Volume: 1, Issue: 1
July 2021

ISSN (Print): **2710-0545**

Foundation University Journal of Dentistry

Foundation University Islamabad,
Defence Avenue, DHA Phase-I,
Islamabad 44000, Pakistan.
http://fujd.fui.edu.pk
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FUJD
Biannual

FUJD Foundation University Journal of Dentistry

ISSN Print: 2710-0545
Volume 1, Issue No. 1
July 2021

FUJD Foundation University Journal of Dentistry

ISSN Print: 2710-0545
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July 2021

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PUBLISHER:
Foundation University College of Dentistry & Hospital (FUCD&H)
Foundation University Islamabad Campus
Defense Avenue, DHA Phase 1
Islamabad, Pakistan
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FUJD Foundation University Journal of Dentistry

ISSN Print: 2710-0545
Volume 1, Issue No. 1
July 2021

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Foundation University Islamabad Campus, Defense Avenue, DHA Phase 1, Islamabad, Pakistan
Phone: +92-51-5788171 Extension: 216, Email: info.fujd@fui.edu.pk

Printed in Pakistan

FUJD Foundation University Journal of Dentistry

ISSN Print: 2710-0545
Volume 1, Issue No. 1
July 2021

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EDITORIAL

Tackling COVID-19 Vaccine Misinformation: A Challenge Greater than the Pandemic

Rozina Nazir[1], Nasar Um Min Allah[1]

The pandemic of coronavirus disease (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged as a public health emergency worldwide. The outbreak has not just overwhelmed the healthcare system by a rising number of cases and fatalities but also affected social patterns, economic systems, and policies alike. The pandemic has reached Pakistan by February 2020 and so far over 944,065 confirmed cases with 882,332 recoveries and over 21,828 deaths have been reported.[1]

Despite the alarming trends in the rising number of cases, the overall global response to this catastrophe has been successful. Strategies were formulated and strictly implemented across the globe. The scientific community has shown an unprecedented and rapid response with a massive publication output.[2,3] A major milestone in efforts against this pandemic was the early and successful development of different vaccines against COVID-19 using different approaches encompassing traditional live attenuated and inactivated vaccines, and modern solutions employing viral vectors, mRNA, DNA, single proteins, and virus-like particles as carriers.[4] Vaccination is one of the most cost-effective ways of avoiding disease. High rates of successful vaccinations will not only help us to overcome this global health crisis but will help us to return a pre-COVID state without a restriction in performing daily activities. However, this is risked by co-evolving "Infodemic" and "Misinformation", a feature unique to the COVID-19 pandemic.[5]

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The global vaccination campaign against COVID-19 is an unmatched operation that is also met with a loud response from anti-vaccine communities currently using all available resources to manipulate public opinion.[6] The resistance against vaccination drive is not a new experience. Historically, organized anti-vaccination trends were seen against smallpox vaccination in the UK as early as the 19th century.[7] A boycott/refusal of the polio vaccination, specifically in the rural areas due to rumours that the vaccine caused infertility led to increased polio cases in Pakistan.[8] World Health Organization (WHO) defines vaccine hesitancy as "the reluctance or refusal to vaccinate despite the availability of vaccines".[9] Vaccine hesitancy threatens to reverse progress made in tackling vaccine-preventable diseases. WHO has declared vaccine hesitancy as one of the top ten threats to global health in spreading communicable diseases and around the world.[9] People may decline immunizations due to false claims by anti-vaxxers that vaccines contain infertility agents or can spread an infectious pathogen such as human immunodeficiency virus (HIV). Moreover, conspiracy theories, promoting fake experts, disseminating false logic, promoting unrealistic expectations and misrepresentation of facts and the use of social 'bots' are all deceptive strategies being used against COVID-19 vaccination.[10]

Therefore, it becomes crucial that all stakeholders involved in the COVID-19 vaccination program realize the negative effect of infodemic and misinformation/ disinformation on these efforts and actively take steps to counter them. Few of the recommendations in tackling this threat are to (a) actively engage with the community and public to increase awareness regarding the vaccination program, (b) employ a multi-prong strategy which must include appropriate use of social media, (c) moderation of social bots with the help of skilled professionals to filter out misinformation, (d) advertise the content in national and regional languages to reach out to the maximum number of people in all parts of the

country and (e) involve medical/dental students and residents in these awareness campaigns and countering infodemic and misinformation since they are more IT touched in this digital pandemic.

DISCLAIMER

None.

CONFLICT OF INTEREST

None to declare.

ETHICAL STATEMENT

Not applicable.

FUNDING DISCLOSURE

The author received no financial support for the research, authorship, and/or publication of this article.

AUTHORS' CONTRIBUTION

Conception and design, drafting and critical review of the manuscript: N. Um Min Allah**,** Approval of the final version of the manuscript to be published: R. Nazir, N. Um Min Allah

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How to cite this Article:

Nazir R, Um Min Allah N. Editorial: Tackling COVID-19 Vaccine Misinformation: A Challenge Greater than the Pandemic. Found Univ J Dent. 2021;1(1):1-2.

ORIGINAL ARTICLE

DOI:10.33897/fujd.v1i1.262

Assessment of Psychosocial Impact of Dental Aesthetics in Adult Patients visiting AFID

Faiza Usman[1], Nadia Zaib[2], Amara Butt[3], Ayesha Aslam[4]

Received: 10 May 2021 / Revised: 30 May 2021 / Accepted: 10 June 2021 / Published online: 02 July 2021

ABSTRACT

Objective: This study aims to evaluate the psychosocial impact of dental aesthetics by using the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ) and self-rated Aesthetic Component (AC) of the Index of Orthodontic Treatment Need (IOTN).

