pISSN: 2220-7562
eISSN: 2617-9482
CODEN: JBUMB7

JBUMDC

Journal of Bahria University Medical & Dental College

Volume 11 Issue 2, April - June 2021

Bahria University Medical & Dental College Adjacent PNS SHIFA, DHA Phase II, Karachi

JBUMDC
Journal of Bahria University Medical & Dental College
Peer Reviewed Multidisciplinary Quarterly Published Journal
ISSN (print): 2220-7562, ISSN (online): 2617-9482, CODEN: JBUMB7
Recognized by PM&DC (IP/0072)
Online edition is available at URL: https://jbumdc.bahria.edu.pk,
Indexed with Index Medicus for the Eastern Mediterranean Region (IMEMR),
https://vlibrary.emro.who.int/searchd/?database=imemr&records=
ROAD Directory of Open Access Scholarly Resources at https://portal.issn.org/
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Published by: Bahria University Medical & Dental College

JBUMDC

Journal of Bahria University Medical & Dental College

JBUMDC Journal of Bahria University Medical & Dental College
Volume-11, Issue-2. April - June 2021

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Editorial **Open Access**

Capacity Building Indicators for Faculty Development Programs

Kiran Fatima Bana, Talea Hoor, Kulsoom Fatima Rizvi

How to cite this Article:
Bana KF, Hoor T, Rivi KF. Capacity Building Indicators for Faculty Development Programs J Bahria Uni Med Dental Coll. 2020;11(2):47-49. DOI: https://doi.org/10.51985/GVET5958

Capacity development targets the changes occurs in human behavior in response to learn any new skills, knowledge, behavior and values overtime within complex organization setting. This development process indicates the progressive readiness of human resource to perform in complex environment. Similarly, this growth process of individual would reflect when dealing with others.[1]

There is continuous revolution in medical education for last thirty years to ensure patient safety. Due to complexity in healthcare standards, emerging new trends of diseases; continuous quality improvement are the important milestones of healthcare delivery.[2] Continuous quality improvement can be assessed by incorporating new technologies / innovations in healthcare delivery and impact of educational theories into goal settings and desired outcomes. Conventionally; stereo-typed medical educators owned subject knowledge acquired by their own teaching experience to become a teacher. This revolution has changed paradigm of medical education where current teachers are performing different than the way they have been taught. This change has placed a huge gap over medical universities worldwide to propose, implement and revise the development programs for faculty and curricular reforms as to perform the various roles of healthcare educators effectively as teacher, leader, administrator and researcher.[3]

Faculty development programs (FDP) is also known as in house/in service training of faculties.[4] It is evident from literature that this capacity building steps empowered faculty members to transform them as a change agent as a role of teacher, leader, administrator and researcher. The study conducted in South Africa highlighted the significant features of faculty development programs in medical education such as collaborative knowledge sharing and support across faculty development program. [5]

Faculty development program scaffolds activities which provide comfort and assistance to the multiple roles of healthcare by enhancing the knowledge, attitude and skills as an individual and by enlarge accelerates the organizational growth. [6] Faculty development programs can strengthen and elevate the levels of basic competencies in five domains such as teaching, mentoring, curriculum, assessment and organizational leadership.[7] The implementation of the faculty development program results in sense of inspiration, energy, creativity and support to bring change in faculty perspective and feel them viable during increased workload in complex organizational environment.[8] Therefore; faculty development program has vital role in academic decision making to sustain the academic process.

Capacity building indicators has a significant impact on the sustainability of any faculty development program as to engage individuals in a collective education development process. Capacity development indicators can provide the future directions for any organizational change to ensure patient safety and targets quality improvements.[1]

There are five themes identified for capacity building indicators in context of courses of basic teaching skills such as innovations in teaching and learning, communication skills development for collaborating at different levels, educational leadership and management development and scholarship development to sustain the faculty development programs. It is evident from the study of Matsika et al in 2019 at Zimbabewe focusing on the role of faculty development programs on medical education and reported that faculty development programs can enhance their confidence to become best teachers, clinicians and researcher. Enhanced attentiveness in research and teaching, interpersonal skills are improved and directed towards new career pathways.[9] In 2020; Steinert Y[4] highlighted in medical teacher that faculty development programs should target all faculty member with diversified roles as educator, teacher, scholar, administrator and leader to enhance the academic performance as a whole.

A part from the five themes identified as a capacity building indicators for faculty development courses of basic teaching skills; peer coaching is extensively used in medical education at clinical setting.[10,11] It fosters collaborative learning and

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Received: 09-03-2021
Accepted: 23-03-2021

enhance inter professional learning in practice setting. Individual learning goals' identification, observation, timely feedback, support and analysis are the key elements of peer coaching. This facilitates career development, mutual trust and socialization of faculty members by learner centered approach and strengthening the mentor relationship.

Workplace learning is known as pedagogy at workplace. Faculty development can be carried out in ever changing and complex environment such as practice setting, communities and in teaching hospital. Faculty development is often conducted as short courses and workshops which are limited to respond in changing healthcare need at workplace. Hence; there is dire need to strengthen transfer of training. Workplace pedagogy includes guidance at distal or proximal, environmental affordance, feedback and role modeling. Workplace learning can be enhanced by facing the workplace challenges and by orientation from workshop to workplace learning and can boost faculty's motivation and participation in everyday life.

Pedagogy at workplace and peer coaching are closely related in community settings. Practice in communities or communities of practice (CoP) is a social network of individuals persistently work in communities by understanding the values , beliefs , experiences and history of common practice. Faculty development programs can work to develop the communities of practice by clear objectives. The sustainability of (CoP) is depending upon the development of medical educator of same community. Filho et al in 2019[12]; highlighted twelve tips of communities of practices such as specific task to unite members, invite members, gather innovative ideas , ensure institutional support to enhance community awareness and implement best practices in communities. Sense of communities can be enforced by using online technologies among faculty members.[12] This capacity building indicator for faculty development can support and nurture new faculties from the experiences of educators, teachers, researchers, administrators scholars and leaders worked in communities in sustainable programs. All of them work as a unit for academic development of medical education as a discipline.[4] The success of faculty development in (CoP) is based on common purpose, dialogues, open communication, guidance and institutional support.

It is interestingly observed that most of faculty development programs are revised in curricula according to the need based analysis of the individual. There are academic competencies framework proposed in literature to design and deliver faculty development program based on program outcomes. A professional medical educator in UK (2014)[4] has developed standards such as five domains and core values for medical educators. These core values are educational scholarship, professional integrity, diversity, equality of opportunities, and respect for patient, learners, colleagues and public. These core values are foundations of five domains of educational development in designing, planning, teaching, assessment, feedback of learners, evidence based practice, educational leadership, educational management and educational research. [5] To design any faculty development program it must be competency based and reflect the professional identity of faculty as to address creativity, commitment, compassion and passion of the faculty.

Enhancing scholarly activities and research promotion is important capacity building indicator for faculty development. The progress in this indictor has been evident from the literature in medical education as reported by Harden et al in 2018.[12] Unfortunately; this growth is not paralleled in faculty development programs. The reasons for this unparalleled growth may vary during the process of program design, implementation, policy development for certification and availability of scarce resources for research and scholarly activities. The need of progress in research activities is always acute.

In a nut shell; the primary role of faculty development is academic development. It is recommended that the curricula of faculty development should broaden to support professional identities of teachers. This can be carried out by incorporating peer coaching, utilizing approaches of competency based framework, workplace based learning in communities, role of faculty in researches, leadership development, career development and research promotion. Hence; it will help to monitor the developmental change in organization accordingly.

Authors Contribution:
Kiran Fatima Bana: Idea Conception, writing
Talea Hoor: Literature Review
Kulsoom Fatima Rizvi: Proof reading, Idea conception

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Original Article

Open Access

Diagnostic Accuracy of High-Resolution CT in Early Diagnosis of COVID-19 Patients with Comparison to Reverse Transcriptase-PCR

Usman Khan, Sana Sharif, Fareeha Khalid, Asif Rehman, Hussain Rashid

ABSTRACT

Objective: To determine the accuracy of high-resolution CT (HRCT) in early diagnosis of COVID-19 in comparison to Reverse-Transcription Polymerase Chain Reaction (RT-PCR).

Study Design and Setting: This was a retrospective study, conducted in Department of Radiology, PNS Shifa Hospital, Karachi from April 2020 to June 2020.

Methodology: A total of 115 patients were included in the study who presented with symptoms. Patient's data such as demographic details, clinical presentations, RT-PCR reports and HRCT reports were collected from the record of the hospital. Data was entered and analyzed using SPSS-25.

Results: Out of 115 study participants, 98(85.2%) were male and 17(14.8%) were female with the average age of 50.53 (±18.64) years. Fever along with cough was the most common clinical presentation, presented by 91(79.1%) subjects. In comparison to RT-PCR, sensitivity of HRCT was 96.2%, its specificity standing at 60% with the overall accuracy of 93.19%. Moreover, mortality Rate of these symptomatic patients was 11.30% (13 out of 115). The average age of the expired patients was 67.07 (±11.45) years and the age of discharged patients was 48.31 (±17.92) years. The difference in age was statistically significant (p-value <0.001).

Conclusion: Highly specific and sensitive diagnostic tests for COVID-19 have not yet been developed. High resolution CT chest has high sensitivity for early diagnosis of COVID-19, hence HRCT should be incorporated as a primary tool in assessment criteria of hospitalized patients for early diagnosis of COVID-19.

Key words: COVID-19, HRCT, PCR, Diagnostic accuracy

How to cite this Article:
Khan U, Sharif S, Khalid F, Rehman A, Rashid H. Diagnostic Accuracy of High-Resolution CT in Early Diagnosis of COVID-19 Patients with Comparison to Reverse Transcriptase-PCR. J Bahria Uni Med Dental Coll. 2021; 11(2): 50-53 DOI: https://doi.org/10.51985/GSPD1787

INTRODUCTION:

Novel coronavirus has a non-segmented, single stranded and positive sense RNA genome. The size of this virus is larger than the other RNA viruses approximately 27kb to 32kb under electron microscope.[1] Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) and Middle East Respiratory Syndrome Coronavirus (MERS-CoV) belong to the same coronaviridae family. The transmission rate of this family is high among others. Both viruses were first discovered in bats. Clinical manifestations are common in coronavirus infections with respiratory symptoms or intestinal symptoms.[2,3] Cases of corona virus spread like wildfire around the globe. That's why, World Health Organization declared it as a public health emergency of international concern (PHEIC). But on 26th February 2020, Pakistan's Federal Health Ministry confirmed the first case in the country. It was the time when 113 countries around the globe were already witnessing the wave of the pandemic. Pakistan is located between two major corona virus infected countries, Iran and China. It was an unrealistic approach to consider Pakistan immune from such disease of high virulence because these microbes do not respect borders.[4]

Primarily COVID-19 was diagnosed as viral pneumonia. Clinical presentation in prodromal phase was dry cough, fever, nasal congestion, and body aches. Some patients even not had these symptoms. Gastrointestinal manifestation in the form of diarrhea was also presented in a few patients. Diagnostic capacity was not enough to do mass screening of travelers and their close contacts through RT-PCR as kits were not available in sufficient quantity. Flight operation

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Received: 18-09-2020
Accepted: 05-03-2021

was halted and pilgrims coming from Iran were quarantined as a measure to prevent its spread. [3,4,5]

Reverse-Transcription Polymerase Chain Reaction (RT-PCR) is used to diagnose viral RNA. Samples are taken from nasopharyngeal swab, oropharyngeal swab or bronchial lavage. High incidence rate of the disease increases the burden of RT-PCR tests on labs. This is considered as a gold stranded test for diagnosis but it is failed to detect virus early due to high false negative rate in initial phase.[6,7] In contrast, high resolution CT chest scan is a one breath hold, quicker way to diagnose early COVID-19 patients. It has been observed that patients having clinical symptoms were PCR negative while they had typical findings on their chest HRCT. Findings related to COVID-19 were Ground Glass Opacities (GGOs), consolidations, interlobular septal thickening and mixed patterns (fig 1& 2). Early detection of virus might help to prevent more aggressive response of COVID-19.[7,8]

Literature suggests that HRCT has more sensitivity than RT-PCR in early detection of virus.[9,10] HRCT is suggested for every patient to confirm early definitive diagnosis. According to World Health Organization guidelines, CT chest and radiograph were main diagnostic tools during prevalence of SARS.[15] National guidelines of Pakistan published by National institute of Health (NIH) on 2nd April 2020 indicated that there is role of chest radiograph in diagnosis among COVID-19 suspected patients having symptoms from mild to critical severity.[20] There is a debate on the use of HRCT as early diagnostic tool. Therefore this study was conducted to determine the diagnostic accuracy of high resolution CT (HRCT) in comparison to Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR).

METHODOLOGY:

In this study, 115 corona symptomatic/suspected patients were advised for getting HRCT scan done. It was a retrospective study and all data collected from the hospital's record. Subjects registered for HRCT in Radiology Department of PNS Shifa Hospital, Karachi and having prodromal symptoms of Corona virus were included in this study. Duration of study was three months from 1st April to 30th June 2020. Patients with the bronchial asthma, COPD, ILD, Tuberculosis and heart failure were excluded from study. Convenient sampling technique was used. Our study approved by the hospital ethical review committee with approval number ERC/2020/RADIO/29. Clinical presentation at the time of admission, and RT-PCR results also noted from the hospital record.

The RT-PCR tests performed on oropharyngeal swabs. The test kits recommended by Chinese Center for Disease Control and Prevention used to test. Negative control and internal control regularly performed with each batch. Laboratory technicians, instruments, and kits were same for all tests. The CT Scan machine had 16 slice multi detector CT scanners. Images were taken in supine position at 1mm slice thickness with 10mm gap. Lung window was used to evaluate all the CT images at level of 500 HU and width of 1500 HU. Two senior consultant radiologists, each having 12 and 15 years of experience, reviewed all the images while they were blinded to name, clinical data and laboratory findings.

Data was entered and analyzed using SPSS version 25.0. Numerical data like age was presented in the form of mean and standard deviation while categorical data like PCR and HRCT findings were presented in frequency and percentages. For numerical data comparison, independent sample t test and for categorical data association, chi square test was applied considering p-value < 0.05 as statistically significant.

RESULTS:

In this study 115 subjects were screened for HRCT chest scan. The mean age was 50.89 (±18.31) years. Among them 17 (14.8%) were females and 98 (85.2%) were males. Mean ages of male and female were 50.53 (±18.64) years and 53.36 (±16.41) years, respectively.

Clinical presentation of patients was correlated with the gold stranded test Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) for COVID-19. At the time of presentation, 84(80%) subjects having fever and cough had PCR positive and 7(70%) subjects were negative. Similarly, among the patients presented with cough 47(44.8%) were positive and 6(60%) were negative. Among the patients having shortness of breath, 44(41.9%) were positive and 4(40%) were negative. Among the patients with complaint of body aches, 33(31.4%) were positive and 2(20%) were PCR negative. (table no 1)

While comparing the HRCT findings, consolidations were noted in 17(16.2%) PCR COVID-19 positive patients. On other hand, no consolidations were documented in negative cases. Ground Glass Opacities (GGOs) were detected in 48(45.7%) positive patients while it was seen in 4(40%) negative patients as well. 29(25.2%) patients had unilateral and others had bilateral Ground Glass Opacities (GGOs). Among the PCR positive patients 82(78.1%) had typical findings of COVID-19 on high resolution CT chest including crazy paving pattern, GGOs, interlobular septal thickening, consolidation and pleural involvement; meanwhile, 2(20%) PCR negative patients also showed these typical findings on scan. (table no 1)

Graph: 1 Diagnostics comparison of HRCT and PCR: Among the PCR positive subjects, HRCT detected 101(96.2%) subjects as positive (**Sensitivity)**. Among the PCR negative subjects, HRCT detected 6(60%) subjects (**Specificity)** and among the HRCT positive subjects, PCR detected 101(96.2%) subjects as positive (**Positive predictive value)**. Among the HRCT negative subjects, PCR detected 6(60%) subjects (**Negative predictive value).** (Graph no 1)

Graph: 2, Survival rate of COVID-19 Patients

Total 15(13%) patients presented in our hospital with clinical features suggestive of COVID-19 and PCR positive expired while the 100(87%) cases recovered from disease and were subsequently discharged. Mean age of the expired patients was 67.07 (±11.45) years and mean age of discharged patients was 48.31 (±17.92) years. The difference in age was statistically significant (p-value <0.001). (Graph No 2).

Figure 1: HRCT Axial section showing GGOs and consolidation with air bronchograms

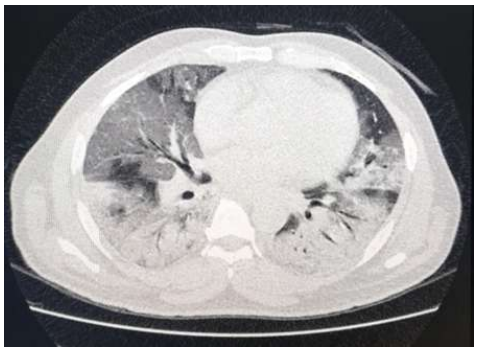


Figure 2: HRCT Axial section showing interlobular septal thickening

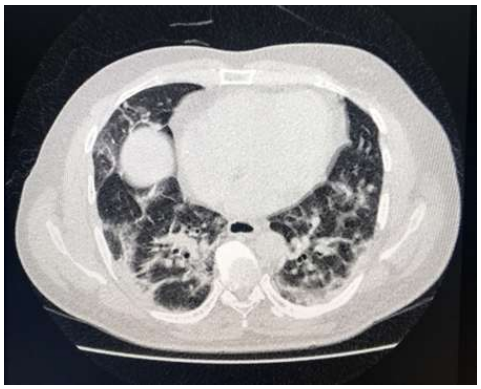
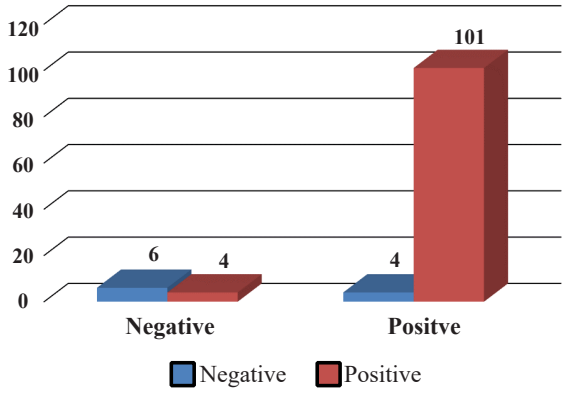


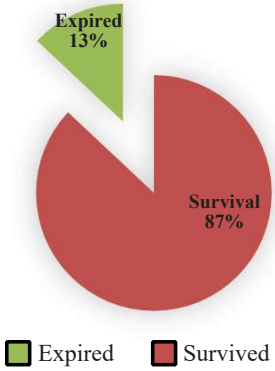
Table 1: Comparison of findings with COVID-19 PCR

Categories	Findings	COVID-19 PCR		P-value
		Positive	**Negative**	
Symptoms	Fever with cough	84(80%)	7(70%)	0.347
	Cough	47(44.8%)	6(60%)	0.276
	Shortness of breath	44(41.9%)	4(40%)	1.000
	Body Ache	33(31.4%)	2(20%)	0.510
HRCT Findings	Positive	101(96.2%)	4(40%)	<0.001*
	Consolidation	17(16.2%)	0(0%)	0.188
	Ground Glass Opacity (GGO)	48(45.7%)	4(40%)	1.000
	GGO and septal thickening with crazy paving appearance (Typical covid)	82(78.1%)	2(20%)	<0.001*
Outcome	Expired	15(13%)	0(0.0%)	0.233

Graph: 1 Diagnostics comparison of HRCT and PCR



Graph 2: Survival rate of COVID-19 Patients



DISCUSSION:

In our study, fever with cough was most common symptom in 91 (79.13%) out of 115 patients on the day of presentation. Shortness of breath was present in 48 (41.73%) patients while body aches were in 35 (34.43%) patients. These results are consistent with other studies.[12,13] Our results showed that 17 (16.2%) patients had consolidations, 52 (45.2%) had only ground glass opacities and 84 (73%) had GGOs along with other features of COVID-19. Consolidations and GGOs were less in our study than the other ones but overall HRCT findings of COVID-19 were same as reported in other studies. It is stated that Ground Glass Opacities (GGOs) appear in early stage of disease and crazy paving, consolidation, plural involvement shows disease progression.[14,15] HRCT showed 96.2% sensitivity and specificity was 60% whereas overall accuracy was 93.19 percent. Though, PCR sensitivity reported more or less 60%.[16,17] 87% of patients completely recovered from all symptoms along with 13% mortality of in-hospital patients.[18]Rivera-Izquierdo M et al. study showed more mortality rate than our study.[19]

Corona virus is a capsulated single stranded enveloped RNA virus causing COVID-19. Transmission is from human to human through droplets. Early identification is necessary

to reduce the morbidity and mortality.[11]RT-PCR is a gold standard diagnostic investigation for corona virus. Sampling through swab from oropharynx and nasopharynx is advised to do but technique is dependent on expertise of laboratory technician. On the other hand, the gold standard nucleic acid test has high failure rate in detecting virus in very early stage.[6]

Limitations of this study are that this is a single center with limited number of patient's data. We could not trace disease progression or resolution. More studies are required on this topic. National guidelines of Pakistan should be revised on the basis of evidence to include HRCT to early diagnose COVID-19. [20]

CONCLUSION:

High Resolution Computed Tomography has shown good specificity, sensitivity and accuracy. HRCT along with etiology and symptoms is a reliable tool for early diagnosis of COVID-19 patients.

