:1 and packed, and polymerized by short curing cycle and eventually deflaked carefully.

Final Insertion of Prosthesis: After curing, the prosthesis was trimmed with acrylic trimming burs and polished with buff and pumice. Intaglio surface was examined for

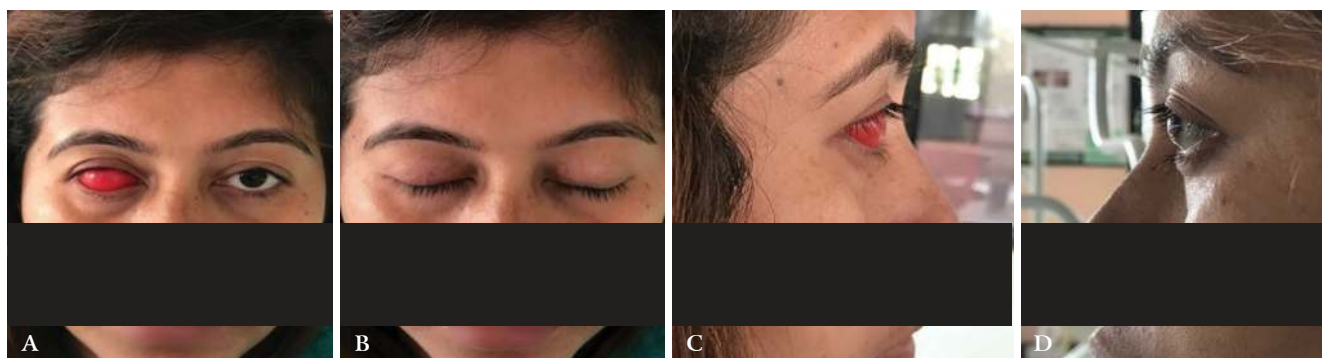


Figure 7: Scleral wax pattern try-in. A,B: Front view, eyes open and closed. C,D: Profile view



Figure 8A, B: Selection of iris



Figure 9: Iris positioning. A, Tissue tape for measuring inter-canthal distance. B, Trial of scleral wax pattern with iris using grid lines



Figure 10A, B: Final scleral wax pattern with iris (cameo and intaglio surface)



Figure 11: Flasking of the wax pattern



Figure 12: Four self-cure stud attached near iris part for its secured position during subsequent procedure

any sharp edges. Finally the prosthesis was inserted and evaluated with movements of eyes in different directions. (Figure 15- A,B,C,D).

Instructions to the patient: Instructions about the proper use, insertion and removal of the prosthesis were given. The patient was advised that the prosthesis be removed once a day and properly cleaned with warm water. Cleaning of the prosthesis with soap solution was recommended every 1 or 2 weeks.⁹



Figure 13: Counter flasking



Figure 14: Dewaxed two parts flask



Figure 15 A,B,C,D: Final Insertion of ocular prosthesis



Figure 16 A,B,C,D: Before and after treatment

DISCUSSION

Accurate impression of the contours of the defect site is the most crucial factor for fabrication of accurately fitting custom made prosthesis. Various impression techniques have been discussed by many authors.^{4,9,10}

Allen and Webster (1969) recommended a perforated stock ocular tray and alginate impression material.⁴ Cain (1982) recommended Allen and Webster's technique and called it the modified impression technique. He suggested using an impression tray with a hollow stem in the shape

of the ocular prosthesis.⁹ Doshi and Aruna (2005) directly injected the impression material into the socket. Since no custom tray was fabricated; there was no proper support for the impression obtained.¹⁰

The technique described here utilizes light body addition silicone that records greater detail of the socket surface and which can be easily removed from undercuts without distortion. Thus, recorded undercuts will help for better retention of the prosthesis. The technique in this case report utilizes iris obtained from the stock eye matched as per the size and color of contralateral eye.