Materials and Methods: A cross-sectional study was conducted at the Armed Forces Institute of Dentistry, Rawalpindi. A total of 120 patients were asked to fill in a questionnaire that evaluated psychosocial impacts based on five variables namely 'Dental Self-confidence', 'Psychological Impact', 'Social Impact', 'Aesthetic Concern' and 'Self-perceived treatment need'. The patients self-evaluated their dental aesthetics by using the IOTN Component.

Results: The comparison between genders was found to be insignificant. All the above-mentioned variables of PIDAQ showed a positive correlation with the self-rated IOTN Aesthetic Component, with $p < 0.05$ except one variable i.e., 'Aesthetic concern'.

Conclusions: The results suggest a strong correlation between self-perceived dental aesthetics and its psychosocial impact on an individual. An increased want for orthodontic treatment may rise from the psychosocial impact.

Keywords: Dental Self-confidence, Facial Aesthetics, Index of Orthodontic Treatment Need, PIDAQ, Psychosocial Impact

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How to cite this Article:

Usman F, Zaib N, Butt A, Pervez M, Aslam A. Assessment of Psychosocial Impact of Dental Aesthetics in Adult Patients visiting AFID. Found Univ J Dent. 2021;1(1):3-10.

ORIGINAL ARTICLE
DOI:10.33897/fujd.v1i1.262

INTRODUCTION

It is widely known that facial aesthetics play a vital role in determining self-confidence, there are many dimensions to aesthetics, an important one is dentofacial status.[1] Teeth, how they look and where they are placed play an integral role in shaping human social interaction as research has suggested that they can somewhat determine how visually appealing someone is, to some extent that is.[2] In recent studies, this has also been seen to affect people's psychological well-being.[3-5]

Traditional orthodontics treatment confines itself to improving oral function and is usually not concerned with the perceptions and mental state of the subject involved.[6,7] It is important to understand that research has suggested that the subject's perception and their idea of aesthetics is important in the determination of a treatment plan with a high chance of success.[4,8]

It is a known fact that self-image plays an important role in determining the patients' state of mind and it can sometimes determine whether the patient deems himself or herself in need of and kind of aesthetic treatment. To ease such a process of classification, scales are used. These include and aren't limited to the Index of Orthodontic Treatment Need (IOTN), Dental Aesthetic Index (DAI) and the Index of Complexity Outcome and Need (ICON). These can test whether there is a need for patient appeasement, largely dependent on the existence of aesthetic impairments.[9,10] Some of them may even be rated by the patients themselves (self-rated) with the more advanced or technical ones being looked at and rated by the concerned doctor (operator-rated), as the aesthetic component of the IOTN system.[3,11] The IOTN-AC may be rated by the dentist or even by the patients themselves.[12,13]

It is now time to delve deeper into the fact that it is fundamental to understand that the psychological impact of dental aesthetics is seen on multiple dimensions and is not always solely based on the need for orthodontic treatment as conventional doctors may assume.[4,14] One such tool to quantify all of the factors involved is called PIDAQ, The Psychosocial Impact of Dental Aesthetics Questionnaire. This multifactorial tool helps to rate the patients' needs, both from an orthodontist's point of view and a more generalized need for a better aesthetic appearance kind of view.[7] It is a self-rating method and is widely the sole reason that patients seek orthodontic treatment in the first place.[15,16]

As orthodontic patients need to be recognized more as individuals rather than a set of maligned teeth, it is necessary to determine the psychosocial impact of a presenting malocclusion.[8,17] Therefore, the present study was undertaken to determine the psychological as well as the social impact of dental aesthetics using the 'Psychosocial Impact of Dental Aesthetics Questionnaire' (PIDAQ) and self-rated Aesthetic Component (AC) of the Index of Orthodontic Treatment Need (IOTN).

MATERIALS AND METHODS

This was a cross-sectional, descriptive study carried out during November 2020, at the Armed Forces Institute of Dentistry, Rawalpindi. Ethical approval was taken from the institute's ethical review board before data collection. Written consent was also taken from study participants. The sample size was calculated by using the WHO calculator as 120.

The data was collected from patients visiting dental OPD at AFID using a non-probability convenient sampling technique. The study participants were 19 years or older as study participants included were adults only. Participants younger than 19 years or those who did not give consent were excluded from the study.

The data was collected by using a structured questionnaire used in previous research investigating dental aesthetics and assessment of its psychosocial impact. The psychosocial impact of the dental aesthetic questionnaire (PIDAQ) developed by KLAGES et al. was used for this study.[16] The questionnaire was self-administered by the subjects with the Likert scale being used to rate the responses on a scale ranging from 0- (total disagreement), to 4 (total agreement). A total of 05 variables including dental self-confidence, social impact, psychological impact, aesthetic concern, and self-perceived orthodontic treatment need were assessed by a series of relevant statements. To avoid increased awareness of the patient to the factorial relevance of each question, the names of the groups were not stated on the relevant items in the questionnaire. IOTN aesthetic component (AC) was used to assess the dental aesthetics. Ten black and white

DOI:10.33897/fujd.v1i1.262

photographs of anterior dentition from the IOTN scale were shown to the participants and they were requested to specify the photograph which most closely resembled their dentition. Participants were divided into different groups based on gender and IOTN-AC grading. An assessment of the psychosocial impact of dental aesthetics was done based on gender and self-rated IOTN-AC grades.[11]

All data were entered and analyzed using SPSS version 25.0. For data analysis, the IOTN-AC grades were divided into four categories. The first three grades were put into separate categories, while grades 4-10 were placed in the fourth category, owing to the small frequency of responses for each of the grades from 4 to 10. Frequencies and percentages were described for categorical variables such as gender, occupational status, and IOTN-AC grades. Mean and standard deviation was described for quantitative variables such as age and PIDAQ scores.