Authors Contribution:
Usman Khan: Selection of topic and introduction
Sana Sharif: Methodology and literature review
Fareeha Khalid: Abstract and data collection
Asif Rehman: Data Analysis
Hussain Rashid: Discussion

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Orginal Article

Open Access

Evaluation of Quality of Root Canal Obturation, Coronal Restoration and Periapical Health in Failed Endodontically Treated Teeth

Syed Adeel Ahmed, Safia Anwar, Imtiaz ul Haq

ABSTRACT

Objective: To investigate the implication of quality of obturation and coronal restoration on periapical tissue in failed endodontically treated teeth.

Study Design and Setting: This cross-sectional research was performed in the Operative Department of BUMDC on 187 patients reporting with root canal failure from March 2019 to August 2019.

Methodology: Patients of both genders aged between 20-60 years were considered for this study. Single and multirooted teeth indicated for repeated endodontic treatment due to under filled, overfilled obturation, voids in obturation, absence and presence of coronal restoration were included. One operator carried out clinical examination of the teeth and periapical radiograph was taken for each patient by using E-Speed film and evaluated by the same operator using an illuminated viewer box. SPSS 17 for windows software was used for data entering and chi- square test was applied for statistical calculation of the outcomes.

Results: Total n=187 endodontic treated failed teeth were evaluated, out of which 52.9% were of females and 47.1% to males. The number of obturations with acceptable length were 81(43.3%), with adequate density were 107 (57.2%) and with consistent taper were 116(62%). Periapical lesion was observed in 118(63.1%) cases. Quality of obturation significantly affects the periapical health. Cross tabulation showed a significant association (p-value <0.000) between inadequate coronal restoration and changes in periapical area.

Conclusion: The successful prognosis of the root canal treatment relies on the good quality of obturation and adequate coronal filling.

Keywords: Coronal restorations, Obturation, Radiographic assessment, Root canal treatment.

How to cite this Article:
Ahmed SA, Anwar S, Ul-Haq I. Evaluation of Quality of Root Canal Obturation, Coronal Restoration and Periapical Health in Failed Endodontically Treated Teeth. J Bahria Uni Med Dental Coll. 2021; 11(2):54-59 DOI: https://doi.org/10.51985/WHTJ7349

INTRODUCTION:

The favorable outcome of endodontic treatment is dependent on complete debridement of the root canals, extirpation of affected pulpal tissues, microbes, and hermetic seal of the system to inhibit the reinfection of the root canals.[1] The literature reveals that various reasons are considered accountable for root canal treatment failure such as incomplete pulpectomy, fractured instruments, missed canals, perforation during canal preparation, overextended and underfilled obturation.[2,3,4] The American Association of Endodontists (AAE), described a criteria based on clinical and radiographic parameters for evaluating the technical success of obturations.[5]

Clinically, for a successful endodontic treatment, percussion, palpation, periodontal pocket depth, and comprehensive checkup of the final coronal restoration should show normal features during periodical follow-up visits. The length, shape and density of the obturation should be assessed radiographically.[6] Current research has revealed a positive correlation between the condition of root canal treatment, the quality of definitive restoration and a patient's periapical condition.[7] The excellence of quality of obturation is determined by various factors, such as consistent taper of the canal from orifice to apex, compact root canal filling without spaces, and obturating materials 0.5–2 mm short of the radiographic apex.[7,8] So there is an increase in the failure rate by 14% after every subsequent loss of 1mm in length in teeth with associated apical periodontitis.[9] Underfilled and overfilled obturations also jeopardize the success rate of root canal treatment.[10] The condition of definitive coronal restoration also has an influence on the periapical tissue of teeth that have undergone root canal treatment.[11] The result of an underfilled root canal obturation can be satisfactory, if the definitive coronal restoration

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Received: 30-09-2020
Accepted: 05-03-2021

is qualitatively adequate.[12] Conversely a tooth having a cleaned and well obturated root canal system but with poor definitive restoration, may fail soon.[13] Numerous observational researches revealed the incidence of insufficiently obturated root canals in relation to normal periapical tissue, and epidemiological statistics have shown various treatment consequences in different regions of the world, with prevalence's of inadequate root canal obturation of up to 72.4%, and with 87.0% of these teeth presenting apical periodontitis.[14,15,16] Acceptable endodontic treatment according to the European Association of Endodontists displays a consistent taper in the canal from coronal to apical portion and densely filled with no voids between the obturating material and canal wall. To prevent post treatment failure, obturation should be no more than 0-2 mm short of the radiographic apex.[17] Research has established that obturation more than 2 mm short of the radiographic apex, extruded past the apex and non-homogeneous with spaces between the fillings enhance the risk of root canal treatment failure.[18] This study identifies the reasons, primarily accountable for the root canal failures, so highlighting the aspect that significant steps should be taken to enhance the contemporary dental practice in relation to quality of endodontic therapy. Therefore, the primary aim of this study was to assess the effect of quality of obturation and coronal restoration on the health of periapical tissue in failed root canal treated teeth.

METHODOLOGY:

This descriptive cross sectional study was carried out at the Endodontic Department of BUMDC after approval by the college ethical committee (ERC no. 014/2019). Sample size was estimated from openepi.com software. The conditions were 95% confidence interval, 5% margin of error. Population size was estimated to be 360 (secondary source of information collected from selected colleges) at a prevalence rate of 50%. The required sample size was drawn to be 187 patients. A total of 187 patients during the period from March 2019 to August 2019, reporting to the Endodontic Department of the College with root canal treatment failures were studied clinically and radiographically. Informed consent was taken from the patients. Patients of both genders, aged between 20-60 years, multirooted and single rooted tooth indicated for repeated endodontic treatment due to underfilled and overfilled obturation, voids in obturation, absence and presence of coronal restoration were included in the study. Patients having periodontally compromised teeth, third molar, non-restorable teeth, dilacerated teeth, teeth with perforations and canals with separated instruments were excluded. One operator carried out clinical examination of the teeth and soft tissues. And periapical radiograph was taken for each patient. All periapical radiographs were taken with an Endograph DC X-ray unit (Villa Sistemi Medicali S.p.A. Italy) using E-Speed film (Eastman Kodak) using cone indicating devices to minimize distortion and processed with liquid fixer and developer according to the manufacturer's guidelines. The periapical radiographs were assessed by the same operator with an illuminated viewer box for variables such as quality of obturation and status of the apical tissue according to the guidelines provided by De Moor et al. and evaluation of coronal restorations was done by criteria recommended by Siqueira et al (Table 1). The data from radiograph was documented on a proforma specially designed for the study. Definition of all criteria is explained in proforma. To evaluate the procedural quality of root canal obturation on radiograph, three criteria were evaluated as monitors: Length of root canal filling, which includes three parameters: 1. Adequate: Obturating material is within the confines of the root canal system and no more than 2 mm of the radiographic apex; Under-filled: Obturating material is more than 2 mm short of the radiographic apex; Over-filled: Obturating material is extruding past the radiographic apex. 2. Compactness of obturating material which includes two parameters: the presence or absence of spaces within the root canal obturating material or between the root canal walls and obturating material. 3. Taper: Presence and absence of constant taper from the orifice of the root canal to the apex.

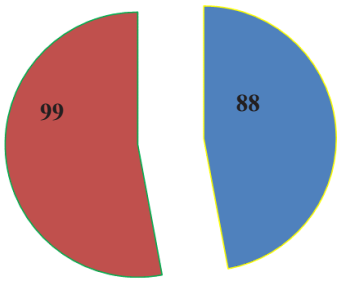
The technical quality of the obturation was considered adequate if the obturation terminated from 0-2 mm of the apex radiographically with no obvious voids within the obturating material or between the root canal walls and the material and steady taper from the coronal to the apical portion. In contrast, the technical quality of the obturations was considered insufficient when one or more of the aforementioned parameters were absent. Teeth with intact coronal restorations were considered acceptable. In teeth where coronal restorations were completely dislodged, partially fractured or had insufficient marginal seal were considered insufficient. SPSS 17 for windows software was used for data entering and statistical analysis. Chi-square test was applied to evaluate the influence of the quality of obturation, coronal restorations on the health of periapical tissue and p value < 0.05 was considered significant.

RESULT:

Total n=187 endodontically treated teeth were evaluated amongst which 47.1% belonged to men and 52.9% belonged to female. (Fig. 1) The mean age of the patients was 35.54 [S.D±9.087] years. Out of 187 Root canal failed teeth, 107 (57.2%) were present in mandibular and 80 (42.8%) belonged to maxillary arch. The most prevalent teeth were molars 78 (41.7%), followed by 64 (34.2%) premolars and 45 (24.1%) anteriors. (Table 2) The number of root canal obturations with acceptable length was 81 (43.3%), with acceptable density were 107 (57.2%), and with consistent taper were 116 (62%). Inadequate length of obturation was recorded in 106 (56.7%) of cases, while non-homogenous filling was noted in 80 (42.8%) teeth and inadequate taper

was observed in 71 (38%) cases. Periapical lesion was observed in 118 (63.1%) cases. Quality of obturation (length p-value 0.00, density p-value 0.00, and taper p-value 0.00) significantly affects the periapical health. (Table 3) Considering the type of tooth, the majority of the endodontic failures were observed in molars (n=46) 38.98% followed by premolars (n=43) 36.44%, while the anteriors (n=29) 24.58% showed the least endodontic failures. The condition of the coronal restoration was unacceptable in 74 (39.6%) cases, while in 113 (60.4%) cases coronal restorations had satisfactory quality. Cross tabulation between leakage from inadequate restoration and periapical alterations showed significant association with p-value 0.000 (Table 4). There was no significant difference (p>0.05) among the tooth-type (Anteriors, premolars and molars) and periapical lesion. There was also no significant association (p>0.05) between arch and periapical health.

Figure 1: The mean age of the patients



DISCUSSION:

It has been reported that there is a direct correlation between the quality of root canal filling, the result of root canal therapy and the health of periradicular tissues.[19,20] The method using periapical radiographs constitute the most commonly employed method in the evaluation of endodontic treatments.[21] If the endodontic treatment has not been done up to the adequate standards, the failure of endodontic management occurs. The key factors contributing to the failure of root endodontic treatment are the tenacious microorganisms in the root canal system and periradicular area. In the current study the most common factor attributing to the failure of endodontic treatment was inadequate length of the obturation (56.7%) in root canals.

Obturating material more than 2mm short of the radiographic apex usually occurs as the consequence of inadequate chemo-mechanical preparation, which usually arises as a result of erroneous working length calculation and insufficient irrigation of the root canal system, which consequently leads to endodontic failures.[12] It was observed by Chugal et al that shortening the working length by 1 mm increases the risk of root canal treatment failure by 14% in teeth with established apical periodontitis.[9] Endodontic treatment failure is also related to tooth position in the arch. The present study reveals that the majority of root canal treatment failures occurred in the molars (41.7%). This probably owes to the fact that these teeth are comparatively difficult to access and have a complex root canal morphology.

The overall widely recognized description behind root canal

Table 1. Criteria for radiographic evaluation of the quality of root canal fillings

Quality of root canal fillings	Acceptable	Acceptable condensation and extent of root canal filling with no mishap
	Non-acceptable	Non-acceptable condensation and/or non- acceptable length of obturation with/without mishap
Length of the RCF	Acceptable	Obturating material confined within the root canal system and no more than 2 mm short of radiographic apex
	Non-acceptable	Obturation is more than 2 mm short of the radiographic apex
	Non-acceptable	Obturation material is not confined to the root canal system and extruding beyond the radiographic apex
Density of the RCF	Acceptable	Consistent root canal filling, good condensation, no visible voids
	Non-acceptable	Poor Non-homogeneous root canal filling, poor condensation or voids present
Taper of the RCF	Acceptable	Steady and uniform taper from the orifice to the apex of the canal, with reflection of the original shape of the canal
	Non-acceptable	Poor Inconsistent taper from the coronal to the apical part of the filling
Coronal restorations	Acceptable	Restoration present
	Non-acceptable	Restorations missed, partly fractured

treatment failure in the multirooted teeth was untreated or unfilled canals followed by underfilling of the root canal system. The percentage of obturations with steady taper was 62%, which was lower than that reported by Balto et al[22] , Elemam et al[23], Roman-Richon et al.[19] The percentage of satisfactory density of obturations in the current study was 57.2%, which was lower than that reported by Elemam et al[23] 2015, Kelbauskas et al[24], and Roman-Richon et al.[19]

Table 2. Distribution of teeth within Arch, tooth type, quality of obturation, periapical lesion and coronal restoration N=187

		N=187	%
Arch	Maxillary arch	80	42.8
	Mandibular arch	107	57.2
Tooth type	Anteriors	45	24.1
	Premolars	64	34.2
	Molars	78	41.7
Length of root canal failed tooth	Adequate	81	43.3
	Inadequate	106	56.7
Density of root canal failed tooth	Adequate	107	57.2
	Inadequate	80	42.8
Taper of root canal failed tooth	Adequate	116	62.0
	Inadequate	71	38.0
Periapical status	Adequate	69	36.9
	Inadequate	118	63.1
Coronal restoration	Adequate	113	60.4
	Inadequate	74	39.6

Table 3: Crosstabulation between quality of obturation, coronal restorations and health of periapical tissue

Quality of obturation		Periapical lesion		Total	P-value
		Absent	Present		
Length of RCF	Adequate	58	23	81	0.000
	Inadequate	11	95	106	
	Total	**69**	**118**	**187**	
Density of RCF	Adequate	59	48	107	0.000
	Inadequate	10	70	80	
	Total	**69**	**118**	**187**	
Taper of RCF	Adequate	60	56	116	0.000
	Inadequate	09	62	71	
	Total	**69**	**118**	**187**	
Coronal restorations	Adequate	62	51	69	0.000
	Inadequate	07	67	118	
	Total	**69**	**118**	**187**	
Arch	Maxillary	37	43	80	0.032
	Mandibular	32	75	107	
	Total	**69**	**118**	**187**	
Tooth type	Anteriors	16	29	45	0.587
	Premolars	21	43	64	
	Molars	32	46	78	
	Total	**69**	**118**	**187**	

The rates of acceptable density in these studies were 75.8%, 79.5%, and 69%, respectively. However, our result was higher than that reported by Balto et al[22] and Moussa-Badran et al 2008.[25] In these studies, 34.9% and 42.7% of cases, respectively, had a dense root canal filling without voids. Radiographic evaluation of teeth showed obturations were satisfactory with respect to both length and consistency in 32.60% cases. In sixty-nine teeth assessed as improperly filled, 62 were related periapical infection. Inadequate coronal restorations compromise the coronal seal of the root canal fillings, which is as important, if not more, as the apical seal. A recent study mentioned that inadequate coronal restorations increase the occurrence of periapical lesion. This in accordance with the present findings.[26]

Another study proved that with an odds ratio of 2.556, the health of periapical tissue with compact and accurate length of the obturation was more than twice if compared with poor quality of obturation ($p < 0.0001$).[27] A current meta-analysis proved an increased ratio of healing of periapical lesion with acceptable quality of both root canal therapy and coronal restoration, and poor clinical results in case of inadequate treatment and restoration.[8] A recent study observed that 128 (6.2%) of the endodontically treated teeth showed acceptable consistency, satisfactory length of the root canal material, and concurrently acceptable coronal restoration, periapical lesion was found in 29.7% of these cases. On the other hand, the combination of inadequate endodontic obturation and poor coronal restoration did not result in periapical inflammation in every case.[28] Increase in laboratory training and adding of seminars would be beneficial for dentists to familiarize with necessary

Table 4: Crosstabulation between quality of obturation and coronal restorations

Quality of obturation		Coronal restorations		Total	P-value
		Adequate	Inadequate		
Length of RCF	Adequate	67	14	81	0.000
	Inadequate	46	60	106	
	Total	**113**	**74**	**187**	
Density of RCF	Adequate	81	26	107	0.000
	Inadequate	32	48	80	
	Total	**113**	**74**	**187**	
Taper of RCF	Adequate	81	35	116	0.000
	Inadequate	32	39	71	
	Total	**113**	**74**	**187**	
Arch	Adequate	54	25	80	0.000
	Inadequate	58	49	107	
	Total	**113**	**74**	**187**	
Tooth type	Anteriors	22	23	45	0.147
	Premolars	41	23	64	
	Molars	50	28	78	
	Total	**113**	**74**	**187**	

procedures and precautions required for managing molars in root canal treatment. The use of dental magnification such as magnifying loupes and operating microscopes while performing molar endodontics would enhance visualization of the treatment field and increase accuracy of the endodontic procedure.

It is recommended that correct case selection is very necessary and should be ensured to increase the success of the endodontic therapy. Also teeth with complicated anatomy should be carefully assessed by new radiographic techniques and referred to the endodontists. The limitations of the study included that others causes associated with failure of root canal treatment were not evaluated and one radiographic technique was used to judge the procedural mistake.

CONCLUSION:

This study concludes that success of the endodontic therapy depends on the quality of the root canal fillings and good quality of coronal restoration. Molar teeth are more challenging to treat endodontically due to their complex anatomy with the lack of knowledge, the deficiency of specific instruments and lack of training of these instruments.

ACKNOWLEDGMENT:

All authors of the study acknowledged the supervision of this project by Prof. Dr. Shama Asghar HOD Operative Dentistry, BUMDC.

Authors Contribution:
Syed Adeel Ahmed: Data Collection, discussion write-up
Safia Anwar: Writeup
Imtiaz ul Haq: Literature search

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Original Article

Open Access

The Emotional Burden of COVID 19 in Frontline Health Care Workers at A Tertiary Care Hospital in Pakistan

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ABSTRACT

Objective: To assess the levels of depression, anxiety and stress in frontline health care workers dealing with COVID 19 patients.

Study Design and Setting: This cross-sectional study was conducted at PNS Shifa hospital from 1st June 2020 to 14th June 2020.

Methodology: Total n=124 health care workers were assessed using Depression, Anxiety and stress scale(DASS 21). All health care workers who dealt with COVID 19 patients were approached and asked to participate after an informed consent. The scale was administered by a doctor who contacted the health care workers directly working with COVID 19 patients through video call and those previously working in this pandemic were contacted in person. The SPSS 20 package program was used for statistical analysis. Quantitative Variables like age were described as mean ± SD. Cross tabulation and Chi-Squared Test were used to identify which of the independent variables had significant influence on the outcome.