Stock conformers often require time consuming adjustments. The presence of the custom made conformer (tray) and its close adaptation to the tissue in the socket simulates the eye muscles to function with normal physiological limits and thus preventing disuse atrophy.

The prosthesis met the criteria for its cosmetic outcome and patient satisfaction. It was fabricated with easy steps that could be performed in any dental clinic.

But the limitation found was that the movement of the prosthetic eye was restricted and the prosthesis did not shine like the contralateral eye.

CONCLUSION

Custom made prosthetic eye with exact fit can encompass the cosmetic requirements to a great extent and even mitigate social and psychological trauma to the patient who have lost their eye permanently.



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Evolution of Dental Colleges in Nepal

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Dentistry is an independent profession of health care. It takes a long way to produce a dentist. Dentists are trained in dental colleges, where they need to fulfill educational and clinical requirements. The world's first dental college was Baltimore College of Dental Surgery, which was established in Maryland, USA in 1840. In the subcontinent, the first dental college was founded in Calcutta, India in the year 1920. The dental education program is relatively new in Nepal. It has taken more than two decades to introduce formal dental education after the commencement of MBBS program. Tribhuvan University Institute of Medicine launched MBBS program in 1978, while the BDS course was started in the year 1999; though there had been earlier efforts.

The pioneer Nepali dentists used to be trained in India owing to their own interest or were selected by the government or the royal palace. Since mid 1960's, Nepali students studied dentistry through the Colombo Plan as well as cultural scholarships from the embassies of India, Pakistan, Bangladesh etc. After late 1980's, many Nepali students self-financed their dental education in India, Bangladesh, Russia, Philippines, etc. Until recently, many educational consultancies attracted Nepali students to foreign dental colleges. Owing to which, more than one thousand graduates are believed to have completed dentistry from private colleges of foreign countries.

After the advent of democracy in 1990, there was a liberalization policy in medical education, as a result many private medical colleges were established in Nepal. Subsequently, many medical institutions attempted to initiate BDS program. Institute of Medicine, Nepal Medical College and Nepalgunj Medical College had held several separate meetings to establish dental college; which was also a primary agenda of Nepal Dental Association. However, such ventures did not materialize during that time.

In 1993, India-based DY Patil Institute commenced BDS and MBBS classes at Chisapani in the mid-western

region of Nepal. The institute had enrolled two batches of dental and medical students in succeeding academic years. However, the programs had to be abandoned due to the failure to obtain affiliation from any university. Many stranded dental students were adjusted at dental colleges in India.

Since 1993-94, many Nepali students joined Manipal Academy of Higher Education (now Manipal University) to study dentistry. For the admission process, the university had recruited a representative in Kathmandu; subsequently, there were groups of Nepali students in each batch till 2001-02. There are more than 260 Nepali dental graduates from Manipal alone.

During 1990's, the country's health sector was facing acute shortage of dental health workforce, on the other hand Nepali students were compelled to go abroad for studying dentistry. Consequently, many initiatives and efforts were under way from both institutional and private level to establish dental college in Nepal. In the year 1999, government authorities granted permission to start dental college to public as well as private institutions. BP Koirala Institute of Health Sciences, Dharan and People's Dental College, Kathmandu started BDS program. During 2004-05 the Ministry of Education issued 'Letter of Intent' to many health institutions to establish medical/dental college. The proposed dental colleges were Amar Adarsh Dental College, Samaj Dental College, Kantipur Dental College, KIST Medical & Dental College, Puspa Lal Medical College, etc; however many were unsuccessful to launch the BDS program.

In 1996-97, People's Dental College was incepted as the first dental college of Nepal, however it was recognized by Nepal Medical Council and granted affiliation by Tribhuvan University only in 1999. The college was established by Late Prof Tirtha Ratna Bajracharya, an educationist and pioneer faculty of the commerce (management) stream. Initially the dental college was installed at People's Campus, Pakanajol, which was later shifted to a rented building in

Nayabazar, Kathmandu. The college had a beginning with just 1-2 postgraduate faculty members and few dental chairs. The formal classes commenced in November 1999. The college later constructed its own building at Nayabazar in 2004 and first batch of students graduated in 2005. In 2010, it instituted the MDS program. So far the college has produced more than 800 BDS graduates in the country. Currently the institute is proposing for a medical program.