To compare the mean values of the five dimensions of PIDAQ with the four categories of IOTN-AC grades (1, 2, 3 and 4-10), a one-way ANOVA was applied. To compare the inter-group, mean differences, post-hoc Tukey analysis was conducted. To compare the mean values of the five dimensions of PIDAQ between male and female participants, an independent sample t-test was applied. An arbitrary value of less than 0.05 was considered to be significant.

RESULTS

A total of 120 participants were included in this study. The sample included 41 (34.2%) males and 79 (65.8%) females. The mean age of the participants was 24.90±6.00 years. The IOTN-AC grades of the participants have been illustrated in Figure 1. While 69 (57.5%) participants reported having grade 1 aesthetics, 17 (14.2%) participants each reported having aesthetic grades 2, 3 and 4-10.

The mean values of the five dimensions of the PIDAQ for each of the IOTN-AC categories have been illustrated in Table 1.

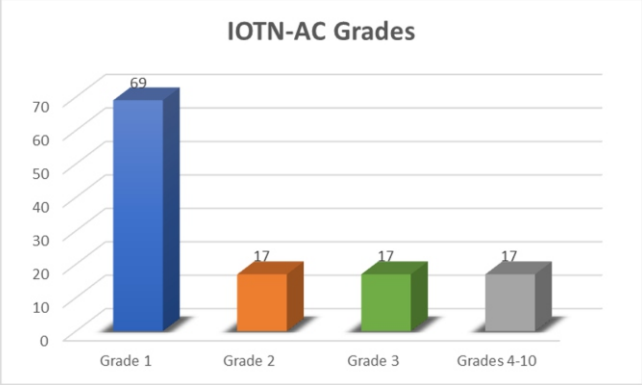

Figure 1: Frequency of IOTN-AC Grades

Table 1: Mean Values of the Five Dimensions of PIDAQ for the IOTN-AC Grades

PIDAQ Dimension	IOTN 1	IOTN 2	IOTN 3	IOTN 4-10	Total
Dental Self-Confidence	13.51±4.10	11.35± 4.90	8.35±3.26	8.12±4.21	11.71±4.69
Social Impact	3.10±2.75	5.65±5.35	6.82±5.83	8.18±6.62	4.71±4.76
Psychosocial Impact	4.42±3.81	6.59±4.61	7.65±4.23	6.53±4.45	5.48±4.23
Aesthetic Concern	5.90±2.26	6.12±2.47	5.82±2.81	4.82±2.32	5.77±2.39
Self-Perceived Orthodontic Treatment Need	5.23±0.91	4.71±0.99	4.59±1.28	4.24±1.15	4.93±1.07

DOI:10.33897/fujd.v1i1.262

The intergroup mean differences comparison for the PIDAQ mean values for the IOTN-AC categories have been illustrated in Table 2. 'Dental self-confidence' scores reported to have significant differences when compared for participants with IOTN-AC grades 1 and 3 (mean difference = 5.15±1.12. $p < 0.001$) and for IOTN-AC grades 1 and 4-10 (mean difference 5.39±1.12, $p < 0.001$). Patients reported to have IOTN-AC grades had significantly lesser 'social impact' scores, when compared with grade 3 (mean difference = -3.72±1.18, $p = 0.011$) and grades 4-10 patients (mean difference = -5.08±1.18, $p < 0.001$). Participants with IOTN-AC grade 1 had significantly lesser 'psychosocial impact' scores, as compared to grade 3 patients (mean difference = -3.23±1.10, $p = 0.021$). Moreover, participants reported to have IOTN-AC grade 1 had significantly higher 'self-perceived orthodontic needs' score when compared to participants with grades 4-10 (mean difference = 1.00±0.27, $p = 0.002$).

Table 2: Inter Group Mean Differences between IOTN-AC Grades for the Five Dimensions of PIDAQ

PIDAQ Dimension	IOTN-AC Grade	Comparison IOTN-AC Grade	Mean Difference	*p*-value	95% Confidence Intervals
Dental Self-Confidence	1	2	2.15±1.12	0.224	-7.63, 5.07
		3	5.15±1.12	***< 0.001***	2.24, 8.07
		4-10	5.39 ±1.12	***< 0.001***	2.47, 8.31
	2	3	3.00±1.42	0.154	-0.70, 6.70
		4-10	3.24±1.42	0.108	-0.46, 6.93
	3	4-10	0.24±1.42	0.998	-3.46, 3.93
Social Impact	1	2	-2.55±1.18	0.144	-5.63, 0.54
		3	-3.72±1.18	***0.011***	-6.81, -0.64
		4-10	-5.08±1.18	***< 0.001***	-8.16, -1.99
	2	3	-1.18±1.50	0.861	-5.09, 2.73
		4-10	-2.53±1.50	0.335	-6.44, 1.38
	3	4-10	-1.35±1.50	0.804	-5.26, 2.56
Psychosocial Impact	1	2	-2.17±1.10	0.208	-5.05, 0.71
		3	-3.23±1.10	***0.021***	-6.11, -0.35
		4-10	-2.11±1.10	0.208	-0.71, 5.05
	2	3	-1.06±1.40	0.873	-4.71, 2.59
		4-10	0.06±1.40	1.000	-3.59, 3.71
	3	4-10	1.12±1.40	0.855	-2.53, 4.71