Results: Total 31(25%) health care workers out of 124 exhibited features of depression whereas 49(39.5%) health care workers showed features of anxiety. Total n=26(21%) health care workers were found to be under stress. It was also seen that depression and anxiety was more common in females and health care workers working as residents, house officers and nursing assistants.

Conclusion: This study showed COVID 19 can cause significant distress in health care workers therefore all health care workers dealing with COVID 19 patient should be regularly monitored for psychological symptoms.

Keyword: Anxiety, Depression, Health care workers, Stress.

How to cite this Article:
kakar MS, Rauf S, Jalal U, Khan WA Gul I. The Emotional Burden of COVID 19 in Frontline Health Care Workers at A Tertiary Care Hospital in Pakistan. J Bahria Uni Med Dental Coll. 2021; 11(2): 60-64 DOI: https://doi.org/10.51985/LLFV9024

INTRODUCTION:

Around 12.6 million people worldwide are currently effected by COVID 19 which has caused almost 560000 deaths around the globe.[1]Pakistan received its first case on 26th Feb 2020.Over the last 4 months these cases have risen to almost 243000 and the number of deaths is around 5100.[2] This pandemic has affected health care workers both mentally and physically. The factors which have caused an increased psychological stress include high infection risk, over work, exhaustion, frustration, isolation and lack of contact with family and friends.[3,4] These factors are further magnified when the doctors have to choose between whose lives to save associated with a decision to prioritize critical beds leading to an increased sense of responsibility and at times even guilt. These emotional challenges and moral injuries can have a long lasting psychological effect on health care workers.[5] It has been seen the health care workers are facing multiple challenges in this crisis including an unknown etiological agent, unpredictability in symptoms, massive demand, and lack of resources, fear of contagion and a marked prevailing sense of helplessness.[6] A study from Pakistan revealed that the biggest fears of health care workers include infecting family members, becoming a carrier, missing a diagnosis and complications of disease.[7] A systematic review based on 13 studies showed a pooled prevalence of 23.2% and 22.8% for anxiety and depression respectively. It was also found to be more in females and nurses.[8] A study from Wuhan in China revealed a prevalence of 12.7% of mild depressive features and 20.1% mild anxiety symptoms however the scores for perceived stress were

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Received: 31-08-2020
Accepted: 15-02-2021

markedly elevated in more than half (59%) of the health care workers. This study also showed females to be more effected.[9] A study looking into a tertiary care hospital found the prevalence of anxiety in medical staff was 23.04% and most of them were found to be mildly anxious (16.09%) whereas stress disorders were found in 27.3% of medical staff. Anxiety and stress was found to be more common in females and in nurses.[10] A Chinese survey based, region stratified study on 1257 health care workers revealed that 50.4% had depressive features, 44.6% had anxiety and 71.5% were in distress. Nurses, females and those working in Wuhan were found to be more effected.[11]It has also been seen despite increased prevalence of psychological issues; health care workers do not often seek or receive mental health care which may be due to the fear of being labeled and stigmatized.[12] A Pakistani study on frontline physicians found a 43% prevalence of anxiety/depression based on WHO self reporting questionnaire SRQ-20.[13]

This study has been designed to look into effects of COVID 19 on health care workers who are directly dealing with such patients. Our hypothesis is that dealing with COVID 19 patients has indirectly affected the mental health of health care workers. Hence; this study was aimed to assess the levels of depression, anxiety and stress in frontline health care workers dealing with COVID 19 patients.

METHODOLOGY:

This cross sectional study was conducted at PNS Shifa hospital Karachi from 1st June 2020 to 14th June 2020. The sample size was calculated by WHO sample size calculator with a confidence interval of 90% and was found to be 124 based on a Chinese study which showed higher levels of depression, anxiety and stress in frontline workers dealing with COVID 19 patients.[10] Health care workers were enrolled into the study after informed consent and ethical approval from the ethical committee of PNS Shifa hospital with ERC number ERC/2020/psych/21. These health care workers were 20 to 50 years of age. Criteria that excluded health care workers from the study included non-consenting individuals and presence of psychiatric illness.

All health care workers who dealt with COVID 19 patients were approached. Assessment tools consisted of a data form (including age, gender, educational level, occupational status including doctors, nurses and paramedical staff and marital status). Depression, anxiety and stress were assessed by applying Depression, anxiety and stress scale(DASS 21).[14] This quantitative scale measures the emotional state of the patient on the lines of depression, anxiety and perceived stress through 21 questions(7 questions each) which are answered on 5 severity levels. The total scores help to demarcate mild, moderate, severe and extremely severe levels of depression, anxiety and stress. The score achieved on the each scale is multiplied with 2 for final score. The scale was administered by a doctor who contacted the health care workers directly working with COVID 19 patients through video call and those previously working with COVID 19 patients were contacted in person. The SPSS 20 package program was used for statistical analysis. Quantitative Variables like age were described as mean±SD. Cross tabulation and Chi- Squared Test were used to identify which of the independent variables had significant influence on the outcome.

RESULTS:

There were 69(55.6%) males and 55(44.4%) females in this study. The mean age was 28.9±6.2.DASS 21 score for depression were high in 31(25.0%) of health care workers. Within the scores for depression, it was seen that 19(15.4%) of health care workers were found to be mildly depressed, 05(4.0%) were moderately depressed and 05(4.0%) of health care workers had scores within severe range. Whereas 02(1.6%) participants were severely affected. The scores for anxiety revealed a total of 49(39.5%) health care workers to be anxious out of which 31(25.0%), 09(7.3%), 04(3.2%) and 05(4.0%) were found to be mild, moderate, severe and extremely severe respectively. On the stress scale it was seen that 26(21.0%) health care workers were stressed. Among them 18(14.6%), 4(3.2%) and 4(3.2%) were mild, moderate and severely stressed respectively. Table 1 shows the correlation of different factors with depressive features. The significant correlation was observed in case of gender(P=0.011), marital status(P=0.045) and appointment of health care workers(P=0.004) showing these features to be more in females and HCWs working as residents, house officers or Nursing assistants. Similarly table 2 shows a significant correlation of anxiety with gender(P= 0.002), marital status(P=0.036) and appointment or type of health care workers(P=0.016) showing more occurrence in females and health care workers working as residents, house officers, nurses and nursing assistants. Regarding the relation of stress scores with different factors it was found to be significant only in the type of health care workers affecting such as residents, house officers and nursing assistants more(P=0.022)- as seen in table 3.

DISCUSSION:

Our study showed a significant prevalence of depression (25%), anxiety(39.5%) and stress(21%) within frontline health care workers dealing with COVID 19 patients. Most of the health care workers who were depressed showed moderately depressive features and depressive features were more existent in females, married health care workers and those working as residents or house officers. Whereas most of the anxious health care workers showed mild anxiety features and anxiety features were more prevalent in females and married health care workers. Similarly stressful features were also significantly prevalent in females. . A cross sectional study from a Chinese institute comparing the mental health of its medical and non medical staff found

Table 1- Demographics of patients with different levels of Depression severity

Patient Characteristics	Number of samples with DASS(Depression) Scores according to severity					Mean total DASS score ± SD	P-Value
	Normal (0-9)	Mild (10-13)	Moderate (14-20)	Severe (21-27)	Very Severe (28+)		
Gender							
Male	60(48.3%)	05(4.0%)	02(1.6%)	02(1.6%)	00(0.0%)	7.9 ± 3.6	**0.011**
Female	33(26.6%)	14(11.2%)	03(2.4%)	03(2.4%)	02(1.6%)	10.8 ± 6.7	
Marital status							
Single	47(37.9%)	06(4.8%)	05(4.0%)	03(2.4%)	02(1.6%)	9.9 ± 6.6	**0.045**
Married	46(37.0%)	13(10.4%)	00(0.0%)	02(1.6%)	00(0.0%)	8.5 ± 3.6	
Type of HCWs							
Consultant	11(8.8%)	00	00	00	00	6.7 ± 1.3	**0.004**
Resident	17(13.7%)	06(4.8%)	00	00	00	8.6 ± 2.7	
House Officers	20(16.1%)	02(1.6%)	04(3.2%)	04(3.2%)	01(0.8%)	12.1 ± 8.1	
Nurses	09(7.2%)	00	00	00	00	8.7 ± 1.9	
Nursing Assistants	36(29.0%)	04(3.2%)	01(0.8%)	01(0.8%)	01(0.8%)	8.2 ± 5.0	

Table 2: Demographics of patients with different levels of Anxiety severity

Patient Characteristics	Number of samples with DASS(Anxiety) Scores according to severity					Mean total DASS score ± SD	P-Value
	Normal (0-7)	Mild (8-9)	Moderate (10-14)	Severe (15-19)	Very Severe (20+)		
Gender							
Male	48(38.7%)	19(15.3%)	01(0.8%)	00	01(0.8%)	6.7 ± 2.7	**0.002**
Female	27(21.7%)	12(9.6%)	08(2.7%)	04(3.2%)	04(3.2%)	9.7 ± 5.9	
Marital status							
Single	38(30.6%)	14(11.2%)	06(4.8%)	00	05(4.0%)	8.6 ± 5.7	**0.036**
Married	37(29.8%)	17(13.7%)	03(2.4%)	04(3.2%)	00(0.0%)	7.4 ± 3.2	
Type of HCWs							
Consultant	10(8.0%)	01(0.8%)	00	00	00	5.8±1.0	**0.016**
Resident	10(8.0%)	10(8.0%)	01(0.8%)	02(1.6%)	00	7.8 ± 3.2	
House Officers	18(14.5%)	03(2.4%)	05(4.0%	02(1.6%)	03(2.4%)	9.8 ± 6.3	
Nurses	07(5.6%)	08(2.7%)	01(0.8%)	00	00	7.8 ± 2.2	
Nursing Assistants	30(24.1%)	09(7.2%)	02(1.6%)	00	02(1.6%)	7.4 ± 4.9	

that health care workers had 1.4 times higher level of fear and 2 times higher levels of depression and anxiety in the health care workers which was more prevalent in those directly dealing with COVID 19 patients.[14] A short review based on 14 studies looking into the effects of COVID 19 on health care workers revealed that severe levels of anxiety and depression were found in 2.2% to 14.5% of all participants and it was dependent on the specialty of the health care workers and their proximity to COVID 19 patients.[15] Another study comparing the effects of COVID 19 on medical personnel and non medical personnel found the prevalence of depression(12.2 vs. 9.5%; $p< 0.04$),), anxiety (13.0 vs. 8.5%, $p < 0.01$), and insomnia (38.4 vs. 30.5%, $p < 0.01$) to be higher in medical personnel. It was also revealed that being female and working close to COVID 19 patients were significant risk factors in medical personnel for depression and anxiety.[16]A study in 2004 looking into the effect of SARS epidemic found that the it lead to increased levels of stress in patients which also included health care workers(39%) who showed higher levels of fatigue and were particularly more worried about their health.[17] In 2009 a study which assessed the long term effects of SARS epidemic revealed that even about 31 to 50 months after the infection, survivors were still diagnosed with PTSD-post traumatic stress disorder (54.5%), depression(39%) and panic disorder(32.5%) , which was a marked increase from their pre-infection prevalence of any psychiatric diagnoses which was just 3%.[18] A study in 2011 on 257 subjects showed

Table 3: Demographics of patients with different levels of Stress severity

Patient Characteristics	Number of samples with DASS(Stress) Scores according to severity					Mean total DASS score ± SD	P-Value
	Normal (0-14)	Mild (15-18)	Moderate (19-25)	Severe (26-33)	Very Severe (34+)		
Gender							
Male	57(45.9%)	09(7.2%)	03(2.4%)	00	00	11.5 ± 3.7	**0.106**
Female	41(33.0%)	09(7.2%)	01(0.8%)	04(3.2%)	00	13.2 ± 5.9	
Marital status							
Single	52(41.9%)	05(4.0%)	03(2.7%)	03(2.7%)	00	12.2 ± 5.3	**0.117**
Married	46(37.0%)	13(10.9%)	01(0.8%)	01(0.8%)	00	12.3 ± 4.5	
Type of HCWs							
Consultant	11(8.8%)	00	00	00	00	9.2 ± 1.6	**0.022**
Resident	15(12.0%)	08(6.4%)	00	00	00	12.5 ± 3.5	
House Officers	24(19.3%)	01(0.8%)	03(2.7%)	03(2.7%)	00	14.0 ± 6.5	
Nurses	13(10.4%)	03(2.7%)	00	00	00	12.2 ± 3.4	
Nursing Assistants	35(27.4%)	06(4.8%)	01(0.8%)	01(0.8%)	00	11.7 ± 4.8	

that seropositivity for coronaviruses was associated with a history of mood disorders and it suggested that coronavirus infections can cause mood disorders.[19] The pro-inflammatory effects of the virus which involves the release of cytokines including Interleukin IL 1b and IL 6 may have a neuroinflammatory effect leading to neuropsychiatric effects.[20] A study from Singapore assessing effect of COVID-19 on 470 employees of 2 tertiary care hospitals found that 14.5% had features of anxiety, 8.9% had depressive features and 6.6% were found to be stressed.[21] A study from Pakistan assessing the stress coping strategies of frontline health workers found that HCWs used limited media exposure, limited sharing of COVID details, religious coping and altruism as their coping strategies.[22] A study from Hubei China involving 534 frontline medical staff showed that they were anxious regarding their safety and the safety of their families and reported psychological effects from reports of mortality from COVID-19 infection.[23] A study from Liberia during the Ebola epidemic looking into the coping mechanisms of health care workers showed that There were several important coping strategies which could help the medical staff deal with the epidemic psychologically including being sustained by religion, a sense of serving their country and community, and peer and family support. External factors which could improve their coping included: training which built health worker confidence in providing care; provision of equipment to do their job safely; workshops that provided ways to deal with the stigma associated with being a health worker; and the risk allowance, which motivated staff to work in facilities and provided an additional income source.[24]There are some limitations of this study. The study was carried out during the pandemic and we were careful not to distract participants from emergency work in result of which interviews were often paused or interrupted because the participants had to attend some other emergency duties. The study lacks generalizability, and only explores the perspectives of health care workers dealing directly with COVID 19 patients. It cannot ascertain the perspectives of other health care workers not working directly with COVID 19 patients as well as administrators and patients. This study did not explore findings of health care workers from other hospitals that may have had different experiences of the pandemic and different coping mechanisms, which need exploration.

CONCLUSION:

This study has helped us understand the effects of COVID 19 on frontline health care workers in a tertiary care hospital in Pakistan. Higher scores on DASS scale suggested that health care workers need regular monitoring and detailed psychiatric interviews to further establish any worsening of symptoms. Administrators of hospitals should focus on the psychological state of their frontline health care workers and actively conduct psychological counseling. Adequate and timely psychological interventions could help reduce the psychosocial problems that may develop in the future.

Authors Contribution:
Muhammad Siddique Kakar: Manuscript writing, data collection
Shehzad Rauf: Manuscript writing, data collection
Umer Jalal: Statistical analysis
Waseem Ahmed Khan: Data collection
Isbah Gul: Statistical analysis

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Original Article

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The Concepts of Complete Denture Occlusion amongst Dental Fraternity

Maria Shakoor Abbasi, Naseer Ahmed, Azad Ali Azad, Fatima Fouad, Humza Daudpota, Mina Farooq, Adil Bin Irfan

ABSTRACT:

Objectives: To assess the concepts of complete denture occlusion among dental fraternity.

Study Design And Setting: Cross-sectional study conducted at various dental hospitals and institutes of Karachi, for a period of six months, from 1st June'2019 to 30th November'2019

Methodology: Total 849 dental practitioners who are currently practising were included. A well-structured and validated questionnaire was used for data collection. SPSS version 25 was used.

Results: Bilateral balanced occlusion was an ideal occlusion by majority subjects i.e, 530(62.4%) in patients with well-formed ridges, followed by 464(54.7%) candidates with skeletal class 1, total 376(44.3%) chose it with uncontrolled diabetes mellitus, 365(43%) in single complete denture cases, 339(39.9%) with increased inter-arch space, 298(35.1%) with parafunction habits, 296(34.9%) in patients with history of neuromuscular disorder and 271(31.9%) where a complete denture opposes a removable partial denture. Furthermore, Lingualized occlusion was preferred by 341(40.25%) participants for patients with skeletal class 3. Total 316(37.2%) candidates chose it for patients with displaceable supporting tissue followed by 264(31.1%) who chose it for skeletal 2 and 260(30.6%) for cases of highly resorbed ridges. Lastly, 311(36.6%) chose canine guided occlusion with highly resorbed ridges accompanied by high aesthetic demand A significant difference between education level and knowledge of occlusal schemes was also found. Chi-square (73.87), df 6, p-value =0.000.

Conclusion: Dental practitioners lack adequate knowledge of occlusal schemes in terms of prescription in complete denture patients. A significant difference between the education level and knowledge of occlusal schemes was found. Therefore, awareness of various occlusal schemes should be increased at undergraduate level.

Keywords: Bilateral Balanced Occlusion, Canine Guided Occlusion, Complete Denture, Lingualized Occlusion, Monoplane Occlusion.

How to cite this Article:

Abbasi MS, Ahmed N, Azad AA, Fouad F, Daudpota H, Farooq M, Irfan AB. The Concepts of Complete Denture Occlusion amongst Dental Fraternity . J Bahria Uni Med Dental Coll. 2021; 11(2):65-69 DOI: https://doi.org/10.51985/OYZP7463

INTRODUCTION:

Although advances in restorative dentistry have been observed, conventional complete denture remains one of the most common treatment options opted by the patients due to its affordability, ease of use and maintenance.[1] One of the most important factors for success of a conventional complete denture is occlusion. Complete denture occlusion is basically the static relationship between the incising or masticating surfaces of the maxillary or mandibular teeth or tooth analogues.[2]

The occlusal concept in complete denture includes, Bilateral Balanced Occlusion (BBO), Canine-guided Occlusion (CGO), Lingualized Occlusion (LGO) and Monoplane occlusion (MPO). BBO is an artificial occlusion; occurs when all the posterior teeth makes bilateral, simultaneous contact in inter-cuspal position as well as in eccentric positions." If such contact occurs in natural occlusion it is termed as premature contact on the non-working side and said to be pathological.[1,3] Researchers argue that bilateral balanced occlusion is important for retention, stability, support and it also increases masticatory efficiency.[4,5] Though some authors disagree and state that there is no clinical evidence to support this.[6]

Another occlusal concept is lingualized occlusion. It is a form of denture occlusion in which the maxillary lingual

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Received: 03-09-2020
Accepted: 05-03-2021

cusps articulates with the mandibular occlusal surfaces in centric occlusion, working and nonworking mandibular position". Only lingual cusps are kept in contact which reduces the potentially damaging lateral forces. Lingualized occlusion offers improved denture stability and patient comfort.[5]

On the other hand, Monoplane occlusion is an occlusal arrangement wherein the posterior teeth have masticatory surfaces that lack any cuspal height.[7] Zero-degree or non-anatomic teeth are used. The flat cuspal inclines minimize the horizontal forces exerted on the supporting tissue which helps maintain and preserve the alveolar bone.[8, 9]

One of the recently introduced concept in complete denture occlusion is Canine-guided occlusion. It is a form of mutually protected articulation in which the vertical and horizontal overlap of the canine teeth disocclude the posterior teeth in the excursive movements of the mandible".[7] Like bilateral balanced occlusion, canine guided occlusion involves simultaneous contact on both sides in centric occlusion but there are differences in eccentric movement. Recent studies have shown that compared to bilateral balanced occlusion, it has an easier and faster set-up with the same masticatory efficiency but better clinical performance. [2, 10, 11]

The harmony of occlusal contacts is an important factor in determining the relationship between complete denture and the stomatognathic system. Studies have shown that the choice of occlusal scheme is necessary for denture stability and patient satisfaction. Any occlusal error such as premature contact or sliding will affect the denture's stability and retention, which in turn will hamper masticatory function, comfort and maintenance of residual ridge.[12] The occlusal scheme should be chosen based on the patient's age, the height and width of residual ridge, the presence of parafunctional habits, underlying systemic conditions, neuromuscular disorders, aesthetic demand, etc. [13,14]

Therefore, the rationale of this study was to assess the concepts of complete denture occlusion of dental fraternity and to highlight this important aspect of stomatognathic system, moreover to provide an update for clinician about unique occlusal scheme prescription in future restorative procedures.