BP Koirala Institute of Health Sciences (BPKIHS), a deemed university, established 'College of Dental Surgery' as the first government dental college in Nepal. The BDS program began at old facilities of Ghopa Camp in August 1999; and was later shifted to new building on February 7, 2004. The college initially was aided by the Government of India through the technical support of All India Institute of Medical Sciences (AIIMS), Delhi. During the formative years, visiting faculties from India had to be recruited due to unavailability of qualified Nepali faculties. The first batch of students graduated in 2005 and the MDS program began in 2011.

Universal College of Medical Sciences, Bhairahawa started BDS program at its Dental Wing in November 2001. Subsequently, 'College of Dental Surgery' was established in 2003. The institution was established by a Kerala-based Indian management called Universal Empire, so there were many Indian students in early batches. The first batch of students graduated in 2006. The college management was taken over by the Nepali management in 2009. The college started MDS program in 2011 and the dental college shifted to a new building in 2013.

In 2006, MB Kedia Dental Institute was established in Birgunj; which was envisioned by Late industrialist Shankar Kedia. The college was promoted by a group of local businessmen and was started in a rented mini-market building. The college was shifted to its own building in 2012-13. First batch of students passed out in 2012.

In 2007, Kantipur Dental College was established at Basundhara, Kathmandu as the first dental college of Kathmandu University (KU). The college was initiated by Dr Buddhi Man Shrestha, who had earlier started 'Kantipur School of Dentistry' to produce auxiliary dental manpower in 1997. At the outset, the college was denied affiliation by Tribhuvan University, later Kathmandu University granted affiliation to the college as it could

gain the trust of formal Vice Chancellor Dr Suresh Raj Sharma and formal Dean Dr Narendra Rana. The BDS program was commenced in December 16, 2007 at its own property. The first batch of students graduated in 2013 and MDS program was started in 2014.

In the year 2011, six new BDS programs were permitted; Tribhuvan University granted permission to two and Kathmandu University granted permission to four medical colleges to start BDS programs. By this time, the Nepal Medical Council had made an undeclared ruling to allow only medical colleges to run the dental program. Then after, there was no new solitary dental college in Nepal. Among the TU affiliated colleges; KIST Medical College launched BDS program in Lalitpur and Chitwan Medical College established 'School of Dental Sciences' to commence BDS program in Bharatpur Municipality, Chitwan in 2011.

Kathmandu University School of Medical Sciences commenced constituent dental program in 2011 at its Dental Department in Dhulikhel Hospital. The university built the dental college hospital building in 2013 and started MDS program in 2017. In the same year, KU granted BDS program to Nepal Medical College, which promoted a separate company named 'College of Dental Sciences & Hospital-NMC'. Additionally, KU granted affiliation to two dental programs outside Kathmandu valley; namely Nobel Medical College, Biratnagar and College of Medical Sciences, Bharatpur. College of Medical Sciences is run by an India-based company 'International Society for Medical Education Pvt Ltd'.

In August 2012, Kathmandu Medical College Ltd. introduced BDS program affiliated to KU at its Duwakot, Bhaktapur campus. Similarly, Gandaki Medical College, Pokhara also appended BDS program affiliated to TU in Lekhnath, Kaski in 2016. The most recent BDS course in Nepal is in the Tribhuvan University-Institute of Medicine at its Maharajgunj Campus, with the first batch admitted in January 2019. It took more than four decades for the nation's premier health institution to institute its constituent BDS program after the MBBS program was commenced.