DOI:10.33897/fujd.v1i1.262

PIDAQ Dimension	IOTN-AC Grade	Comparison IOTN-AC Grade	Mean Difference	*p*-value	95% Confidence Intervals
Aesthetic Concern	1	2	-0.22±0.65	0.986	-1.90, 1.46
		3	0.08±0.65	0.999	-1.61, 1.76
		4-10	1.08±0.65	0.346	-0.61, 2.76
	2	3	0.29±0.82	0.984	-1.84, 2.43
		4-10	1.29±0.82	0.392	-0.84, 3.43
	3	4-10	1.00±0.82	0.613	-1.13, 3.13
Self-Perceived Orthodontic Need	1	2	0.53±0.27	0.226	-0.19, 1.24
		3	0.64±0.27	0.093	-0.07, 1.36
		4-10	1.00±0.27	***0.002***	0.28, 1.71
	2	3	0.12±0.35	0.987	-0.79, 1.02
		4-10	0.47± 0.35	0.530	-0.44, 1.38
	3	4-10	0.35±0.35	0.987	-1.02, 0.79

The gender-wise mean differences comparison for the PIDAQ dimensions have been shown in Table 3. As shown, no difference in any of the mean values was found between male and female participants.

Table 3: Gender Wise Comparison of the Mean Values of the Five Dimensions of PIDAQ

	Male	Females	Mean Difference	*p*-value
Dental Self-Confidence	10.88±4.59	12.14±4.71	1.26±0.90	0.161
Social Impact	5.07±4.71	4.52±4.80	0.55±0.92	0.545
Psychosocial Impact	5.37±4.41	5.54±4.16	0.18±0.82	0.831
Aesthetic Concern	5.49±2.19	5.91±2.48	0.42±0.46	0.340
Self-Perceived Orthodontic Need	4.90±1.02	4.94±1.10	0.03±0.21	0.866

DOI:10.33897/fujd.v1i1.262

DISCUSSION

In the present study, most of the participants self-rated themselves as having an IOTN-AC grade 1 (n = 69, 57.5%). A study from Islamabad showed similar results with 46.5% of the participants rating themselves as having grade 1.[8] Klages et al. also reported having similar results to our study, with 33.5% of the participants rating themselves as having grade 1.[16] However, a study performed by Munizeh and colleagues[18] reported that a greater proportion of participants reported as having grade 2 (35%). The possible difference could be due to the sample selection, as Munizeh and colleagues had only selected patients for their study.[18] However, in this study 51 (42.5%) participants were dentists. The IOTN-AC results of our study suggest that most of the participants were satisfied with the aesthetic appearance of their facial outlook.

On comparing the psychosocial impact of dental aesthetics with gender, no significant association was found. This suggests that dental aesthetics in this sample was not affected by gender. Similar results were reported by Klages and colleagues and Carlos and colleagues.[16,19]

Comparing the psychosocial impact of dental aesthetics between participants with different IOTN-AC grades revealed interesting results. Participants with grade 1 had significantly higher 'dental self-confidence' scores than individuals with grades 3 ($p < 0.001$) and 4-10 ($p < 0.001$). Participants with grade 1 also had significantly lower scores than individuals reporting to have grades 3 ($p = 0.011$) and 4-10 ($p < 0.001$).

'Social impact' of an individual based on one's 'Dental self-confidence' reflects the level of confidence and contentment an individual has with one's soft tissue profile, smile and in turn, projects an impact on the person's emotional outlook. Having satisfied dental aesthetics not only improves one's confidence but also improves the self-esteem of a person.[20] On the other hand, having dental aesthetics with which one is not happy can lead to low social confidence and low self-esteem, thereby negatively impacting one's social and personal life. All these associations were supported by the results of our study. People who perceived as having good dental aesthetics (IOTN-AC grade 1) reported having better 'dental self-confidence' and having lesser 'social impact' than those participants who believed that their dental aesthetics had been altered (grades 3 and 4-10). Previous studies have shown similar results to this study.[16,18]

The 'psychosocial impact' refers to individuals' low perception when comparing themselves with others with better perceived dental aesthetics, thereby referring to an inferiority complex. Although this study found individuals with grade 1 to be having lower 'psychosocial impact' scores than those with grade 3, no significant difference was found between the scores of participants with grade 1 and 4-10. Therefore, the evidence is insufficient to suggest an association between the psychosocial impact and dental aesthetics. However, studies by Munizeh and colleagues and Klages and colleagues reported a strong association between psychosocial impact and dental aesthetics.[16,18] Lack of sufficient evidence to suggest a strong association in this study could be due to smaller sample size.

'Aesthetic concern' is associated with the feeling a person has upon seeing themselves smile in photographs and is related to how a better smile may change one's appearance and become a source of successful and confident social interactions. This study found no association between 'aesthetic concern' and dental aesthetics.

'Self-perceived orthodontic need' assesses how one feels that he or she requires orthodontic treatment for correction of their dental aesthetics. Individuals with IOTN-AC grade 1 were found to have a significantly higher score as compared to those with grades 4-10. This shows that despite rating them as having excellent dental aesthetics, people with grade 1 still felt that they do need corrective treatment to improve their dental aesthetics. On the contrary, this also implies that individuals who perceived their aesthetics to be poor still did not feel the need to get orthodontic treatment to improve this condition.

Some limitations were present in this study. Firstly, this study had a relatively small sample size. It is noteworthy to point out the IOTN-AC grading is based on photographs of anterior segment malocclusion with only 10 photographs. Many of the participants found it difficult to associate their current condition with any of the photographs, suggesting that perhaps a wider spectrum of photographs should have been available. In addition, conditions such as diastema, anterior

DOI:10.33897/fujd.v1i1.262

crossbites, class III malocclusion, open bite and increased overjet were not seen in the included photographs.