METHODOLOGY:

This cross-sectional study was conducted at various dental institutes and hospitals of Karachi for a period of six months, from 1st June'2019 to 30th November'2019. Prior approval from AIDM ethics and review board has been sought out; AIDM/EC/06/2019/10. Non-probability sampling was used, candidates who had a minimum qualification of bachelor's in dental surgery with at least 1 year of House job experience and currently practicing were included in this study. Students, dental technicians and non-practicing doctors were excluded. The sample size for this study was calculated through OpenEpi software. Considering the mean values for bilateral balanced occlusion and canine guided occlusion 0.186±0.041 and 0.167±0.016.[6] With the power of study 80 and confidence interval of 0.05%, the sample size calculated with an overestimation effect to cover a large population was 898 participants.

The data was collected from participants working at various discipline of dentistry manually using a well-structured and validated proforma. A pilot study was carried out on 50 participants to validate proforma the internal consistency of items tested with intra class correlation showed a strong relation of 0.75. A consent statement for voluntary participations was included for all subjects to understand prior to their agreement. The proforma had two sections. The first section involved questions pertaining to demographic data, such as, the candidate's age, gender and qualification. The second section had questions about various clinical scenarios and the candidate's choice of an occlusal concept in that situation. The data collected was analysed through Statistical Package for Social Sciences (SPSS-Version 25). The descriptive statistics and chi-square test were performed, considering a p value of = 0.05 as statistically significant.

RESULTS:

Out of the total, 898 dental practitioners. 849 completed the proforma with a response rate of 94%. from 552 (65.01%) were females and 297 (34.98%) were males, with majority, 554 (65.25%) belonging to a common age bracket of 21-25 years. Furthermore, 590 (69.49%) were dental graduates, 90 (10.60%) were postgraduate trainees while 169 (19.90%) were consultants (restorative dentistry, prosthodontics) from various dental specialties as mentioned in Table 1.

Preferred occlusal scheme opted by the dentists or participants for different clinical scenarios is depicted in Table 2. Bilateral balanced occlusion was thought to be an ideal occlusion by majority dentists or participants i.e, 530 (62.4%) in patients with well-formed ridges, followed by 464 (54.7%) dentists or participants who opted it for patients with skeletal class 1. In addition, 376 (44.3%) chose it in cases of uncontrolled diabetes mellitus, 365(43%) in single complete denture cases, 339 (39.9%) dentists or participants for patients with increased inter-arch space, 298 (35.1%) opted it for patients with known parafunction habits, 296 (34.9%) in patients with history of neuromuscular disorder and 271 (31.9%) opted it for cases where a complete denture opposes a removable partial denture.

Furthermore, Lingualized occlusion was thought to be an ideal occlusion by majority candidates i.e, 341 (40.25%) for patients with skeletal class 3. Total 316 (37.2%) candidates chose it for patients with displaceable supporting tissue followed by 264 (31.1%) who chose it for skeletal 2 and 260 (30.6%) opted it for cases of highly resorbed ridges.

Whereas, Canine guided occlusion was thought to be the

ideal occlusion by majority of our candidates, 311(36.6%), in patients with highly resorbed ridges accompanied by high aesthetic demand only.

Lastly, Monoplane occlusion was chosen as the preferred occlusion by majority of our candidates in cases of patients with decreased inter-arch space 225 (26.5%). In addition, a significant difference between education level and knowledge of occlusal schemes was found; Chi-square (73.87), df 6, p value < 0.000 as depicted in Table 3.

DISCUSSION:

Although complete denture is one of the most basic treatment modalities for edentulous patients, many essential variables have not been scientifically validated. Even today this conventional option faces many problems and difficulties, including the lack of expertise regarding high-quality complete dentures and scarcity of sound evidence supporting specific guidelines. The issue about which occlusal concept is most appropriate for individual needs is clinically and economically relevant.

Out of the four occlusal concepts, BBO was thought to be the ideal occlusion for complete denture patients. Authors argue that balance is necessary during excursive moments as it improves stability and transmits equal and even distribution of forces thus preventing bone resorption. [4,15] Majority of our candidates also shared the same school of thought as they opted for the BBO as the most suitable occlusion, in majority of the clinical scenarios, including: patients with well-formed ridges (62.4%), for patients with skeletal class 1 (54.7%) and uncontrolled diabetes mellitus (44.3%). Total 43% opted it for single complete denture cases, 39.9% for patients with increased inter-arch space, 35.1% opted it for patients with known parafunction habits, 34.9% in patients with history of neuromuscular disorder and 31.9% opted it for cases where a complete denture opposes a removable partial denture. This agrees with proponents of BBO and its importance in maintaining denture retention, stability and support.[2, 16-18] But this contrasts with other authors, who suggested LGO or MPO would be ideal for patients having parafunctional habits, when complete denture opposes a removable partial denture and in uncontrolled diabetes. [4,19,20] It has been further emphasized

Table 1: Demographic characteristics of participants (n=849)

Variables	Frequency	Percentage
Female	552	65.01
Male	297	34.98
21 to 25 years	554	65.25
25 years and above	295	34.74
Graduates	590	69.49
Postgraduates	90	10.60
Consultants	169	19.90

Table 3: Education level and knowledge of occlusal schemes (n=849)

Variables		Pearson Chi-Square		
Education	Knowledge of Occlusal schemes	value	df	p-value
		73.87	6	<0.000

Table 2: Frequencies of occlusal schemes selected by the participants (n=849)

Clinical Scenarios	Occlusal Schemes			
	Balanced Bilateral Occlusion, Frequency (N%)	Lingualized Occlusion, Frequency (N%)	Canine guided Occlusion, Frequency (N%)	Monoplane Occlusion, Frequency (N%)
For patients with well-formed ridges	530 (62.4%)	65 (7.7%)	172 (20.3%)	82 (9.7%)
For patients with highly resorbed ridges	244 (28.7%)	260 (30.6%)	109 (12.8%)	236 (27.8%)
For patients with resorbed ridges accompanied by high esthetic demand	295 (34.7%)	144 (17.0%)	311 (36.6%)	99 (11.7%)
For patients with increased inter-arch space	339 (39.9%)	260 (30.6%)	152 (17.9%)	98 (11.5%)
For patients with decreased inter-arch space	195 (23%)	193 (22.7%)	219 (25.8%)	225 (26.5%)
For patients with displaceable supporting tissue	283 (33.3%)	316 (37.2%)	125 (14.8%)	125 (14.7%)
For patients with parafunctional habits	298 (35.1%)	195 (23.0%)	162 (19.1%)	194 (22.9%)
For patients with skeletal class 1	464 (54.7%)	102 (12.0%)	244 (28.7%)	39 (4.6%)
For patients with skeletal class 2	219 (25.8%)	264 (31.1%)	262 (30.9%)	104 (12.2%)
For patients with skeletal class 3	186 (21.9%)	341 (40.2%)	187 (22.0%)	135 (15.9%)
For cases where complete denture opposes removable partial denture	271 (31.9%)	151 (17.7%)	211 (24.9%)	216 (25.4%)
In single complete denture cases	365 (43.0%)	205 (24.1%)	208 (24.5%)	71 (8.4%)
In patients with uncontrolled diabetes mellitus	376 (44.3%)	165 (19.4%)	189 (22.3%)	119 (14%)
For patients with neuromuscular disorder	296 (34.9%)	196 (23.1%)	90 (10.6%)	267 (31.4%)

by Haralur et al that MPO should be preferred in patients with severe neuromuscular disorders and in patient with poor muscular control as it accommodates for irregular mandibular movement. [21]

Moreover, Rangarajan et al believed that there is no balancing contact on non-working side during mastication hence the forces distributed on both sides are uneven[4]. Therefore, there is no clinical evidence to support BBO as the ideal occlusion in complete denture cases. Studies have also shown that it does not improve masticatory efficiency and has little impact in clinical outcomes and patient satisfaction. [6, 22]

The principles of teeth set-up in LGO, according to various authors includes placing the maxillary lingual cusps in articulation with the central fossa of the mandibular teeth, with the buccal cusps kept out of occlusion.[4,19,20] In addition, it offers multiple advantages that include cross-arch stabilization and improved patient comfort, as only lingual cusps are kept in contact which reduces the potentially damaging lateral forces.[2] This scheme also allows the vertical forces to be centered on the mandibular ridge, hence, providing improved denture stability and help maintains soft and hard tissues.[9, 15] According to resources LGO has better masticatory efficiency, improved patient comfort and increased chewing efficiency when compared to BBO. [23] At the same time researchers found that patients preferred it due to increased masticatory efficiency and improved esthetic in comparison to MPO. [24] Our results showed that LGO was the preferred choice by majority of candidates in cases of highly resorbed ridges (30.6%) This disagrees with Jones et al,[8] who stated MPO is more advantageous in such conditions, as it eliminates the potentially damaging horizontal forces, providing increased stability. But if this situation exists along with high aesthetic demand, then LGO should be preferred. [4,19] Approximately 31.1% of candidates in our study felt LGO was ideal in patients with skeletal class 2 and 40.25% for patients with skeletal class 3. But again, Jones et al[8] argue that MPO is better choice as compared to LGO. LGO can be used effectively when a complete denture opposes a removable partial denture as in combination syndrome and in displaceable supporting tissue. [24] 23.1% of our candidates thought LGO would be ideal in cases of Parkinsonism which agrees with authors that state in mild cases of neuromuscular disorders such as Parkinson's, LGO offers better esthetics and masticatory efficiency, less distortion and limited lateral movement. [21] On the other hand, MPO has multiple advantages according to Jones et al, which includes their ability to preserve alveolar bone, elimination of horizontal forces and imparts a sense of freedom to the patient as it doesn't lock the mandible in one position. It is indicated in cases of severe ridge resorption, due to flat cuspal inclines reducing the destabilizing horizontal forces. [9] It is also more adaptable to unusual jaw relationships such as skeletal class 2 or class 3. [8] MPO has been preferred in patients with severe neuromuscular disorders and in patient with poor muscular control as it accommodates for irregular mandibular movement. [21] In our study MPO was deemed as the most suitable occlusion by majority of candidates solely in cases of decreased inter-arch space (26.5%), though according to Zarb et al monoplane occlusion is ideal for uncoordinated muscular movements and severe cases of parafunctional habits[15] though it has the disadvantage of decreased masticatory efficiency and compromised esthetics. [4]

In our study CGO was thought to be the ideal occlusion by majority of our candidates in cases of highly resorbed ridges accompanied by high aesthetic demand. This disagrees with Rangarajan at al and Kamath et al who have stated that in this clinical scenario LGO would be preferred [4,19]. Authors used to believe that CGO would impair masticatory function due to the oblique forces, resulting in trauma and ulceration. However, Brandt S et al concluded that canine guidance can be recommended as a comfortable alternative to bilateral balanced occlusion for complete dentures. [25] Similarly, Farias, et al, showed no difference in outcomes between CGO and BBO. [6] BBO complicated and time-consuming construction compared to CGO. Studies have shown that patients preferred CGO in terms of chewing ability when compared to other occlusal concepts. [25] It can be successfully used in mandibular denture, providing adequate retention, aesthetic appearance and chewing ability. The relative ease of the procedure associated with canine guided occlusion, along with improved masticatory efficiency and clinical outcome when compared to BBO, makes it a rational recommendation as an occlusal concept in complete denture patients. [4, 11]

No such study about the knowledge and attitude regarding the concepts of complete denture occlusion amongst dental fraternity has been conducted yet. Moreover, our study along with assessing the concepts of complete denture occlusion of dental fraternity also provided an update for clinician about CG occlusal scheme prescription in future restorative procedures. The limitations of our study included the lower ratio of specialist as compared to graduates or post graduate trainees and had a small sample size that represented a limited population. Further studies with a larger sample size and equal participation of consultant, specialists and dental practioners from both genders are required.

CONCLUSION:

It was concluded that lack adequate knowledge of occlusal schemes in terms of prescription in complete denture patients. A significant difference between the education level and knowledge of occlusal schemes was found amongst the participants. Therefore, awareness of various occlusal schemes should be increased at undergraduate level. Moreover, the importance of choosing an occlusal concept according to the clinical scenario should be emphasized.

Authors Contribution:
Maria Shakoor Abbasi: Conception and design, Manuscript writing
Naseer Ahmed: Statistical analysis, Final review
Azad Ali Azad: Critical review, Final review
Fatima Fouad: Manuscript writing, Literature review
Hamza Daudpota: Data collection, literature review
Mina Farooq: Data collection, literature review
Adil Bin Irfan: Data collection

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Orginal Article

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Diagnostic Accuracy of Elastography in Differentiating Benign from Malignant Thyroid Nodules Taking Fine Needle Aspiration Cytology as Gold Standard

Ameet Jesrani, Marya Hameed, Naveed Ahmed, Pooja Devi, Abdul Baseer

ABSTRACT

Objective: To evaluate the diagnostic accuracy of Strain Elastography in differentiating benign from malignant thyroid nodules taking fine needle aspiration cytology as gold standard.

Study Design and Setting: It was a cross sectional study conducted at Radiology department of Jinnah Postgraduate Medical Centre, Karachi from May 2019 to June 2020

Methodology: Total 586 patients with complaints of swelling in region of thyroid gland were enrolled in study on which Strain Elastography was performed using linear transducer with ultrasound frequency of 7.5 MHz. The results of strain Elastography were compared with histopathology. All the information was recorded into predesigned proforma. Chi-square test was used for comparison among categorical variables and when it has not worked then imitation of Monte Carlos was applied and to see agreement among various categorical variables Kappa statistics were performed. Level of statistical significance was accepted as $P < 0.05$.

Results: The sensitivity of 100%, specificity of 80.2%, positive predictive value of 61.7%, negative predictive value of 100%, and diagnostic accuracy of 85% of elastography was calculated in differentiation among benign from malignant thyroid nodules.

Conclusion: Strain elastography is noninvasive technique which can be used to characterize thyroid nodules and helps in differentiating benign from malignant thyroid nodules and can limit the utilization of invasive technique like FNAC and helps in selection of patients which needs surgery.

Keywords: Benign, Histopathology, Malignant, Noninvasive imaging, Strain Elastography, Thyroid Nodules

How to cite this Article:
Jesrani A, Hameed M, Ahmed N, Devi P, Baseer A. Diagnostic Accuracy of Elastography in Differentiating Benign from Malignant Thyroid Nodules Taking Fine Needle Aspiration Cytology as Gold Standard. J Bahria Uni Med Dental Coll. 2021; 11(2):70-75 DOI: https://doi.org/10.51985/OLBL1894

INTRODUCTION:

Nodules in thyroid gland are widespread and present as solid or cystic lumps in the population and are predominantly non-cancerous and sometimes as cancerous nodules. Depending on the populace and the approach used, its occurrence will vary and reports are showing increasing trend in their prevalence. [1] Nodule occurrence increases with age and is increased in women, in human beings with iodine deficiency, and after radiation exposure to head and neck. Some reports showing that their prevalence vary in accordance with physical examination they noted in 2 to 6% of population, in 4-8% by palpation method in adults, while by ultrasonography they noted in 10 to 41% of population and on data of autopsy their prevalence is 50% (8 to 65%). [2] Cytology/histopathology must be performed before surgery to diagnose thyroid nodules and distinguish between benign and malignant nodules. High-resolution thyroid ultrasound and real-time elastography are adjuvant presurgical tools in selecting patients for surgery, particularly those with uncertain or non-diagnostic cytology. [1]

Elastosonography is a new advanced dynamic approach that can estimate the hardness of tissues by ultrasound (US). This is achieved by measuring the degree of deformation under the action of external forces. This technique is based on the following principle: when compressing body tissue, the softer parts are more likely to deform than the hard parts. Strain US elastography technique is based totally on low-frequency compression of the tissue, that is typically implemented manually through the handheld ultrasound

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Received: 28-10-2020
Accepted: 16-03-2021

transducer (additionally referred to as freehand EUS).The principal precept of strain EUS is based on a compressive force applied to tissue inflicting axial tissue displacement. Tissue stiffness is calculated by way of comparing the echo sets earlier than and after the compression. Ultrasound elastogram is displayed on the B mode image in a color scale that tiers from red for components with the greatest elastic strain (i.e. the softest component), to blue for components without elastic strain (the hardest component).[2] Currently nodules in thyroid gland are assessed by comparing the elasticity in tissues by method called Elastography. [3] The two kinds of elastography being utilized in scientific practice are Strain and Shear wave elastography (SWE). [4] Strain elastography can evaluate two kinds of elasticity, first, according to the 4-5 scoring system and secondly there is visual scoring by color coding in the nodules and around the nodules. Second, the area of interest is designated as the target area and the adjacent reference area. After that, the strain ratio is automatically calculated by elastography.

A higher strain ratio leads to a higher probability of malignancy. [4] SWE can obtain a quantitative elastic value based on stimulus of tissue by sound waves. So nodules in thyroid gland can be evaluated by acoustic radiation and shear wave techniques by ultrasonography. [5] Strain elastography is used to characterize thyroid nodules.[6] They are very common in population and are found in 50% of ultrasound examinations. Most nodules are benign, with approximately 5% to 10% of malignancy.[6] Firm or hard consistency upon palpation is associated with an increased risk of malignancy as reported in recent consensus. [7] Fine needle aspiration cytology (FNAC) is the best single test for differentiating malignant from benign thyroid lesions. The major limitation of FNAC is that 10% to 15% of specimens are non-diagnostic or indeterminate. In addition, there are reports that the elastography technique to evaluate the stiffness of nodules has recently been put into practice. It overcomes the limitations of traditional Color Doppler and Gray scale sonography and improves specificity, so it is expected to be used to identify malignant lesions. [8] Due to subjective interpretation, strain elastography provides operator-related results, while SWE is operator-independent; however, the verification of this method requires further research.[6] After Rago et al.,[9] proposed use of noninvasive elastography as a latest technology for diagnosing thyroid cancer in 2007. These evaluation methods are based on the use of different scoring systems. The FNAB results of thyroid nodules or different patient groups were evaluated by pathological comparison of elastography. [10, 11, 12, 13, 14]

The rationale of this study is to highlight the use of new technique along with its advantages as noninvasive technique in evaluation of thyroid nodules demonstrate the availability, advantages, and predictive values of noninvasive strategies like strain elastography and to confirm cytology as to reduce the number of patients who need to refer to invasive diagnostic methods or who might go through surgical operation. Therefore; this study was aimed to evaluate the diagnostic accuracy of Strain Elastography in differentiating benign from malignant thyroid nodules taking fine needle aspiration cytology as gold standard.

METHODOLOGY:

This study was done from May 2019 to June 2020 in radiology department of Jinnah Postgraduate Medical Centre, Karachi. Total 586 patients by nonprobability consecutive sampling technique with complaints of swelling in region of thyroid gland were included. Age of patients was ranged from 25 to 65 years with mean age 35.5 + 10 years of both genders referred from Outpatient Department of ENT clinics. Complete clinical evaluation and necessary laboratory investigations like CBC, Thyroid profile including (T3, T4, and TSH levels) PT, APTT and INR were carried out. All those patients were excluded who did not show will for biopsy or left the hospital against medical advice or referred to other hospital. Considering sensitivity and specificity of strain elastography to diagnose benign and malignant thyroid nodules sample size was calculated in this cross sectional study after taking informed consent from ethical committee department.

Various characteristics of 586 nodules were evaluated in this study like their size, halo, echogenicity pattern and calcifications were noted on both Color Doppler with Elastography and gray sale ultrasonography by using (TOSHIBA; GRE, Germany) ultrasound machine with high frequency (7.5 MHz) linear array transducer. Evaluation done by senior radiologist having more than 5 years of experience and was unaware of fine needle aspiration cytology results.