Collectively, there are fourteen institutions offering Bachelor of Dental Surgery (BDS) program in Nepal. Among them, three are solitary dental colleges and eleven are dental programs attached to the medical colleges. Likewise, three are constituent programs of the universities

and eleven are affiliated programs run at the private colleges.

The number of Nepali students enrolling in foreign universities dropped down dramatically after 2006-07 because of the availability of dental colleges in the country. In 2008, Nepal Medical Council (NMC) made a mandatory rule to obtain eligibility certificate for Nepali students who desire to pursue education in foreign universities. Later in 2017, the Council added another rule requiring the students to qualify any medical entrance exam in the country prior to studying medicine/dentistry abroad. These rules are believed to discourage the students from going abroad.

Dental colleges started producing graduates in the year 2005. The proportion of graduates produced in Nepal has risen tremendously in recent years. The percentage of dental graduates produced in Nepal was 19% in 2008; whereas this figure has increased to 59% in 2017. Similarly, the number of dentists has also increased exponentially in recent decades, which owes to the establishment of dental colleges in Nepal. The total number of Nepali dentists was about 200 in the year 2000, while the number is 3200 in 2019.

Many dental colleges in Nepal especially the ones situated outside Kathmandu valley struggle for their survival. Dental colleges are still compelled to recruit certain faculties from India. On many academic sessions, the medical council has reduced the seats or debarred the intake of students owing to the insufficiency in faculty position and deficiency of

required infra structure. On the other hand, many dental colleges face the problems of low enrollment of BDS seats. In future, few dental colleges could be on a verge to close down.

In a recent development to organize the medical education sector; 'Medical Education Commission' was constituted in November 10, 2017. Subsequently, Nepal Government promulgated 'Medical Education Act-2075', which was passed by the parliament on February 22, 2019. As per the demands of the stakeholders, the government has committed to set up government medical institutions in all seven provinces of the country. The government has also agreed for not allowing the private institutions to start any MBBS, BDS and Nursing program within the Kathmandu valley for the following 10 years. As a result, provincial health institutes may come up with the dental program to fulfill the dental health workforce demand in the rural areas. In near future, Nepalese Army Institute of Health Sciences has the plan to establish the dental college.

There has been a quantum leap in dental education in the country during the last two decades. Indeed there have been both quantitative and qualitative developments in dental education and oral health among the Nepali population. The dentist-population ratio has dropped down remarkably in recent years in terms of statistics; however the issues on employment of new graduates, low enrollment in dental colleges, and dental health service to all sections and locations of the people remain the continuing challenges in dental health sector of Nepal.

Institutions conducting BDS program

SN	Name of the Institution	Place	Affiliation	Estd.	Status
1	People's Dental College	Kathmandu	TU	1999	Private, affiliated college
2	BP Koirala Institute of Health Sciences	Dharan	BPKIHS	1999	Deemed university
3	Universal College of Medical Sciences	Bhairahawa	TU	2001	Private, affiliated program
4	MB Kedia Dental Institute	Birgunj	TU	2006	Private, affiliated college
5	Kantipur Dental College	Kathmandu	KU	2007	Private, affiliated college
6	KIST Medical College	Lalitpur	TU	2011	Private, affiliated program
7	Kathmandu University School of Medical Sciences	Dhulikhel	KU	2011	Constituent program
8	Nepal Medical College	Kathmandu	KU	2011	Private, affiliated program
9	Nobel Medical College	Biratnagar	KU	2011	Private, affiliated program
10	College of Medical Sciences	Bharatpur	KU	2011	Private, affiliated program
11	Chitwan Medical College	Bharatpur	TU	2011	Private, affiliated program
12	Kathmandu Medical College	Bhaktapur	KU	2012	Private, affiliated program
13	Gandaki Medical College	Pokhara	TU	2016	Private, affiliated program
14	Tribhuvan University Institute of Medicine	Kathmandu	TU	2019	Constituent program

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Journal of Kantipur Dental College

Author Guideline

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