It is recommended that in the future, studies should be done to compare this association between individuals who have had orthodontic treatment, as compared to those who have had no treatment. Moreover, socioeconomic status should also be considered as a confounding factor in future studies. A strong association between dental aesthetics and the psychosocial impact was found in our study. This substantiated the results of previous studies. Even slight changes to a person's dental aesthetics may significantly impact their psychosocial life. Thus, it is recommended that the treatment needs of an individual are assessed not only normatively by the orthodontist but also by taking into consideration the perceptive needs of the individual who is the 'patient'.

CONCLUSION

The results suggest a strong correlation between self-perceived dental aesthetics and its psychosocial impact on an individual. An increased want for orthodontic treatment may rise from the psychosocial impact.

DISCLAIMER

None to declare.

CONFLICT OF INTEREST

There is no conflict of interest to be declared by the authors.

ETHICAL STATEMENT

Ethical approval was taken from the institute's ethical review committee before data collection.

FUNDING DISCLOSURE

The author(s) received no financial support for the research, authorship, and/or publication of this article.

AUTHORS CONTRIBUTION

Conception and design of the study: F. Usman, N. Zaib

Acquisition of data: F. Usman, A. Butt, A. Aslam

Analysis and interpretation of data: N. Zaib, A. Aslam

drafting of the manuscript: F. Usman, N. Zaib, A. Butt

Critical review of the manuscript: N. Zaib, A. Aslam

Approval of the final version of the manuscript to be published: F. Usman, N. Zaib, A. Butt, A. Aslam

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ORIGINAL ARTICLE

DOI:10.33897/fujd.v1i1.270

Assessment of Tooth Cleaning Techniques and Oral Hygiene Status among Madrassa Students in Islamabad: A Cross-sectional Study

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Received: 25 May 2021 / Revised: 3 June 2021 / Accepted: 10 June 2021 / Published online: 02 July 2021

ABSTRACT

Objective: To assess the oral hygiene status of madrassa students, including both male and female, in Islamabad city, Pakistan.

Materials and Methods: A cross-sectional study was carried out at two Madrassa's, one male and another female, within Islamabad city. The study took place from July 2018 to December 2018 by four 3rd year dental students under the supervision of a senior dentist to assess the oral health status of madrassa students. Data of 233 madrasa students were recorded using the DMFT index and OHI-S index. The data were analysed using SPSS software version 23.

Results: Maximum participants of our study ranged between the ages of 11-15 years. They were using different cleaning techniques, with a majority (42.5%) using Miswak as a primary cleaning method. The study indicates that 50.6% of madrassa students have DMFT=0, with overall mean DMFT being 1.24, and mean OHI-S being 1.19.

Conclusion: The findings indicate that madrassa students have good oral hygiene despite limited resources.

Keywords: Madrassa, Miswak, Oral Health, Oral Hygiene, Toothbrushing

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How to cite this Article:

Choudhary UJ, Zaib N, Ilyas S, Bukhari SS, Naseem M. Assessment of Tooth Cleaning Techniques and Oral Hygiene Status among Madrassa Students in Islamabad: A Cross-sectional Study. Found Univ J Dent. 2021;1(1):11-17.

ORIGINAL ARTICLE
DOI:10.33897/fujd.v1i1.270

INTRODUCTION

Health is a fundamental right of every individual and oral health is an integral part of general health and is much more than just healthy teeth.[1] According to World Health Organization (WHO), it is a state of being free from mouth and facial pain, oral and throat cancer, oral infections and sores, periodontal disease, tooth decay, tooth loss and other diseases and disorders that limit an individual capacity in biting, chewing, smiling, speaking and psychosocial well-being. [2-4]

Various factors are responsible for the maintenance of good oral health. Socio-economic status, occupation and education are playing a major role in the maintenance of good oral health.[5] Despite adequate advancement in global oral health, problems persist in many communities around the world. Dental disease, especially dental caries and periodontal disease is the most prevalent dental disease affecting a large population throughout the world.[6] Numerous studies have been conducted both at the national and international level assessing the oral health status of nearly all subsets of the population, particularly the school students. Nonetheless, with the increasing researches on various aspects of oral health in different populations, there are usually a certain number of groups that are overlooked, one such group is Madrassa students.

The madrassa is the Arabic word for any type of educational institution, whether secular or religious. Madrassa not only constitutes religious education but also the modern curriculum.[7] However, Madrassas in Islamic countries are mostly religious schools, focusing on Islamic education.[8] They are privately managed with aid from public donors and the government. The total number of madrassas is estimated but there are different reports with different numbers. In some areas of Pakistan, they outnumber the underfunded public schools. According to the tribune, in 2018 the number had reached as much as 32000 madrassas.[9]

Some of the Madrassas in Pakistan constitute modern resources and technology, however, a large group faces limitations in this aspect. Upon literature review, it was discovered that no studies have been conducted in Pakistan that specifically targeted the oral hygiene status of madrassa students. Considering all these reasons this study was carried out to assess the oral health status of Madrassa students by using the Decayed Missing Filled Tooth index (DMFT/dmft). It is a commonly used index for epidemiological studies and dental research. It quantitatively provides the number of decayed, missing and filled teeth. The higher the DMFT score is, the higher is the caries prevalence.[10] Simplified Oral Hygiene Index (OHI-S), which is a sum of debris and calculus index, and is also used to evaluate the oral health status.[11]

MATERIALS AND METHOD

This cross-sectional study was carried out to assess the oral hygiene status of the Madrassa students. The 233 Madrassa students were selected through a non-probability convenience sampling technique, consisting of both male and female between the age ranges of 5-22. The sample size was taken randomly based on the presence and absence of students in Madrassa. The study was carried out after receiving proper consent from the Madrassa head/parents. The students that were absent and didn't consent to be a part of the examination, were excluded. The study was carried out at one male and a female madrassa each in the city of Islamabad. The data was collected by four dental students under the supervision of a senior dentist.