Four patterns were evaluated and so as nodules were categorized by elastography. When whole of the nodule has softer areas as tissue strain in comparision with surrounding tissue, it is labelled as pattern 1. When a nodule has almost softer areas while fewer harder areas (coded blue), it is labelled as pattern 2. Pattern 3 labelled when most of the nodule has harder areas and pattern 4 when almost whole of the nodule has harder areas (coded blue) as compared to surrounding tissue values. FNAC was done which evaluated 444 nodules as benign and 142 as malignant. In order to obtain sensitivity and specificity of strain elastography for thyroid nodules SPSS 21.0 was statistically used. Frequency and percentage was calculated for qualitative variables like complains of patients, elastography and fine needle aspiration cytology findings frequency and percentages were calculated.

For quantitative variable like age of the patient mean + SD was computed. Sensitivity, specificity, PPV, NPV were calculated to obtain diagnostic accuracy of strain elastography taken fine needle aspiration cytology findings as gold standard. Chi-square test was used for comparison among categorical variables and when it has not worked then

imitation of Monte Carlos was applied and to see agreement among various categorical variables Kappa statistics were performed. Level of statistical significance was accepted as $P < 0.05$.

RESULTS:

Various features are demonstrated in Table 1 and Table 2 of both malignant and benign thyroid nodules like in terms of size there was no significant difference noted while features like hypoechogenecity, microcalcifications and absent halo was more pronounced in malignant thyroid nodules. Similarly the pattern 4 of elastography and central vascularity were more highlighting the presence of malignancy in nodules.

Hypoechogenecity, microcalcifications, absent halo and central vascularity increases the chances to be malignant by 3.8, 7.7, 11.5 and 5.8 times respectively, Table 2.

Figure 1 is showing almost complete harder area (blue) in thyroid nodule which is highly suggestive of malignant thyroid nodule. FNAC was done which showed solid sheets and nests of atypical cells, features of medullary carcinoma of thyroid gland.

Figure 2 is showing most of the area in thyroid nodule is green to very lighter blue and specks of reddish areas as well (softer areas mostly) which signifies the findings as most likely of benign thyroid nodule. FNAC was done which showed closely packed follicles devoid of colloid and surrounded by thick capsule, features of benign follicular adenoma. Table 3 and Table 4 showing distribution of thyroid nodules and statistical analysis respectively. Figure 1**:** Strain elastography showing almost complete harder area (blue) in thyroid nodule which is highly suggestive of malignant nodule which is proved by FNAC (High-power view showing a neoplastic lesion composed of solid sheets and nests of atypical cells separated by richly vascularized stroma, in a case of medullary carcinoma of thyroid gland. (HE, ×200).

Figure 2: Strain elastography showing almost complete softer areas (green, very light blue and specks of red areas) which are highly suggestive of benign nodule which is proved by FNAC (Low-power view showing neoplastic lesion of thyroid composed of closely packed follicles devoid of colloid and surrounded by thick capsule. Surrounding compressed thyroid tissue is seen. Features are of follicular adenoma of thyroid. (HE, ×40).

Table 1: Features of malignant and benign thyroid nodules

Characteristics of nodule	Benign nodule (n=444)	Malignant nodule (n=142)	*P**
Nodule size	24(5-70)	26(3-45)	
Presence of halo			
No	96(21.6)	108(76.1)	<0.001
Yes	348 (78.4)	34(23.9)	
Presence of microcalcification			<0.001
No	392(88.3)	70(49.3)	
Yes	52(11.7)	72(50.7)	
Echogenicity			
Isoechoic	158(35.6)	18(12.7)	<0.001
Hypoechoic	286(64.4)	124(87.3)	
Doppler patterns			
No remarkable Vascularity	56(12.6)	6(4.2)	
Peripheral vascularity	146(32.9)	38(26.8)	0.013
Peripheral+central Vascularity	168(37.8)	52(36.6)	
Central vascularity	74(16.7)	46(32.4)	
Elastography			
Pattern 1	26(5.9)	0	<0.001
Pattern 2	330(74.3)	0	
Pattern 3	88(19.80	64(45.1)	
Pattern 4	0	78(54.9)	

*Chi square test

DISCUSSION:

Ultrasound examination is the main diagnostic tool for detecting and examining thyroid nodules.

According to reports, Doppler ultrasound is has high sensitivity in differentiating benign from malignant thyroid nodules[6] and some features like absent halo, microcalcifications, hypoechogenicity, irregular borders, and growth patterns of the mass, with anterior and posterior greater than medial-lateral increases likelihood. According to reports, these features detectable through the ultrasound are sensitive, but not specific enough. [6] It was pointed out that in thyroid malignancy stiffness in nodules is an independent predictor.[7]

Evaluation by elastography becomes challenging when there is difference of opinion among interobservation among interobservers. Such type of variability was pointed out by Ko et al [15] when he observed that physicians with lack of experience and those with good experience have difference of opinion among them in evaluating difference between benign and malignant thyroid nodules by elastography and reported that experienced physicians have higher specificity in such cases. In another study, for the consistency between observers, Cantisani et al. [16] reported the Coen Kappa coefficient (0.95) with the highest strain ratio measurement and the Cohen Kappa coefficient (0.83) with the lowest echogenicity score. There was a study conducted by Ragazzoni et al. [17] who observed good agreement among three different operators and that was (kappa test: 0.64, P <0.0001). In this study, the two examiners' scores were almost perfect compared to the final score (the first examiner's kappa value was 0.835, and the second examiners' kappa value was 0.815).

Various studies have been conducted on elastography for evaluation of thyroid nodules, one such study[18] has shown

Table 2: Risk factors for malignancy; OR: Odds ratio, CI: Confidence interval

	P	OR	95% CI	
			Lower limit	Upper limit
Echogenicity (hypoechoic)	<0.001	3.806	1.796	8.066
Presence of microcalcification	<0.001	7.754	4.173	14.407
Absence of halo	<0.001	11.515	6.121	21.660
Doppler pattern (no remarkable vascularity)	0.018			
Peripheral vascularity	0.179	2.429	0.667	8.854
Peripheral = Central vascularity	0.101	2.889	0.812	10.280
Central vascularity	0.008	5.802	1.582	21.276

Figure 1:

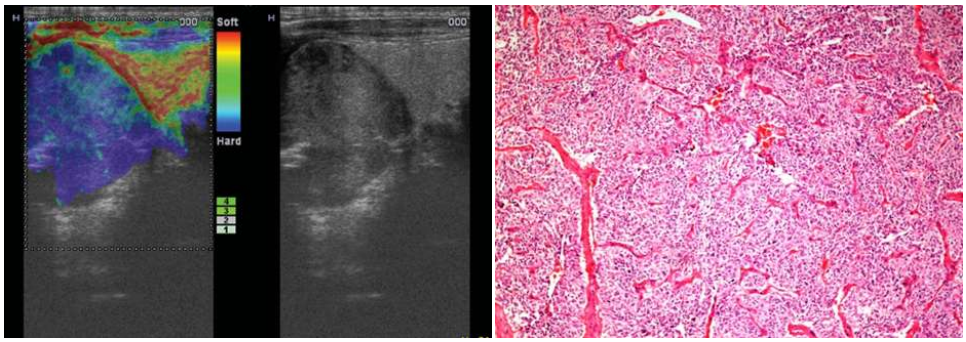

Figure 2:

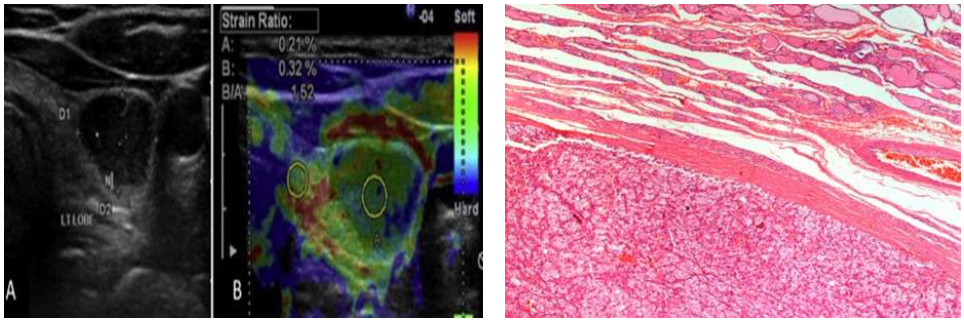

Table 3: Elastographic characterization of benign and malignant thyroid nodules

Elastography	Fine needle aspiration cytology	
	Benign, n (%)	Malignant, n (%)
Benign pattern (pattern 1+2)	356(100)	0
Malignant pattern (pattern 3+4)	88(38.3)	142(61.7)

Table 4: Statistics of elastography. (CI: Confidence interval, NPV: Negative Predictive value, PPV: Positive predictive value)

		Lower limit	Upper limit
Sensitivity	100%	93.6	100
Specificity	80.2%	74.2	85.1
PPV	61.7	52.2	70.5
NPV	100%	97.4	100
Accuracy	85%	80.4	88.9

the sensitivity 92%, and specificity 34% and positive predictive value (PPV) 85.4% and negative predictive value (NPV) 72.3% and accuracy 73%. while evaluating benign and malignant lesions. In a local study [19], ultrasound specificity, sensitivity, positive and negative predictive values, and accuracy for differentiating benign from malignant nodules were 93.2%, 93.8%, 81.1%, 98%, and 93.3%, respectively. Ragazzani et al, [17] observed sensitivity of 85%, specificity of 83.7%, positive predictive value of 69.3% and negative predictive value of 92.7% while evaluating 77 out of 92 lesions as benign scored 1 0r 2 and 34 out of 40 lesions as malignant scored 3 or 4. The sensitivity of 97.3% and specificity of 91.7% was observed in study done by Cantisani et al [20] on elastography on 97 patients and observed the increased probability of malignancy in nodules having >2 strain ratio. In one study of Cantisani et al [21] he reported more accuracy of elastography in comparison to color Doppler findings. Mansour and Schwebel [22] observed sensitivity of 75.4%, specificity of 85.5%, positive predictive value of 71.4%, negative predictive value of 90.5% and diagnostic accuracy of 86.7% and report that when used with high-resolution ultrasound, the diagnostic performance of elastography will improve.

Bojunga et al. [23] conducted a meta-analysis of studies that distinguish benign and malignant thyroid nodules by evaluating real-time elastography and observed the significance of elastography for patient's candidates for surgery. With overall average sensitivity of 88-96% and specificity of 85-95% in a meta-analysis of 8 studies for 639 thyroid nodules proved high sensitivity and specificity for malignant nodules and excluded patients for invasive procedure which have elasticity score of 1. The sensitivity of 100%, specificity of 95%, positive predictive value of 40% and negative predictive value of 100% was observed in study done by Akcay et al [24] who used the ultrasound elastography technique to evaluate 110 nodules through the stiffness score and considered cutoff value of 4 for malignancy and achieved such sensitivity and specificity. This study also showed nodules with sore of 1 and 2 found to be benign while nodules with score of 3 and 4 found to be malignant. "Compared with studies in the literature, our research population is large." The sensitivity of 100%, specificity of 80.2%, positive predictive value of 61.7%, negative predictive value of 100% and diagnostic accuracy of elastography is 85.0%.

The main limitation is that the patient's definite diagnosis is made by fine needle aspiration cytology and not by surgical findings and histopathology which may have yield more accurate results and thus may have provided more sensitivity and specificity for elastography.

CONCLUSION:

Strain elastography is noninvasive technique which can be used to characterize thyroid nodules and helps in differentiating benign from malignant thyroid nodules and can limit the utilization of invasive technique like FNAC and helps in selection of patients which needs surgery.

Authors Contribution:
Ameet Jesrani: Study design and concept, data analysis, data interpretation, initial and final drafting of manuscript and critical revision of manuscript.
Marya Hameed: Data collection.
Naveed Ahmed: Questionnaire design.
Pooja Devi: Initial drafting of the manuscript
Abdul Baseer: Initial drafting of the manuscript

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Medical Education - Orginal Article

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E-Learning Experience of Medical and Dental Students from Private Colleges of Karachi, During COVID-19

Sumera Saeed, Beenish Shah, Asma Basharat Ali, Asma Shahid, Ayesha Anis, Batool Sajjad

ABSTRACT:

Objectives: To evaluate the IT aptitude of medical and dental students. The secondary objectives were to identify IT related issues faced by students during e-learning sessions,to asssess the perception of e-learning among students and to assess the perception of different e-media among students.

Study design and Setting: A cross-sectional study was conducted among randomly selected MBBS and BDS students of various private Medical and Dental Colleges of Karachi, affiliated with the same University.

Methodology: The sample size was calculated to be 442. Students from the first year to the final year were approached to fill the online pre-tested questionnaire. The data collected was analyzed using SPSS, Version 21. Confidentiality and privacy of the data were maintained. Ethical approval was taken from the relevant boards.

Results: Out of 446 participants, 57.62% were from MBBS and 42.3% were from BDS. 96.41% of students were taking their online classes from their home. Most of the students (56.7%) preferred mobile phones for these sessions and used broadband or local area network internet connections (55.59%).

Conclusion: Uninterrupted network connectivity is crucial for the effective implementation of a Virtual Education Program. The Medical and Dental Colleges of a developing country like Pakistan, have a long way to go but with the development of a technologically sound infrastructure, e-learning can prove to be successful in the future

Keywords: COVID-19, e-learning, Distance learning, Online learning, Medical and Dental students, Social distancing, Teaching modalities, Virtual learning environment

How to cite this Article:
Saeed S, Shah B, Ali AB, Shahid A, Anis A, Sajid B. E-Learning Experience of Medical and Dental Students from Private Colleges of Karachi, During COVID-19. J Bahria Uni Med Dental Coll. 2021; 11(2):76-80 DOI: https://doi.org/10.51985/DAHJ2908

INTRODUCTION:

The COVID-19 pandemic has sneaked up on the world forcing many nations to enforce a complete lockdown. The public health workforce has urged governments around the globe to encourage "Work From Home" and "Social Distancing".[1] This situation has affected the education system worldwide leading to the closure of schools, colleges, and universities alike.[2] Most of the teaching institutes decided to use distance learning, online programs to continue and complete the planned curriculum.[3,4] Although in the last decade or so, there had been many suggestions but no successful inculcation of e-learning in the Medical and Dental institutes of Karachi, and with the current lockdown, many of these institutes has been done. With no choice but to resort to e-learning with very little guidance to refer to.[5] E-learning methods provide a medium for the transmission of information and skills using electronic applications.[6] Various online learning tools and applications have been explored for their effectiveness in teaching and learning.[7,8] Studies have proved that along with the presence of tools and applications, technological accessibility and a good internet connection are essential in making online learning a success.[7,9.]

The switch from Traditional Learning Environment to Virtual Learning Environment (VLE) is not an easy one. It requires not only the latest gadgets and devices, proper internet connection, and recording facilities but also techno-savvy faculty and students and infrastructure to facilitate online

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Received: 10-01-2021
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teaching and learning.[4]

Medical and Dental Colleges' administrators and teachers are taking appropriate measures to conduct effective e-learning via e-lectures, e-tutorials, case-based e-learning, etc. so that continuous education can be provided without getting much affected during the quarantine period.[7,8,10] Therefore, the objectives of our study were to evaluate the IT aptitude of medical and dental students. The secondary objectives were to identify IT related issues faced by students during e-learning sessions,to asssess the perception of e-learning among students and to assess the perception of different e-media among students.

METHODOLOGY:

A cross-sectional study was conducted among randomly selected MBBS and BDS students of various private Medical and Dental Colleges of Karachi, affiliated with the same University.

The face and content validity of the questionnaire was established through expert opinions of Medical Educationists and pilot testing which was done to pre-test the questionnaire among the sample of 40 students and they were not included in the main study. Necessary changes were made in the questionnaire. Cronbach's alpha (0.8) was used to measure internal consistency.

The sample size was calculated to be 442 (using Calculator.net) with a 95% confidence interval and a 5% error margin. All the registered students from the first year to the final year were approached to fill the online pre-tested questionnaire. Students who consented to participate, their responses were collected. Confidentiality and privacy of the data were maintained. Ethical approval was taken from the relevant boards. Medical & Dental students taking online sessions during COVID-19 lockdown were included in the study. Students who did not agree to participate were excluded. The data collected was entered and analyzed using the statistical package SPSS, Version 21. Since the data was collected through convenient sampling and normality was not known, the non-parametric tests (Mann-Whitney U and Kruskal Wallis test) were applied for the analysis.

RESULTS:

The survey was conducted among 446 students of all years of MBBS & BDS, in different Medical and Dental colleges affiliated with the same University thus following the same curriculum. In this survey 57.62% MBBS and 42.38%, BDS students participated. The age of the students ranged from 17-28 years with a mean age of 20.29+1.6. Out of these participants, 64.35% were females and 35.65% were males.

During COVID-19 enforced online learning sessions 96.41% of students were taking their classes from their home whereas 3.59% of students were attending their classes either from the hostel or from some relative's house.

In most of the institutes (74.7%) Zoom video conferencing application is being used for student's online sessions whereas 22.2 % of the students attended recorded lectures either through college portals or direct through YouTube recordings .for e-learning session. Many students preferred smartphones (56.7%) for their online learning sessions whereas 21.5% students use laptops and 12.5% use both laptops and smartphones for their sessions. Around 46% of students faced internet disruption multiple times a day which affects their learning process. However, 42% of students faced internet disruption one to two times a day or in a week. A few students around 12% said that they never had internet disruption. The internet disruption was found to be more evident with a signal-based internet connection (44.6%) while the most consistent one was Optical fiber which was least disrupted (4%) but was used by the least amount of students. Where significant value á =0.05 and grouping variable: Discipline scale

From this data, it can be concluded that teaching using images was more beneficial for learning in the MBBS than it was in BDS. It was proven through the Mann-Whitney U test where the result was statistically significantly higher in MBBS (U = 20817, p = .007). A Kruskal-Wallis H test showed that there was a statistically significant difference in improvement in learning through e-learning among the different academic years of BDS, (Chi-square = 12.697, p = 0.005), with a mean rank in improvement in learning through e-learning of 91.78 for the First Year, 114.00 for Second Year, 100.20 for Third Year and 70.21 for fourth Year BDS. A Kruskal-Wallis H test showed that there was a statistically significant difference in improvement in learning through e-learning among the different academic years of MBBS, (Chi-square =14.565, p = 0.006), with a mean rank in improvement in learning through e-learning of 213.96 for First Year, 230.10 for Second Year, 262.04 for Third Year and 190.98 for fourth Year and 170.65 for final year.

As for the benefit of these sessions, the majority (53.3%) of students agreed that these online classes have proved beneficial during the COVID-19 lockdown.

DISCUSSION*:*

Pakistan with its first reported case of COVID 19 on 24th February 2020, was quick to close down its educational institutes on 27th February, 2020.[11]The lockdown was further imposed in phases by March.[11] It allowed students to move back to their homes promptly, owing to the 96.41% of students attending online lectures from home. A similar condition happened in neighboring countries where educational institutions were closed first and later on lockdown was imposed in the country.[10] The situation is quite the opposite for other countries where sudden lockdowns were imposed.[4,12]

By mid-March, most of the Universities including medical institutions and their affiliated colleges adopted Virtual

Figure 1: Shows the internet connection preferred by students during E-learning session

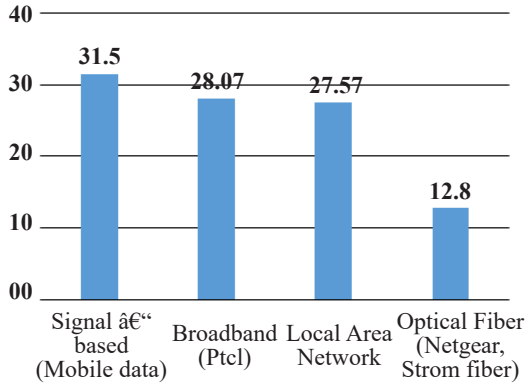

Table 1: Comparison between different e-learning media used for MBBS and BDS students

Use of images in lectures	Demonstration videos	Recorded lectures	Live lectures	Live discussion / tutorial
20817.5	23529.50	22263.5	22013.5	21627
0.007	0.557	0.121	0.407	0.256

Table 2: e-learning among the different academic years of BDS

Kruskal Wallis Test

	e-learning improved my learning
Chi-square	12.69
df	3
Asymp. Sig.	0.005

Grouping Variable: New Acad Year

Table 3: e-learning among the different academic years of MBBS

Kruskal Wallis Test

	e-learning improved my learning
Chi-square	14.56
df	4
Asymp. Sig.	0.006

Grouping Variable: New Acad Year

Learning Environment (VLE). VLE learning can be either commercial or open-source.[13]VLE includes Asynchronous, Synchronous, and blend of both. A lot of institutions went out for Synchronous e-learning via open sources due to their financial constraints.[3,14]Multiple applications were used for this purpose such as Google Classroom, TEAMS, Google Hangouts, and Zoom video conferencing service.[15,16]Zoom was the most commonly used one in medical institutions as was evident in our study where 74.6% were attending a blend of synchronous and asynchronous learning through live Zoom Session as well as their recordings. The remaining 22.2 % of the students are attending asynchronous eLearning via recorded lectures either through college portals or directly by YouTube recordings.

Mobile phones were the device of choice among our students (56.7%) which was comparable to the study conducted in Turkey (2016) where 95.5% of students preferred smartphones.[17] This preference of smartphones over desktops/laptops was due to its flexibility of use anywhere and anytime as well as it being a cheaper gadget as compared to Desktop/laptop which was proven in a study done in Pakistan.[18]

The success of e-learning adoption is also highly dependent on technological accessibility and good internet connection(Saudi and others). Previous studies have reported that connectivity issues limited the use of e-learning.[19,20] There are various forms of internet connections available in Karachi: broadband, Local Area Network, 3G or 4G mobile connection, and Optical fiber network. The data showed 55.59% of our students used broadband and Local Area Network and 31.8 % used 3G or 4G mobile connection. Signal-based internet connection (3G/4G) was linked more with connectivity problems (44.6%) as compared to Optical fiber network (4%), which was used by only 12% of our students. Most of the students (46%) faced multiple disruptions per day while few students (24.9%) faced fewer disruptions in connectivity per day.

The skills enhancement and development program for educators and learners to use technology in education is an important factor for the success of e-learning as discussed in other studies.[7,9,24,25]

Students in this study reported a greater perceived level for computer skills and learning management systems similar to a study conducted in Saudi Arabia.[26.]

This study shows that using more images for e-lectures helps students for better understanding of lectures as some articles also considered the images to be one of the important media which can enhance the retention of information and its retrieval. Hence it should be used accordingly to create interest. These images can be accompanied by scarce bulleted text.[27]

E-learning has a well-established role in medical education and it is effective in enhancing learning and is well accepted by students.[28] Table 2 and 3 of the results of the survey also show the significant improvement in learning through e-learning among the different academic years of medical and dental students.

According to our survey, 53.3% of students agreed that online sessions proved beneficial during COVID-19 lockdown. The studies that were done in 2016 and 2019 in Pakistan also showed a willingness to adopt online learning among students.[21,22]The inculcation of e-learning is dependent upon a proper technical infrastructure with the availability of high-speed, uninterrupted internet connection to the students as well as appropriate use of different e-learning media to deliver information. [23]

The limitations of this study were that the government institutes were not included and since it was online survey participation by all students could not be ensured. The technological capabilities of the students were not taken into consideration and the reason for the preference for using mobile phones was not explored.Further studies on comparison among different undergraduate years regarding willingness to adopt online learning are required.

CONCLUSION:

Students found the online sessions useful during the COVID19 lockdown. Uninterrupted network connectivity is crucial for the effective implementation of a Virtual Education Program. The Medical and Dental Colleges of a developing country like Pakistan has a long way to go but with the development of a technologically sound infrastructure, e-learning can prove to be successful in the future. Using different e-learning media improves understanding of a topic**.** The training of students in regards to Information and Communication Technology (ICT)plays an important role in the success of online teaching.

Authors Contribution:
Sumera Saeed: Conception or design of study, revision and final approval
Beenish Shah: Conception or design of study, analysis, revision and final approval
Asma Basharat Ali: Conception or design of study, revision and final approval
Asma Shahid: Conception or design of study, interpretation, revision and final approval
Ayesha Anis: Drafting the work, data collection
Batool Sajjad: Drafting the work, data collection, revising the work critically for important intellectual content

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Dietary Habits, Perceptions and Barriers Among Government and Private College Intermediate Students in Karachi: A Cross-Sectional Survey

Mariam Rashid, Sabeela Noor, Khadija Abdus Salam, Ramsha Irfan, Ayesha Siddique

ABSTRACT

Objective: To determine differences in eating practices, perceptions, and perceived barriers among intermediate students of government and private sectors in Karachi.

Study design and setting: A cross-sectional study was conducted in six intermediate colleges of Karachi from October to December 2018.

Methodology: Total N=390 students aged 16-24 years were selected via non-probability convenience sampling. The study team developed a questionnaire to assess the dietary habits and barriers among the students.

Results: Mean BMI of government college students was 20.41 ± 4.15 kg/m^2 while that of private college students was 22.25 ± 5.43 kg/m^2. The proportion of underweight participants was higher (36.8%) in government college students, and overweight students being higher in private (23.8%). Similar responses were recorded for daily meals and weekly fast-food and fruit consumption. Skipping meals was found out to be a common practice among students. Breakfast was most commonly skipped meal among both groups (23.9% & 39.2%, respectively). Watching television during meals was common in both groups (58.7% & 67.7% respectively). The majority of the students from both groups did not familiar with the term body mass index BMI (84.6% & 82.5%, respectively). Smoking was more common among the private sector, 16.9%, compared to 3.5 % of the government sector. Fruit juice was considered a healthier option (58.7% & 52.9%, respectively). Similarly, white bread against bran bread was perceived healthier by the majority in both groups (70.1% & 59.3%, respectively). Carbohydrate was reported as a major nutrient in the diet by (51.7% & 57.1% respectively). Factors like educational stress, time, will-power to maintain the diet, availability of junk food, and climate were some of the significant influencers of diet/lifestyle recorded.

Conclusion: Students from both groups shared similar eating and lifestyle practices irrespective of their educational institutes' status.

Keywords: Barriers, College Students, Dietary Habit, Perceptions.

How to cite this Article:
Rashid M, Noor S, Salam KA, Irfan R, Siddique A. Dietary Habits, Perceptions and Barriers Among Government and Private College Intermediate Students in Karachi: A Cross-Sectional Survey. J Bahria Uni Med Dental Coll. 2021; 11(2):81-86 DOI: https://doi.org/10.51985/ECXV5827

INTRODUCTION:

Unhealthy eating habits are a significant public health concern among young adults who experienced the transition into academic life. They are exposed to stress, loads of work, peer pressure, and lack of time.[1, 2] Rapid physical growth and psychosocial development have placed these young adults as nutritionally vulnerable groups with poor eating habits that fail to meet dietary requirements. Some common unhealthy eating patterns among young adults included skipping meals, eating away from home, snacks, and fast-food consumption.[3, 4]

Existing data shows the rising incidence and prevalence of malnutrition among youth.[4, 5] This is due to unhealthy eating and living practices, as most of the college students were not meeting dietary and physical activity guidelines.[4]The average college student gets junk food twice a day as more frequently and easily than any other person. Consequently, young people are a higher rate of morbidity, disability, and mortality from various developmental, behavioral, and environmental risk factors than the general population.[6]

Nutrition is one of the major lifestyle factors related to

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Received: 04-02-2021
Accepted: 22-03-2021

developing many non-communicable diseases (NCDs). [7] Eating a healthy diet and adopting a healthy lifestyle is instrumental in reducing risk factors for several major diseases like; anemia, metabolic syndrome, stroke, myocardial infarction, etc. Some of these have a very high mortality rate. Healthy eating is particularly significant for children and young people for proper growth and cognitive development, preventing major health problems from developing and ensuring a long and healthy life.[8, 9]

In a survey conducted among the college students in California, over half of the subjects rated their diet as poor, with lack of time listed as the topmost barrier to eating well, and breakfast was the most commonly missed meal.[10] Similarly, in one of the local studies conducted in Karachi, there was no difference between medical and non-medical students' perceptions regarding 'work-related stress' in their life. 'Lack of time' was cited as the most reason for skipping meals and being a barrier to exercising regularly among both groups. Based upon their research, the knowledge, attitudes, and practices of medical students in Karachi suggest that superior knowledge about a healthy lifestyle does not necessarily result in better practices.[11]

There are many interwoven factors influencing adolescents eating behaviors, from personal and cognitive factors to parental and media influences.[12] Some important barriers to healthy eating as reported by previous researches are lack of knowledge, lack of self-control, the influence of media, time limitations, cost-effectiveness, lack of cooking skills, social and family pressure, personal preferences, wrong perception about weight, nature of food available at home and school/college, and habits ingrained from childhood.[13-15] Facilitators of a healthful diet included support from family, wider availability of healthy foods, and willpower.[16]

There is a significant difference between the socio-economic status, cultural milieu, and the resources available to the students of the government and private colleges in Karachi.[17] Assessing dietary habits, perception, and the barriers they faced enabled us to determine whether there was any major difference between the two groups.

The results of this study may be utilized to develop better interventional strategies to promote healthy eating by overcoming the identified barriers, and in the long run, to prevent the emerging cases of NCDs related to nutrition.

METHODOLOGY:

A KAP survey was conducted among the students of intermediate colleges of Karachi. A non-probability convenience sampling was used for the primary data. The sample size of 390 was calculated by taking a 95% confidence interval with the range of anticipated proportion of 49% to 55% with a precision of 5 %, using an online OpenEpi calculator.[11]

The participants were students from Government and private intermediate colleges in Karachi, both male and female, aged between 16 and 24. Approval to conduct the study was granted by Jinnah Medical and Dental College's ethics committee, Karachi number: ERB-1019/JMDC dated on October 09, 2018. The study was conducted in six intermediate colleges in Karachi, Pakistan. Three colleges from the government and three from the private sector were visited for data collection after permission, on the colleges' administrations' allotted time and date. The names of colleges are not mentioned for the sake of confidentiality. All the consenting students were included and asked to complete the questionnaire in their classrooms during recess, whereas non-consenting students were excluded from the study. The study was conducted from October to December 2018.

The questionnaires were distributed and recollected by the members of the research team. Prior to questionnaire distribution, students were explained why they were suitable candidates for the chosen research and the goals of the study. The questionnaire was designed by reviewing the literature.[10-12] It consisted of the following four parts: Part (A) included the participants' demographic data. Part (B) was used to assess dietary and lifestyle habits. Part (C) demonstrated the participants' perception of healthy eating. This part also included a picture guide of a healthy eating plate as a reference to some questions. In Part (D), the participants were asked to identify the barriers encountered in maintaining healthy dietary habits.

Weight (kg) and Height (m) of participants were recorded using manual weight and height scale, respectively, and BMI was calculated using the Weight (kg)/height (m^2) formula. The data were analyzed using SPSS (Version 22). Simple statistical techniques were used to tabulate the results of the study. For nominal data mean, median, and standard deviation were recorded while for the categorical data, frequencies and percentages were computed. A Chi-square & fischer exact test was applied to describe the characteristics of the study sample. P value of = 0.05 was considered as statistically significant.

RESULTS:

Demographics:

A total of 390 (Government n= 201 & Private n=189) intermediate college students participated in the study. Male participants (52.7% govt. / 65.1% private) were greater in number than female participants (47.3% govt. / 34.9% private). The response rate was 100%. The mean age for government and private college students (male, female) was 17.05 ± 3.90 and 17.34 ± 1.32 years respectively. The mean BMI of government college students was 20.41 ± 4.15 $kg/m^{2,}$ while that of private college students was 22.25 ± 5.43 kg/m^2. Based on their BMI, participants from both groups were categorized as underweight (below 18.5), normal (18.5-24.9), and overweight (above 24.9). About half of the participants, 50.8% (49.3% govt. / 52.4% private) had BMI

in normal ranges. The proportion of underweight participants was higher (36.8%) in the government college students than private college students (23.8%). The overweight student population was higher (23.8%) in private colleges as compared to that in government colleges (13.9%).

Dietary habits:

The dietary habits and lifestyle of participants were assessed through various questions and presented in table 1. The participants were inquired about the number of meals per day, weekly fast-food and fruit consumption, and daily water intake. Habits like skipping meals, physical exercise, watching T.V during meals, counting calories, and smoking were also assessed. Participants were asked about the effect of stress on their diet and familiarity with the concept of BMI. About half of the students (51.2%) belonging to government colleges reported skipping meals, while the proportion of private college students who skip meals was slightly higher (58.7 %). Breakfast was the most commonly skipped meal among the groups (23.9% /39.2% respectively) followed by lunch (18.4% / 13.2% respectively). During meals, watching television was a common practice, 58.7% for government and 67.7% for private students. The majority of both groups were not familiar with the concept of BMI at all (84.6% / 82.5%). Smoking was reported more by private college students, 16.9%, compared to 3.5 % of government college students.

Perception

This section comprised several questions that helped to assess the perception of participants regarding a healthy diet. In one of the questions, the participants were asked to select the healthier option from the given choices, i.e., healthy vs. unhealthy. The choices were as follows: raw fruit vs. fruit juice, butter vs. margarine, bran bread vs. white bread, cooked food vs. processed food, and milk vs. carbonated drinks. It was found that fruit juice was perceived healthier than raw fruit (58.7% / 52.9%). Similarly, white bread against brown bread was cited as a healthier option by many among both the groups (70.1 % / 59.3 %). On inquiring about the major nutrients, carbohydrate was reported as a major nutrient of diet by many (61.2 % and 61.4 %).

Table-1: Comparison of dietary habits of the study population

Parameters	Government% n = 201	Private % n = 189	P Value
Meals/day			
3 or less	49.3	61.9	0.043*
More than 3	50.7	38.1	
Fast food			
3 or less	75.6	74.1	0.040*
More than 3	24.4	25.9	
Fruit consumption			
3 or less	32.3	44.4	0.222*
More than 3	67.7	55.6	
Water intake			
< 8 glasses	62.2	67.2	0.577*
> 8 glasses	37.8	32.8	
Skip Meals	51.2	58.7	0.083**
Skipped Meal			
None	48.8	41.3	0.012*
Breakfast	23.9	39.2	
Lunch	18.4	13.2	
Dinner	9.0	6.3	
Exercise			
Daily	15.4	19.0	0.149*
Sometimes	67.7	58.2	
Never	16.9	22.8	
Watch T.V	58.7	67.7	0.041**
Count calories	6.5	6.9	0.515**
Smoke	3.5	16.9	0.000**
Stress effects diet?			
Eats more	20.4	23.3	0.783
Eats less	37.3	36.5	
Not affected	42.3	36.9	
Familiar with BMI	15.5	17.5	0.342

*Chi-square
**fishcer exact test

Table-2: Comparison of perception of Healthy Diet

Parameters	Govt. (%)	Private (%)	P Value
Raw Fruit Vs. Fruit Juices			
Raw fruit	41.3	47.1	0.147**
Fruit juices	58.7	52.9	
Butter Vs. Margarine			
Butter	78.6	70.4	0.04**
Margarine	21.4	29.6	
Bran bread Vs. White bread			
Brown bread	29.9	40.7	0.016**
White bread	70.1	59.3	
Cooked food Vs. Processed food			
Cooked food	88.1	91.0	0.217**
Processed food	11.9	9.0	
Milk Vs. Carbonated drinks			
Milk	81.1	70.9	0.012**
Carbonated drinks	18.9	29.1	
Major portions			
Carbohydrates	61.2	61.4	0.192
Fat	22.4	24.9	
Proteins	51.7	47.1	
Fiber	44.8	38.1	
Food at canteen			
Healthy	10.4	7.4	
Junk	89.6	92.6	
Views			
Needs improvement	44.8	56.6	
Fine	49.3	38.1	
Not bothered	6.0	5.3	
Eating Plate			
Almost same	29.9	30.2	0.684
More or less same	48.8	51.9	
Completely different	21.4	18.0	

**fischer exact test

Protein was the second-most reported major nutrient (51.7 % and 57.1 %) followed by fiber and then fat. Food available at college canteens was considered junk food by majority of government and private college students (89.6% & 92.6% respectively). On the illustration of a healthy eating plate through the questionnaire, nearly half of the participants from the government (48.8%) and private (51.9%) reported that their eating plate is "more or less same" to the one provided in the guide. When questioned regarding their dietary habits, around half (49.3%) of government college students considered their eating habits acceptable. In contrast, more than half (56.6%) of the students from private colleges thought that they need improvement in their eating habits.

Barriers

In this section, the participants identified the barriers faced by them in maintaining a healthy diet. Numerous barriers were classified into the following three categories: personal barriers, social barriers, and environmental barriers. Among the personal barriers, lack of will power to maintain a healthy diet (39.3%) and lack of time (53.4%) was the highest reported barrier by government and private college students. Out of various social factors, "Educational stress" ranked highest (51.7% and 56.1 %), which was also the overall highest reported barrier (53.8%). "Easy access to unhealthy food" was recorded as the most commonly faced environmental barrier (44.8% / 51.3%). Refer to the table no. 3

DISCUSSION:

The purpose of this study was to assess dietary practices, perceptions, and barriers to healthy eating among college students in Karachi and to study any differences in these factors concerning the educational institution status of either government or private sector. Our study showed that although the mean BMI was within normal ranges in both groups, about half of the population had abnormal BMI values, more students falling in the underweight category (30.5%). This contrasts with research conducted on college students in Saudi Arabia [18] and Oman [19] that showed a higher percentage of overweight/obese students, 37.5 % and 28.22%, respectively, compared to only 18.7 % overweight/ obese students in our study in Karachi. Underweight students' prevalence was more in government college students, while overweight/obese students were more among private sector students. Past research in Karachi indicated 27% underweight and 22% overweight college students[20]. Another previous study on government sector medical college students in Karachi demonstrated the higher prevalence of underweight students.[21]

Table-3: Perceived barriers to healthy eating by the students

Barriers	Govt. %	Private %	Total%
Personal Barriers			
Lack of motivation	30.8	35.4	33.1
Lack of knowledge	30.8	22.8	26.9
Lack of cooking skills	30.3	32.8	31.5
Lacking will power to maintain healthy diet	39.3	46.6	42.8
Personal preference	32.3	33.9	33.1
Lack of time	32.8	53.4	42.8
Social Barriers			
High cost of food	19.4	21.7	20.5
Depression	20.4	23.8	22.1
Educational stress	51.7	56.1	53.8
Media influence	19.4	30.7	24.9
Influence of family/friend	36.8	37.6	37.2
Environmental Barriers			
Ethnic preference	09.0	11.6	10.3
Climate	42.3	35.4	39.0
Easy access to unhealthy food	44.8	51.3	47.9
No access to healthy food	19.9	13.8	16.9

The comparison of eating habits showed only slight differences between the two groups. In terms of meal frequency, the overall majority reported consuming only three or fewer meals per day, including snacks, the percentage being higher in private sector students than government sector students. The majority of students in both groups consumed fast-food only three or fewer times a week. The majority in both groups reported a weekly fruit consumption of more than three times but, a higher percentage was seen in government sector students. Almost similar frequencies of daily water intake of fewer than eight glasses were found among both groups. Meal skipping was a common practice with breakfast being the most commonly skipped meal of the day among the general student population. These results were consistent with various previous researches identified in a systematic review, demonstrating skipping meals, especially breakfast, a common practice among the youth and students [10, 22]. Exercise patterns did not differ among the two groups, and the majority from both groups found to exercise only sometimes. Watching television was found out to be more common in private sector students. Only a negligible proportion of students in both groups practiced calorie counting. Smoking was more common in private college students as compared to government college students. Almost similar effects of stress on diet were noted in both groups. Generally, students were not familiar with the concept of BMI irrespective of their educational institute's status.