The DMFT/dmft index and OHI-S were assessed to evaluate the oral hygiene status of the students.[10,11] Proper and thorough intra oral examination was done to obtain the correct scores. DMFT/dmft was acquired to estimate the caries experience of the candidate. The teeth missing or filled due to traumatic instances or other treatments i.e., Orthodontic procedures were not recorded.

Oral hygiene was analysed by using a Simplified Oral Hygiene Index (OHI-S). It constitutes two components: The Debris index and the Calculus index. The OHI-S score was obtained by summing the debris index and calculus index scores of an individual after examination of the buccal and lingual surfaces of the six index teeth (the upper first molars, lower first molars, upper right central and lower left central incisors). The Debris index and the Calculus index was evaluated using examination sets i.e., mirrors, probes and tweezers. Information regarding name, age and gender, information about cleaning techniques i.e., Miswak, Toothbrush or Dandasa (Walnut tree peel) was gathered. DMFT and OHI-S were compared with cleaning techniques and age ranges. The data was analysed using IBM SPSS version 23.

DOI:10.33897/fujd.v1i1.270

RESULTS

A total of 233 madrassa students age ranging between 5 to 22, both male and female participated in this study. Maximum participants were between 11 to 15 years as shown in Figure 1.

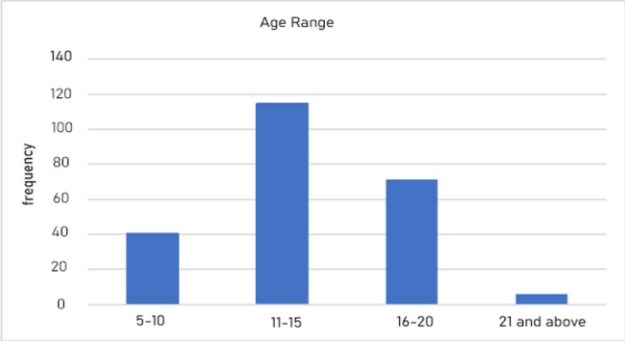

Figure 1: Percentage of age distribution among the studied participants

Among the students 115 (49.4%) were males and 118 (50.6%) were females. Since this is not a comparative study no statistical test was applied out to find the relationship between male and female based on cleaning technique and oral hygiene status.

The most frequently used techniques were cleaning by Miswak, Toothbrushing, Dandasa (walnut tree peel) and a combination of any of these. There was a small number that did not practice cleaning at all comprising three students (1.3%) as shown in Figure 2.

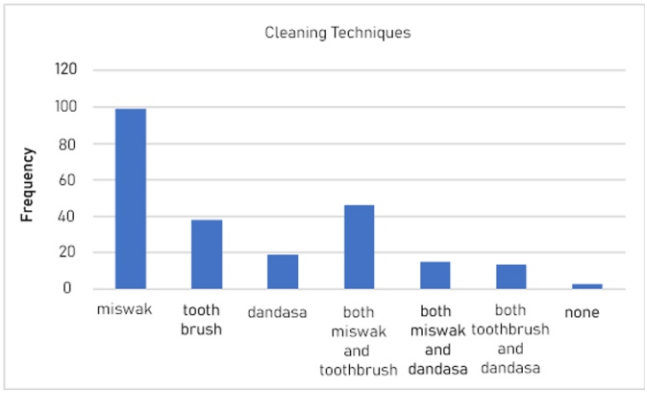

Figure 2: Percentage of teeth cleaning techniques among the studied participants

DMFT was evaluated by examining the decayed, filled and missing teeth. The mean DMFT for males was 1.35 ± 2.20 and for females 1.14 ± 1.52. There were 118 students (50.6%) with DMFT = 0. Simplified Oral Hygiene Index was also assessed that consisted of the sum of calculus and debris index. While examining and analysing the participants and data, it was found out that the calculus deposits in the students were not as much as compared to debris level. The overall mean OHI-S score was 1.19 with a standard deviation of 0.94. While in this, the males presented with the mean OHI-S of 1.68 ± 0.97 and female presented with 0.72±0.60. The mean DMFT and OHI-S score with relation to cleaning technique and age are shown in Table 1 and 2, respectively.

Table 1: Effect of teeth cleaning technique on DMFT and OHI-S

Teeth cleaning technique	N	Mean	
		DMFT±SD	OHIS±SD
Miswak	99	1.40±2.13	1.51±0.96
Toothbrush	38	1.21±1.56	1.26±1.04
Dandasa	19	1.05±1.58	0.62±0.46
Both Miswak and Toothbrush	46	1.34±2.11	0.95±0.87
Both Miswak and Dandasa	15	0.73±1.03	0.66±0.55
Both Toothbrush and Dandasa	13	0.92±1.11	0.86±0.71
None	3	0.33±0.57	1.32±0.92
Total	233	1.24±1.88	1.19±0.94

DOI:10.33897/fujd.v1i1.270

Table 2: Relation of Age range with and DMFT and OHI-S

Age (years)	N	DMFT ± SD (Mean)	OHIS ± SD (Mean)
5-10	41	1.70±2.18	0.74±0.55
11-15	115	1.00±1.61	0.93±0.69
16-20	71	1.33±2.04	1.76±1.06
21 and above	6	1.83±2.40	2.60±1.25
Total	233	1.24±1.88	1.19±0.94