The perception regarding healthy or unhealthy food choices was nearly similar; however, there were slight differences in terms of reported percentages, for example, the larger number of a participants from government colleges considered white bread healthier than brown (bran) bread and similarly, a greater number of participants among private students perceived carbonated drinks as healthy. Likewise, similar responses were noted in both groups regarding major dietary nutrients both in terms of frequency and order of the nutrients. The food usually available at college canteens was considered as unhealthy/junk by the great majority of

both groups. On comparing their usual eating plate with a standard one, the majority from both groups perceived their eating plates as more or less similar to the standard eating plate; moreover, the proportions of students that perceived their eating plate as almost the same or completely different from the standard were also comparable. Despite having about similar eating habits and perceptions, it was seen that more of the private college students believed that they need improvement in their eating habits whilst the majority of government students were fine with their current eating habits. The study explored various personal, social, and environmental factors prevailing in young students that hinder healthy lifestyles and dietary practices. Again, nearly similar percentages were observed between the two groups with slight variations. Among the government institute students, the top three encountered barriers were educational stress, climate influence, and easy access to unhealthy food. It included educational stress, lack of time, and easy access to unhealthy food for private institute students. Although educational stress was identified as the most commonly faced barrier among the general student population, lack of time and media influence were the additional major factors influencing private college students' habits. Influence of family and friends was also a significant barrier to healthy lifestyle habits among youth. Results were supported by some similar researches done in the past that identified educational stress and lack of time as major factors influencing students' lifestyles along with the other identified barriers.[10, 11] To address the limitation: larger sample swould have more valid results. As the questionnaire was self-constructed, providing proper validity is an issue.No funding was provided, self-financing was hindered to progress the project. Time constraints, mainly due to college timings and getting permission from institute heads should be addressed too. It is recommended that there is a need to create awareness and knowledge regarding a balanced healthy diet and a good dietary habit in both government and private intermediate college students of Karachi.

CONCLUSION:

Students from both groups shared more or less similar eating and lifestyle practices irrespective of the educational institutes' status with slight differences in terms of reported percentages and p values. However, it was seen that more of the private college students believed that they need improvement in their eating habits while the majority of government students were fine with their current eating habits and lifestyles. The barriers encountered by students were also similar.

Authors Contribution:
Mariam Rashid: Collected Data, writing draft
Sabeela Noor: Design, Supervise and finalized
Khadija Abdus Salam: Collecting data, writing draft,
Ramsha Irfan: Collected data, Analyzed data
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Review Article

Open Access

The Impact of Religious and Cultural Beliefs Towards Immunization in Pakistan

Eman Anwar, Fawad Saeeduddin, Yasmeen Mahar, Sahal Salman, Rabia Javed

ABSTRACT:

Pakistan is one of the only two countries in the world where poliomyelitis virus is still not eradicated. Efforts from government such as Expanded Programme on Immunizations (EPI), which has received ample international funding, have not been successful as some sub-sections of population have a negative attitude towards vaccinations. These people generally belong to areas with a lack of education as well as strong influence of religious leaders, who are known to perpetuate misconceptions that the purpose of vaccinations is to sterilize future generations, they are not made from halal products, or are an agenda by Western intelligence agencies to gather information. Also, there are other cultural and social barriers, such as lack of female vaccinators and concerns about their handling. The stance of local people is compared with Muslim leaders and laws of other Islamic countries. Furthermore, a global vaccine confidence survey is discussed to evaluate Pakistan's position in the broader context.

Keywords: Expanded Programme on Immunization, Misconceptions, Perceptions, Vaccination, Religious clerics.

How to cite this Article:
Anwar E, Saeeduddin MF, Mahar Y, Salman S, Javed R. .The Impact of Religious & Cultural Beliefs Towards Immunization in Pakistan J Bahria Uni Med Dental Coll. 2021; 11(2):87-92 DOI: https://doi.org/ 10.51985/AXMH2383

INTRODUCTION:

Administration of antigenic substance (vaccine) to develop immunity against a disease is known as vaccination. Vaccines offer protection from the harmful effects of diseases by many infectious agents.[1] Vaccines are a medical breakthrough in the fight against diseases. Two fatal infections, smallpox[2] and rinderpest (cattle plague) have been globally eradicated as a result.[3] It is most economical public health interference to protect from communicable diseases and decrease child mortality rate.[4] Immunization is regarded as one of the most significant health indicators of a thriving childhood. It guarantees safeguard against lethal and crippling childhood illnesses.[5] The World Health Organization's Expanded Programme of Immunization was initiated in 1974, with the goal of providing universal access to vaccines to all those at risk. Pakistan's government launched its own Expanded Programme on Immunizations (EPI) in 1978 with the aim of vaccinating children against fatal diseases. The EPI vaccination schedule includes the BCG vaccine against childhood tuberculosis (one dose at birth), the Oral polio virus vaccine (OPV) with 4 doses up till 14 weeks after birth, and vaccines against Diphtheria, Pertussis and Tetanus (DPT) at 6, 12 and 14 weeks after birth. The Hepatitis B vaccine was later added to the programme. Along with these immunizations, two doses of measles vaccine are meant to be given to children in Pakistan, at an age of 9 and 15 months.[3] The aim of this program was to eliminate polio by 2012, eradicate neonatal tetanus and measles by 2015 and to decrease the cases of vaccine-preventable diseases.[6]

The polio eradication programme officially started in 1994.[7] EPI was implemented with the help of 6000 Lady Health Visitors, 10,000 vaccinators, and other paramedical staff. The polio immunization effort received international funding from the WHO, United Nations Children's Fund (UNICEF), the Bill and Melinda Gates Foundation and the Global Alliance for Vaccinations and Immunizations (GAVI). Although polio cases in Pakistan saw a great decline from 20,000 in the 1990s (UNICEF), the programme was not completely successful in eliminating the virus from the local population, a major cause being people's lack of compliance for vaccinations.[3]

Various reasons can be attributed to the noncompliance of these immunization programs, such as socioeconomic injustice in order to access the services, poor security[8],

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Received: 07-01-2021
Accepted: 08-03-2021

absence of demographic statistics, poor infrastructure, reduced coverage, attitude of parents, concerns about safety of vaccines, inflow of non-immunized refugees from Afghanistan, insufficient awareness, inefficient training of health care professionals, poor facilities to store vaccine, and finally vaccine quality.[9, 10,11]

One of the main causes for the lack of success of immunization programs in Pakistan, Afghanistan and Nigeria is the resistance by Muslim fundamentalists. The religious misconceptions about polio vaccination are one of the biggest hindrances in the tribal areas of Pakistan. Epidemiologists have determined transmittance of polio virus from polio-endemic territories, mostly in southern regions of Afghanistan, near the borders of Pakistan to the adjacent tribal areas of Pakistan, which has lead to the emergence of fresh cases of polio in regions which were previously free from polio. In addition to this, Taliban residing in these regions have given verdicts declaring vaccination as an American strategy for sterilization of Muslim populations. Another popular belief propagated by extremists is that vaccination is a way to obviate Allah's will.[12]

METHODOLOGY:

The literature search included articles from 2000 to 2020. PubMed and Google Scholar were the main search engines utilized, along with JSTOR, using MESH terms vaccine, vaccination, immunization, and religion. After the initial 1546 search results on PubMed, the search was filtered by adding the key word Pakistan, which gave 84 results. Out of these, the articles dealing with social implications or other non-related topics were disregarded and only the ones showing a link between religious, social and cultural beliefs and vaccination were included in the search. From a total of 60 articles read, about 40 were selected for writing this article. Studies from polio virus and measles are mainly included since both diseases are locally prevalent with regular outbreaks every few years.

LITERATURE REVIEW:

In Pakistan, 5.8 million children under the age of 1 have been enrolled in EPI.[13] However, even if the first dose is administered, the required subsequent doses are not taken up which renders the schemes ineffective. For instance, only 10 % of children who were given the first dose of DPT from 2000 – 2004, completed the entire dosage of vaccination.

One of the most important reasons hindering vaccination against polio virus is the hesitancy of a big section of the masses to immunize their children. This can be attributed to many factors. Pakistani children are given supplemented doses of oral polio vaccine each year which is contrary to WHO recommendation. This raises suspicion in the public due to their lack of awareness of the necessity for booster doses in tropical regions. Moreover, people believe that vaccines are not handled properly during transportation and storage, rendering the vaccine ineffective.[14] People in Pakistan are also skeptical about the side effects of vaccines due to their improper storage and handling. In an incident in a village in KPK in 2019, a large number of children had to be taken to the hospital due to fainting, vomiting and pain abdomen after they were administered oral polio vaccine. Later on, the enraged protesters burnt a nearby health-care facility.[15]

In 2014, the number of polio cases in Pakistan reached 306[16], causing WHO to declare "a public health emergency of international concern", because of the risk of virus spread to other polio-free countries.[17,18,19] In response, the government launched the National Emergency Action Plan (NEAP) to curb the spread of the virus. However, progress has been continuously hindered due to a section of the population's reluctance to get vaccinated. Security hazards to the healthcare workers, misguided religious beliefs, and restricted access to conservative communities have gravely impeded the advancement of 'End Polio from Pakistan' campaign.[20]

Region-wise, the areas most influenced by this thinking are conflict zones in Khyber Pakhtunkhwa (KPK).[21] Federally Administered Tribal Areas (FATA) and some parts of Balochistan.[22] These districts have a high rate of illiteracy combined with strong influence of religious personalities. The local people place their trust in religious leaders who are unfortunately tend to spread myths and false beliefs regarding immunization campaigns, because of their own lack of comprehensive knowledge. For instance, there is a widespread misconception in some regions of Pakistan, Afghanistan and Nigeria that the polio virus vaccine causes infertility.[3]

A cross sectional study conducted in Peshawar in 2015 revealed a significant association of knowledge about immunizations with the participant's age. Young population seemed to have more knowledge as compared to older individuals. This was most likely due to health information disseminated on different websites on social media. However, it should be understood that the elders in a family are usually the decision makers in society. They make judgement regarding various aspects of life such as whether to vaccinate children in the family. The study also revealed that participants with no formal education, low incomes, who residing in rural localities had little knowledge about diseases such as polio. The results of this study were in accordance to previous reported studies.[20]

Karachi is the only mega city in the world where polio virus still exists.[23] A study conducted in low socioeconomic areas of Karachi revealed that if mothers are provided vaccine-related targeted knowledge at home, it can improve childhood vaccinate ratio in low literacy areas. A marked betterment was seen in infant DPT-3 and Hepatitis B vaccination in the group of mothers who were provided home-based education on the significance of vaccines, in comparison to those

mothers who were given standard health promotion messages only.[24] Same holds true for vaccination against other disease such as measles.[25]

Qualitative assessments of a study carried out in three districts of Swat Valley, a region with extensive spread of polio virus, revealed that misinterpretation of religious values is another reason many people refuse vaccines, believing that health and fate are determined by God only. There were false perceptions among residents that oral vaccines contain pork, thus they are not permissible for consumption in Islam. Amongst surveyed districts, the percentage of Lady Health Visitors who faced OPV refusal extended from 0-33%, while the ratio of mothers who did not want to administer OPV to their young ones ranged from 0.5-5.7%. Their attitude towards injectable vaccines was more or less the same because of the similar reasons.[26]

One of the main factors resulting in non compliance of vaccination is far location of EPI center (>2 km). Presence of lady health workers in EPI centers was single important factor to have additive outcome in hard to reach areas.[27] Similarly the lack of female vaccinators in door-to-door campaigns presents cultural barriers for mothers with conservative backgrounds. The repeated administration of OPV has also been cited as a cause for suspicion, as some parents assume that it is meant to ensure their children are sterilized.[3]

A propaganda by religious fundamentalists and militants operating from the Pak-Afghan border has created a story connecting vaccination programmes to a Western conspiracy. It falsely portrays vaccinators as spies for a highly contentious drone programme run by the US Central Intelligence Agency. This belief was reinforced by revelations that the CIA sponsored a phoney hepatitis B vaccination drive to track down Osama Bin Laden in Abbottabad.[28] For these reasons the campaign has been surrounded by suspicion, particularly in rural KPK and FATA, which have most polio cases as well as the highest refusal rates for vaccine administration. Vaccinators working in such areas of FATA and KPK recount significant hostility, partly since they are considered to be following a Western agenda. Survey data from FATA showed that only 25 % of residents trusted vaccinators compared to 61 % in low-conflict areas, highlighting how pervasive this narrative has become.[29]

Some religious extremists have adopted a hostile approach against immunization teams, endangering their lives. The ban imposed by Taliban on vaccination in 2012 was damaging to the efforts for the eradication of polio, particularly in areas of FATA, where vaccination could not be provided to over 350,000 children for more than two years.[17] Moreover, targeted attacks against polio frontline workers have killed almost 40 vaccinators since July 2012[30], severely hampering progress and making it harder to recruit health care workers for the campaign. These incidents are not only limited to conflict-affected areas, for on July 2012, an anti-polio worker was attacked in Islamabad. The next day, a UN doctor was shot in Karachi.[31]

A study of religious scholars' awareness and attitudes towards polio immunization of Muslim scholars from religious institutions and local mosques were surveyed using anonymous and self-administered questionnaires. About 45.2% of participants displayed good knowledge about polio. There were knowledge gaps in 32.6 % of them regarding modes of transmission, and in 39.9% about consequences of polio virus. Overall, 68.4% of participants displayed a positive attitude towards polio immunization. Nonetheless, 44.6 % showed reservations about participating in future polio immunization campaigns. 75 % quoted security and 64 % vaccine management issues as the leading hurdles towards immunization of polio in Pakistan. Upon evaluation, results depicted insufficient knowledge of the scholars about polio, even though more than half had a positive attitude towards immunization. Further research is needed at the national level for more valid results.[12]

However, in 2013, Maulana Samiul Haq, head of the political party "Jamiat Ulema-e-Islam" declared a fatwa that "there is nothing forbidden" in the polio vaccine, at his Darul Uloom Haqqania religious seminary located in the city of KPK, Akora Khattak. He further stated that it is the duty of the religious scholars who are present in Ulema councils to eliminate misinterpretations about the usage of vaccines in order to safeguard the children from the incapacitating illness. He also publicly announced that Shari'a law in Islam states clearly that this is the responsibility of the people to get their children vaccinated.[32]

Attitude of people towards other vaccinations is also poor. Measles, a fatal disease which claimed the lives of 300 children in Pakistan in 2012[33], still has insufficient immunization coverage due to some people's lack of awareness and reluctance towards vaccines. Another outbreak occurred in 2017, in which 130 children died. The number of deaths rose to 300 in the first eight months of 2018.[34] The first measles-containing vaccine (MCV1) dose had a nationwide coverage of 76% in 2017, well below the recommended level of 95%.[35]

During the measles outbreak of 2012, vaccination teams in rural areas of Sindh faced much resistance from parents. According to a news report by The Express Tribune, the villagers were adherents of Hindu beliefs which declare that a goddess had entered the affected children and medicine would offend her. Some songs were even chanted to the child. These customs prevented parents from seeking proper medical treatment for their children suffering from measles. Earlier, parents in Khairpur district believed measles was a test of faith and refused medical help for the disease.[36]

If we compare these perspectives to a qualitative study of religious and community leaders' acceptance of rotavirus

vaccine in Yogyakarta, Indonesia, a different attitude is observed. Rotavirus is a disease which causes diarrhoea in young children and can potentially be fatal. The oral rotavirus vaccine in Indonesia is not funded through the National Immunization Programme (NIP), nor does it have halal labeling by Indonesia's Islamic Council due to the use of porcine trypsin in its manufacture. Therefore its acceptance by religiously racticing Muslims in Indonesia is complex. In this study, a series of interviews with community leaders and community representatives were carried out. The results showed that the leaders were broadly accepting of the vaccine and recognized their role in promoting it in their communities.[37]

It is worth noting that the behavior of such religious authorities is not always consistent with their stance. The Meningococcal vaccine has long been among the Hajj mandated vaccines for pilgrims all over the world.[38] All the religious leaders who project a negative stance towards immunization must have been vaccinated themselves during their holy visits to Saudi Arabia. More recently, the polio virus vaccine was also made mandatory for pilgrims arriving from Pakistan. Common Muslims who follow these clerics must be made aware of their double standards to change their attitudes towards immunization programmes.

Comparison with vaccine attitudes worldwide:

A global survey of 67 countries, including Pakistan, assessed overall vaccine confidence and identified patterns interviewing by 65,819 respondents, it examined their perceptions of vaccine safety, religious compatibility, importance and effectiveness.Religious factors displayed no consistent pattern on the global scale, though the Western Pacific region recorded the greatest level of religious discordance with vaccines. Faith-compatibility issues were observed in many countries, most notably Mongolia and Thailand. Although religious fundamentalism seems to be the leading factor for the refusal of polio vaccine in Pakistan, Afghanistan and Nigeria, which showed objection to vaccines due to religious beliefs (14%, 12% and 3% respectively), but faith is not the only factor linked to it, e.g., Saudi Arabia, a country with 100% Muslim respondents, showed minimal religious resistance rate (2%). It has been noted in a review on vaccination and religious instructions, that most vaccine hesitation and rejection, which are thought to be due to religious faith, is more connected to the safety of the vaccine or personalized reasons which are disseminated within religious groups across social networks. Historical, cultural and political circumstances alter the effect of religion rather than being specifically connected to theological idea.[39,40]

It is recommended that vaccine awareness campaigns should work within the existing belief system. In order to eradicate vaccine preventable diseases, it is imperative to engage religious community leaders in raising awareness and changing parents' perceptions towards vaccinations. Enlisting their support for the campaign will impact the mindset of countless people under their influence. Dispelling common myths and clearing doubts about the quality of vaccines would be further steps in the right direction. Approaching the campaign from a religious point of view, religiously observant Muslims should be made to understand that treating preventable diseases is encouraged in Islam. They should be made aware how immunization programmes are implemented in other Muslim majority states, such as the strictly religious Saudia Arabia.

Parental perception is vital for the success of immunization campaigns, and the education of the mother has been linked to their level of acceptance of vaccines. Thus female literacy should be made a higher priority. The number of female vaccinators should also be increased to comply with social and cultural values for mothers who might be alone with their children.

At this hour, it is crucial to improve the attitude of people towards vaccines, because a possible vaccine against COVID-19 could be the only permanent way to counter the pandemic. Given the highly communicable nature of the disease, the people of Pakistan must not let their beliefs and misconceptions stand in the way of not only their own health, but the health of those around them.

CONCLUSION:

The research establishes that vaccine resistance is mainly based on religious, cultural and social grounds. However, religion is not the only factor as Muslims in other countries have a far more accepting approach, rather it is the way religion is interpreted due to cultural norms. Anti-western sentiment plays a key role as well, raising suspicions about vaccination campaigns and their links to US intelligence services. Repeated doses, doubts about the effectiveness of vaccines, lack of female vaccinators and fabricated myths are other obstacles in the success of immunization campaigns. The general lack of trust towards frontline health workers has created a hostile environment for them, raising concerns for their safety. Media coverage of such incidents gives the country a negative reputation internationally. Worldwide, religious factors are not as prominent as other concerns about vaccine safety and effectiveness. As a result of these perceptions, the health care system's struggle is not against medically curable diseases, but misguided beliefs.

Authors Contribution:
Eman Anwar: Chief Author of the Article
Fawad Saeeduddin: Review and Editing Article
Yasmeen Mahar: Literature Review
Sahal Salman: Editing and References
Rabia Javed: Review and Editing

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Case Report

Open Access

Obturation of A Mandibular 2nd Molar with the Help of Ultrasonic Irrigation to Clean the Lateral Canal

Hira Abbasi, Abhishek Lal, Rizwan Jouhar, Muhammad Saqib

ABSTRACT:

Apex of root is of great interest for endodontists mainly because of different stages involved in its development and the surrounding tissues. Mandibular molars normally consists of 2 roots, one mesial and one distal. About common occurrence, 2 canals are found in mesial root and 1 canal in the distal root. The patient was diagnosed with symptomatic irreversible pulpitis. After cleaning and shaping, the next step is obturation. Lateral canals are complex findings in the apical third of root which is characterized as a lateral canal deviating from the main canal. Normally, this lateral canal is not part of the standard root canal procedure due to the complexities, but sometimes obturation might be possible, which might affect the long-term prognosis of the tooth. Advanced skills are required to attempt and complete obturation of the lateral canal which might be a difficult task for the general practitioners.

Key words: Apical delta, Lateral canals, Root canal treatment.

How to cite this Article:
Abbasi H, Lal A, Jouhar R, Saib M. Obturation of A Mandibular 2nd Molar with the Help of Ultrasonic Irrigation to Clean the Lateral Canal. J Bahria Uni Med Dental Coll. 2021; 11(2):93-95 DOI: https://doi.org/10.51985/ZLCD4512

INTRODUCTION:

Pulpectomy or root canal treatment is one of the most frequently performed procedures on an outpatient department basis. The primary reason for it is mainly due to caries, pulpal pathologies, and trauma. A successful root canal treatment is intensively ground on filling the three-dimensional root canal morphology. Explicit numbers of root canal filling material and techniques have been developed with every clinician having his preferred way of attempting root canal treatment. Every clinician intends to completely fill the root canal system including any anatomical variation which is intermittently observed. Dentinal tubules, ramifications, lateral canals or deltas may dower to the endurance of periapical lesion in spite of completion of endodontic treatment. The complex anatomy of the root canals makes it difficult to remove the necrotic pulp from these spaces. In order to reach these areas, an appropriate solution and technique must be used.

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Received: 04-12-2020
Accepted: 05-03-2021

Lateral canals are an intricate part of the main root canal system which consists of blood vessels and nerves from the peripheral regions of the pulp system. About its morphology, it is mainly present in the apical third of the roots, sometimes it is not distinguishable from the root apex as it terminates close to it. Lateral canals are also associated with the peri-radicular disease due to inflamed pulp inside. Lateral canals are difficult to instrumentation and irrigation during the endodontic treatment, which may eventually promote microorganisms' growth if the infected pulp is to be left. General dentists usually don't attempt to obturate the lateral canals even if the finding can be appreciated radiographically, mainly being limited by their set of skills. However, such cases should be referred to the endodontists, who can manage such cases.

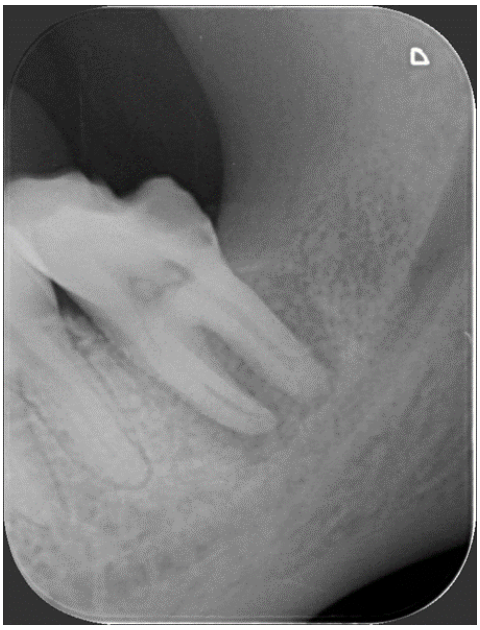
Complete removal of the infected and inflamed pulp is one of the main objectives whilst performing the root canal treatment. Lateral canals contain neurovascular bundles which mandate, if possible, the removal of the pulp to avoid further complications of the previously treated tooth such as re-endodontic treatment, which is considerably less successful as compared to first time endodontic treatment.

CASE REPORT:

A 40 years old patient presented to the Out-patient Department (OPD) of operative dentistry of Altamash Institute of Dental Medicine (Karachi, Pakistan). Earlier 1 week ago patient developed severe throbbing pain in her lower-left region of the jaw which was not being able to be located at one particular tooth. She stated that pain was radiating to the neck, jaws, and temporal areas on the affected side, pain was aggravated upon sleeping and at times disturbed her

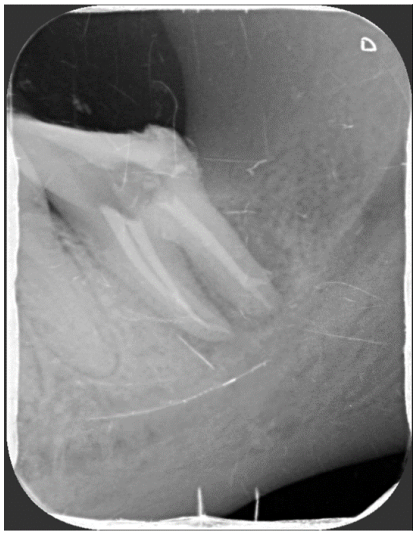
sleep as well. Before visiting the OPD, the patient did not report taking any sort of painkiller to relieve her pain. Regarding the medical history of the patient, no remarkable thing was to be noted other than a less frequent complaint of gastric reflux for which she took proton pump inhibitor. About dental history, the patient previously had a tooth extracted which required administration of local anesthesia, and the outcome post-operatively was unremarkable. Upon clinical examination of the oral cavity, poor oral hygiene was generally seen with several missing teeth. A carious lesion was seen in the lower left 2nd molar which was tender to percussion with no mobility. Moving towards the radiographical examination, a deep carious lesion was seen invading the pulp chamber of the tooth occlusally along with periodontal ligament widening. Furthermore, an extensive circular radiolucent image with defined limits; was observed associated with the distal root of the tooth with the visible lateral canal on the apical third of the distal root shown in (figure 1)**.** Patient was counseled regarding the diagnosis, and the treatment plan of root canal treatment was explained. After taking consent from the patient, the treatment was started.

Figure 1 : Radiolucency at apical third of the distal root



Considering the pain with which the patient initially presented, inferior alveolar block anesthesia (Lidocaine 2% with epinephrine 1:100,000) was administered in order to create a pain-free environment for the patient. Initial access opening was done under rubber dam isolation of the 2nd left mandibular molar, with subsequent pulpectomy. It was followed by cleaning and shaping with crown-down instrumentation technique using universal Pro-taper system in the first appointment along with frequent use of ultrasonic irrigation containing 2.5% sodium hypochlorite in order to thoroughly clean the root canal system targeting the lateral canal in the apical third of the distal root. Canals were dried and medicated with calcium hydroxide and the patient was called after 15 days. On the second appointment, the patient was asked about any post-op pain which she might have suffered during these 15 days, to which the patient did not complain about. No other remarkable finding was found when the patient came back for the second appointment. Now, obturation was performed on the previously treated tooth. Gutta-percha cones were inserted up to the working length of each canal with zinc oxide eugenol as a sealer which was confirmed previously on the periapical radiographs. Using the lateral condensation method, obturation was performed and the tooth was restored in the 2nd visit. A final periapical radiograph was performed on the same treated tooth for evaluation of any voids. It was noted that root filling revealed a lateral canal that was also obturated along with the main root canal system following ultrasonic irrigation. (figure 2)

Figure 2: Using leteral condensation obturatin was performed



DISCUSSION:

Obturation of the lateral canal is a rare finding while performing the root canal treatment of the patients. Normally, the lateral canals are difficult to obturate mainly due to complex morphology and occurrence along with skills limitations. Practicing and experienced endodontists are well aware of the fact of identifying lateral canals when they encounter it as finding and obturating lateral canals are considered to be a positive prognostic factor for that particular tooth. Furthermore, a variety of techniques has been stated in the literature for performing lateral canal obturation which includes Lateral condensation, Continuous wave of condensation, warm vertical condensation, carrier-based thermoplasticized gutta percha, and warm lateral condensation.

In our case, the lateral canal was found to be obturated in the mandibular 2nd molar. After removing the vital pulp of the tooth, the patient was pain-free with no further complications. Proper isolation of the tooth under treatment is among the standard care steps to ensure sterile and optimum treatment for the patient.

Locating lateral canals along with obturating it is a difficult task considering the intricate morphology of it. Removal of all the infected pulp of the canal is one of the primary targets of standard root canal treatment. Remnants of infected and inflamed pulp, in this case, lateral canal in the distal root at the apical third, can be a detrimental factor which might in future necessitate performing re-endodontic treatment of the same tooth, but the success rate is considerably low of doing endodontic treatment of previously treated tooth.

Most of the time, gutta-percha cones when condensed does not follow into these lateral canals nor does the sealer material, primarily due to the tricky morphology of it. Moreover, currently sealing this part of the root is now considered to be a good prognostic factor. In contrast to using gutta percha, studies do report greater efficiency of using resilon using thermomechanical compaction technique for obturating the lateral canals. Although this might be due to limited skills and technique used.

Literature states that lateral canals are part of complex minor root morphologies that have been associated with pulpal diseases, canal reinfection, post-treatment disease, and primary root canal infection. Normally the endodontic files cannot penetrate such lateral canals due to their deviated morphologies, but during condensation, there are chances of gutta percha or sealer to follow into it which might provide the needed seal to successfully complete the root canal treatment.

CONCLUSION:

Lateral canals are commonly found in the human teeth but locating and obturating it is a big challenge mainly due to its complex morphology. It is considered to be a positive prognosis for the teeth being treated if these lateral canals are thoroughly cleaned using ultrasonic irrigations and also sealed along with the main root canal system. The practicing dentist should routinely keep an eye on the radiographs to appreciate and effectively manage such findings.

Authors Contribution:
Hira Abbasi: Conception and design of the study, Collection of data and assembly and article writing.
Abhishek Lal: Literature review, drafted the manuscript and compilation of results.
Rizwan Jouhar: Final approval of the manuscript.
Muhammad Saqib: Critical review of the manuscript

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Commentary Open Access

Is Covid-19 vaccine truly the miracle drug the world was waiting for?

Shazia Durrani Fakhir, Ammara Hameed

How to cite this Article:
Fakhir SD, Hameed A. Is Covid-19 vaccine truly the miracle drug the world was waiting for and can it alone save the world from this pandemic?. J Bahria Uni Med Dental Coll. 2021; 11(2):96-98 DOI: https://doi.org/10.51985/TRLH8681

BACKGROUND:

World is in the middle of COVID-19 pandemic. COVID-19 was declared as a pandemic by WHO on 11, March 2020.[1] Globally 108 million cases have been reported worldwide, claiming the deaths of 2.32 million globally.[2] The need for wearing masks, frequent hand washing and social distancing cannot be emphasized more since the surge of this pandemic. Now wearing mask and adopting the social distancing are more of a routine. But these measures are certainly not enough to control the pandemic. Efforts more than this are required.

As we know from the history, until 1970 smallpox a viral infectious disease has been a pandemic for more than 3000 years, endemic in developing and tropical areas with periodic epidemics worldwide.[3] in 1980 via effective vaccination small pox was eradicated from the world. Importance of vaccination cannot be undermined, it saves millions of lives each year. Soon after the pandemic was considered uncontrollable, various agencies all over the world began a race to develop an effective vaccine against novel COVID-19. Currently more than 50 vaccines are under trial.[4]

Challenges to accept COVID-19 vaccine:

The major controversy is the reliability, efficacy and possible side effects of the rapidly created vaccine for COVID-19 virus in a hurry to dampen the SARS-COV-2 infections.[5] In Pakistan, COVID vaccination has been started among the health care workers only. The hesitancy amongst the HCWs slowly decreased as they started receiving the vaccine. Even then the junior doctors and residents were reluctant and the Sindh Government had to order cutting salary to force them to get it done. Reluctance is still present as no one knows the long term side effects might be. Real hesitance is because of the rapidly made vaccine without enough trial time. People are also confused on which type of vaccine is safest and most efficient. Although the efficiency is related to the immune response of the person receiving it. BCG vaccine efficacy is only 55% and still all newborns receive the live vaccine as it claims to prevent not the disease but its complications such as TB meningitis.[6]

The fact that COVID-19 virus has been mutated twice in the past one year, vaccine makers have to keep in mind that this vaccine would probably need to be updated according to the mutated versions just like the influenza vaccine needs to be renewed every year. The more important point is to prevent the spread as this virus will mutate more if it is allowed to go through human bodies and given a chance to mutate.

Preventing the COVID-19 spread: Role of physical distancing:

Vaccine, although has a very significant role in prevention of complications and possible improvement in mortality but the more important thing is prevention of transmission. This is achieved by adapting certain measures like physical distancing, isolation etc. which we know worked. According to WHO, testing and identifying positive cases who are infectious, provide them supportive isolation, tracking and contact tracing, quarantining the contacts, ensure physical distancing, wearing a mask, avoiding crowded places and closed settings, where there are a lot of people, washing hands, respiratory etiquette, staying home especially if you're sick. All these things together have been proven to make a huge difference in bringing down transmission.[8]

Epidemic studies predict that social and physical distancing is exigent in controlling COVID-19. A recent study evaluates the effectiveness of different physical distancing measures in controlling viral transmission.[9, 10, 11]

Controlling COVID 19 Pandemic- By achieving Herd immunity:

Another important point to be discussed here is herd immunity. 'Herd immunity' is indirect protection from infectious disease. It occurs when a certain percentage of the population has become immune to a disease, whether through vaccination or previous infections, thus reducing the chances of infection in those individuals who have not developed immunity. Achieving herd immunity naturally

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Received: 09-03-2021
Accepted: 22-03-2021

would lead to unnecessary deaths and suffering in the population. Vaccine is the only alternative method. The percentage of population needed to become immune for herd immunity depends on the particular infection. [12]

The main purpose to establish herd immunity is to protect those individuals from the disease who cannot be vaccinated, including the very young and immune compromised individuals, and ensure that they are still protected against disease.[13] *It is important to understand certain terms to actually know what herd immunity can be achieved to stop transmission.* The point at which the proportion of susceptible individuals in a population falls below the threshold required for disease transmission is called Herd immunity threshold.

R_0 is the average number of secondary infections caused by a solitary infectious person presented into a completely susceptible population.

Assuming an R_0 (basic reproductive number) estimate of 3 for SARS-CoV-2, the herd immunity threshold is approximately 67%.[13,14,15] which means that herd immunity for SARS-CoV-2 to be achieved, 67% of the population need to be vaccinated.

COVID-19 Vaccination- Concerns about side effects:

Another major concern is the possible side effects of vaccines. The decision of giving vaccine is made after establishing a balance between the side effects of the infection and the vaccine. The suffering of the disease should outweigh the danger of the vaccine side effects.[16]

COVID-19 Vaccination- Myths among the masses:

One more major hindrance in vaccine acceptance is the Myths and mis-concepts. Anti-vaxxers are the individuals who have faith that vaccination can lead to medical ailments. Some of these anti-vaxxers have dedicated their whole lives to railing against vaccines. Some of the myths include:

- As COVID-19 vaccine has been developed in a very small time frame as compared to the usual 10 to 15 years of any other vaccine development, it might be unsafe.
- The COVID-19 vaccine can cause DNA mutations.
- Getting vaccinated for COVID-19 can give you COVID-19 infection.
- The COVID-19 vaccines have microchips!
- The COVID-19 vaccination can lead to women infertility.
- There is fetal tissue in COVID-19 vaccine.
- If someone has already been infected with COVID-19 virus, he/she does not need the COVID-19 vaccine anymore.
- If anyone receives the COVID-19 vaccine there is no chance for him to transmit the virus.
- If anyone has been vaccinated for COVID-19, there is no more need of social distancing and other precautions taken to prevent the spread of virus.
- COVID-19 vaccination can provide life time immunity.
- Someone with other chronic diseases cannot be vaccinated for COVID-19.
- Elderly population should not receive the vaccine for COVID-19.

Scientists were studying SARS-CoV-2 for a decade or more before it became pandemic and did simultaneous trials as volunteer availability was not an issue worldwide and hence were able to complete it in one year time. Vaccine is made of mRNA, and cannot alter DNA. mRNA is a transmitter to translator protein and does not even reach the nucleus where DNA is stored. COVID-19 vaccine is dead vaccine and hence cannot cause the disease. In short all these and more myths can be scientifically explanation and have been debunked by WHO and CDC authorities.[17,18]

Take-home message: It is difficult to believe that 1 year ago, COVID-19 and SARS-CoV-2 were almost unknown. Now we have quite a few reliable, viable, effective and safe vaccines.

In the current technological era, rumors propagate and spread like wildfire. In addition, feelings of fear and anxiety provide the perfect growth of stubborn and dangerous myths. The situation is changing and the science is progressing rapidly. The best advice would be to ensure that you always take information from reliable sources and do not pay attention to powerful but misleading social media posts.[19]

CONCLUSION:

Despite unknown mild to moderate side effects of currently developed vaccine against SARS-CoV-2 virus, apart from continue practicing SOPs, availability of an effective vaccine is the only ray of hope in the battle against COVID-19 pandemic.[20]

Authors Contribution:
Shazia Durrani Fakhir: Conception or design of the work, Drafting the article, Critical revision of the article, Final approval of the version to be published.
Ammara Hameed: Conception or design of the work, Drafting the article, Critical revision of the article, Final approval of the version to be published.

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Importance of Mobile Photography in Dental Practice

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How to cite this Article:
Zafar D, Inayat A, Anam U. Importance of Mobile Photography in Dental Practice. J Bahria Uni Med Dental Coll. 2021; 11(2): 99 DOI: https://doi.org/10.51985/LVND5229

Respected Editor,

This letter aims to explain the importance of using cell phones to take helpful images with high efficiency in various types of dental procedures. In our dental practices' photography is an effective tool. Its applications are widespread such as in the diagnosis and treatment planning, keeping an illustrative clinical history, legal documentation, publishing, and delivering lectures.[1] In modern dentistry, photography has grown into a standard of treatment. With the advent of digital technology these days, photography has now become simpler and widely available. Even then, few practitioners introduce them in their daily practices due to reasons such as a lack of expertise in cameras, lenses, and technique, disruption of workflow, and cost considerations. The use of smartphones with improved technology, however, is constantly emerging. It allows every practitioner with minimal interruptions in their patient workflow to incorporate photography into his or her practice.[2] Making images from mobile in dentistry has multi-level importance. Its implementation in dental practice is simple, swift, and extremely useful in recording working practices, conducting health promotion sessions, and administering clinical examinations, thus providing dentists and patients with many advantages.[1-2]

With the evolution of mobile cameras, an impact on digital photography made it accessible and high-definition pictures can now easily be taken. DSLR (Digital Single Lens Reflex) cameras are still frequently used in dentistry to capture high macro images, but due to rapid technological growth, smartphones can now produce high-quality images.[3] Smartphones and tablet cameras were not initially developed for dentistry. Therefore, practitioners must treat their device as a camera and not as a phone in overcoming the perception of smartphones in the development of low-quality photographs. There are many distinct advantages of using smartphones in dental practice rather than using an expensive and heavy camera. Requirements for the realization of photography are the white balance, expansion, focus, ISO, calculation, and shutter velocity which is offered by the last generations of smartphones. Smartphones can achieve a large field of vision owing to their compact size, diaphragm, have good ISO adaptation and greater light sensitivity with little noise. When it comes to displaying good resolution data is required. They offer a wide display to preview pictures. Their battery timings allow the practitioners to work for hours, the settings can be modified manually, and they are light in weight and user friendly.[1,3]

Irrespective of equipment, the key factor of dental photography refers to the restricted amount of light available inside the oral cavity, specifically when posterior teeth are photographed.[4-5] A continuous light source developed to provide a huge spectrum of lighting choices, allowing smartphone photos of better quality and offering a convenient way that matches most cell phones (55-85 mm width range).[4]

With the rapid advancement in smartphone technologies, it is not too early to predict that mobile phones are making their way to replace expensive, heavy, and technique sensitive cameras with their high quality and user-friendly photographs.

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Received: 09-03-2021
Accepted: 22-03-2021

Authors Contribution:
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Ahsan Inayat: Gave the concept, reviewed and did the corrections in the letter
Uzma Anam: Drafted the manuscript and searched for literature

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Journal of Bahria University Medical & Dental College
Peer Reviewed Multidisciplinary Quarterly Published Journal
ISSN (print): 2220-7562, ISSN (online): 2617-9482, CODEN: JBUMB7
Recognized by PM&DC (IP/0072)
Online edition is available at URL: https://jbumdc.bahria.edu.pk,
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