DISCUSSION

Oral hygiene assessment plays an important role in upgrading the dental health of the general public. With increasing urbanization and changes in living conditions, the prevalence of oral diseases continues to increase notably. In today's world, dental caries is the most prevalent oral disease, especially in children. There are several types of research performed on school-going children but very few on the madrassa going children. However, our research focuses on the oral health of madrassa going children, both male and female as compared to a study done in Lucknow, India which only had a male population.[12]

In this study, the difference between both the genders is very slight with a percentage of females (50.6%) being higher than that of males (49.4%), which is quite similar to study done in Madrassa in Bangladesh and Qatar with females' percentage minutely higher than that of males.[3,4]

This study is focused on a population with age ranging from 5-22 years. The maximum percentage of students lie in ages from 11-15 while only 2.6% were twenty and above. Through a literature review of different studies, we found out that most studies focus on these age ranges. The population of a study done in Bangladesh belonged within the ages of 0-14 years whereas the study done in a madrassa in India consisted of age ranges from 12-20.[3,12]

The cleaning technique being used by an individual is a very important parameter to maintain oral hygiene. A major prospect of this study is directed towards different cleaning techniques being used. This study revealed that the majority of madrassa students (42.5%) use miswak for cleaning their teeth while 19.7% use both miswak and toothbrush and only a small number (16.3%) of students use toothbrush alone. Similarly, a study performed in a primary school in Saudi Arabia by Amin et al. showed that a large number (44.6%) of students used miswak as a primary cleaning method and 24.5% of students used toothbrush.[13] In contrast, another study done in a madrassa in Saudi Arabia by Al Hammadi et al demonstrated that 46.5% of madrassa students used tooth brushes, 44.5% use both tooth brush and miswak whereas only 8% use miswak alone.[14] Also, a study done on Sudanese school children displayed that 93.1% of children used toothbrush while only 3.9% used Miswak.[15] Even though the percentages varies in different studies, it is clear that miswak is still used as one of the cleaning methods by many students.

DMFT is a commonly used index in epidemiological surveys of oral health. This study shows that the mean DMFT of madrassa students is 1.24±1.88 (males 1.35±2.20, females 1.14±1.52) which is contrasting to the study conducted in madrassa of Bangladesh showing mean DMFT of 1.94[3] and also to the studies conducted in 2015 in Saudi Arabia showing DMFT of 1.94±2.0.[16] Another research carried out in Mangalore, India showed that the DMFT of males is 2.54±2.84 and of females is 2.50±2.85. It shows comparable results to our study as the DMFT of these studies is slightly higher than ours, thus suggesting that participants of our study have better oral hygiene.[17]

According to this study, 50.6% of madrassa students have DMFT= 0 which is an indicator of good oral health whereas a study conducted in Madrassa of Bangladesh by M. Khan et al showed that around two-thirds of their respondents had decayed teeth while the majority didn't have any missing and filled teeth which are similar to study conducted in 2017 in Hongkong in which 55% of the study population have DMFT > 0.[3,18] This contradicts with the general perception of madrassa students being less than the school-going children.

DOI:10.33897/fujd.v1i1.270

The minimum DMFT=1 is observed in the age range of 11-15 years which is almost similar to the study conducted in 2013 in Himachal which demonstrates the DMFT= 0.62 at the age of 12 and DMFT = 1.06 at 15 years of age.[19] Another study in India revealed DMFT= 0.8 in the age group of 13-15 years.[20]

In this study, it is observed that the mean DMFT of miswak users is 1.4 and that of toothbrush users is 1.2, this difference is not statistically significant. Since the majority of students studying in madrasas belong to families with low socio-economic background, we compared our results with another Pakistani study carried out to assess the oral hygiene status of the low-income strata population i.e., Railway Coolies age ranged between 15-60 years. Their results revealed a DMFT of 6.2 and 4.8 for toothbrush and miswak users, respectively. These high values are indicative of very poor oral hygiene status, the reason being unaffordability to buy even toothbrush and paste and lack of awareness.[21] Comparison of this study with the present study highlighted the fact that both the study populations belong to low socio-economic backgrounds, but the oral hygiene status results are nearly opposite. The most appropriate reason for the good oral hygiene status of madrasa students is because of their good knowledge and understanding of oral hygiene measures, it signifies that madrasa students are taught well regarding the different aspects of oral hygiene. As when you understand the importance of oral health, the cost of any tool to be used for maintaining oral hygiene whether it be toothbrush/paste or miswak becomes extremely negligible. Another study in Saudi Arabia demonstrated that DMFT of miswak users is low as compared to non-miswak users, thus again endorsing the fact that good oral hygiene can be achieved with miswak as well which is generally a cheap tool for maintaining oral hygiene as compared to tooth brush/paste.[22]

OHI-S is an expression of the oral health of an individual in numeric values, range starting from zero, lower the score better the oral hygiene is. In our study, mean OHI-S was found to be 1.19, the students with ages ranging from 5-10 had mean OHI-S of 0.74, while 11-15 had mean OHI-S 0.93 which is an indicator of good oral hygiene. The highest mean OHI-S was observed in the age range 16-20 and 20 and above being 1.76 and 2.60 respectively, which displays that with an increase in age the accumulation of debris and calculus increased. In contrast, a study done on school children of Sunsari District, Nepal showed that children with ages 12-13 and 15 had quite identical values of mean OHI-S i.e., 1.21 and 1.22, respectively.[23]

There is a great impact of the cleaning technique on OHI-S like in this study we found that children who used toothbrushing had a mean OHI-S of 1.26 while that of miswak was 1.51. It may be due to the reason that a large number of madrassa students use miswak as compared to a toothbrush or maybe due to the reason that they are unaware of the proper technique to use miswak. However, another study done in Saudi Arabia did not find any significant relation between OHI-S and cleaning technique.[14] Even though the study is carried out properly, we could not collect a large number of data due to permission from madrassas.

CONCLUSION

The present study indicates that Madrassa students have good oral hygiene status despite the fact majority of madrasa students belong to low socioeconomic background. This relates to their better understanding of the importance of oral hygiene.

DISCLAIMER

None.

CONFLICT OF INTEREST

No conflict of interest declared by the authors.

ETHICAL STATEMENT

Ethical approval was taken from the institute's ethical review committee before data collection.

FUNDING DISCLOSURE

The author(s) received no financial support for the research, authorship, and/or publication of this article.

AUTHORS CONTRIBUTION

Conception and design of the: U.J. Choudhary, N. Zaib, S. Ilyas, S.S. Bukhari and M. Naseem

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Analysis and interpretation of data: U.J. Choudhary, S. Ilyas, and S.S. Bukhari

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DOI:10.33897/fujd.v1i1.270

Critical review of the manuscript: U.J. Choudhary, S. Ilyas, S.S. Bukhari, and M. Naseem

Approval of the final version of the manuscript to be published: U.J. Choudhary, N. Zaib, S. Ilyas, S.S. Bukhari and M. Naseem

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ORIGINAL ARTICLE

DOI:10.33897/fujd.v1i1.273

Lower Back Pain and Disability: An Occupational Public Health Dilemma of Chamalang, Balochistan Coal Miners

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Received: 26 May 2021 / Revised: 9 June 2021 / Accepted: 11 June 2021 / Published online: 02 July 2021

ABSTRACT

Objective: Lower back pain (LBP) is a common problem associated with the musculoskeletal system due to abnormal and persistent working posture among coal miners. This study aims to explore the occupational and personal factors associated with LBP and disability in coal miners of Baluchistan.

Materials and Methods: This cross-sectional study was conducted in Chamalang, Baluchistan, spanned over four months. Using the random sampling technique, a total of 376 underground conventional coal miners were approached. A pre-validated structured questionnaire i.e., Oswestry Lower Back Pain Questionnaire based on the Oswestry Disability Index (ODI) was used for data collection. Descriptive statistics, correlations analysis and chi-square tests were performed for data analysis using SPSS version 20.0. A value of $p < 0.05$ was considered statistically significant.

Results: Amongst the 376 respondents with the age distribution 20-50 years, the majority (50%) were from the 31-41 years age group and, nearly all suffered from LBP and had developed varying degrees of disability. Occupational factors contributing towards LBP included lifting heavy loads (81.1%), static posture underground (81.9%), working in confined spaces (77.9%), jolts from machinery (66%) and personal factors contributing towards lower back pain were age, smoking (71.8%), and existing respiratory condition (58.5%). No significant association was found between job satisfaction and the lifting of heavy loads.

Conclusion: Increasing age, diagnosed respiratory condition and nature of work were found to be significantly associated with LBP in coal miners. It is recommended to define and implement proper guidelines for the coal miners. This will improve their quality of life, as well as minimize disability-oriented risks associated with LBP.

Keywords: Coal miners, Disability, Lower back pain, Musculoskeletal disorders, Pakistan

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How to cite this Article:

Arif M, Kawish AB, Nasim M, Zeb A. Lower Back Pain and Disability: An Occupational Public Health Dilemma of Chamalang, Balochistan Coal Miners. Found Univ J Dent. 2021;1(1):18-24.

ORIGINAL ARTICLE
DOI:10.33897/fujd.v1i1.273

INTRODUCTION

Musculoskeletal disorders (MSDs) such as pain, inflammation, paresthesia or poorly functioning muscle, nerve, bone or joint are reported to be associated with many professions including miners, healthcare workers and drivers.[1] They have negative impacts on quality of life such as work-related disability as well as substantial financial implications related to medical expenses and workers compensation. Coalmining poses numerous high-risk health challenges of varying degrees including cardiovascular, gastrointestinal, skin, joints and many more with MSDs being a characteristic health feature of the miners.[2]

Lower back pain (LBP) is one of the most common causes of musculoskeletal disorders. It can be defined as a "Subjective perception of pain in the lower back, buttocks, or legs" while "Disability" associated with coal mining is a complex phenomenon ranging from activity limitations, participation restrictions to permanent impairment.[3] An estimated 80% of the general population experiences a back problem at some point in their life.[4] The 2010 global burden of disease study reported lower back pain as one of the top ten diseases and/or injuries causing the highest number of disability-adjusted life years (DALYs) worldwide.[5]

The Mining industry as reported in scientific literature has the highest reported incidences of Lower Back Pain, back injury ratio and other musculoskeletal disorders. Vertebral disc compression, spinal sprains due to lifting heavy loads, jolts of drill machine, working in confined spaces and others are examples of the occupational hazards that expose the miners to lower back pain and disability.[6]

In Pakistan, coal mining is very important and is a significant contributor to the economy. Pakistanis refer to coal as "Black Pearl" and to meet the country's interminable demands of energy it is being extracted from Chamalang coal fields in Baluchistan since 1973.[7] Despite technological advancements, most of the coal mining at Chamalang is of underground conventional type and is pre-dominantly non-mechanized and hence miners are expected to lift heavy loads, work crouched or in bent positions and are often exposed to vibrations. Over the years, the mining industry has witnessed long term health issues and disabilities including accidents and even fatalities.

Despite the existence of international standards such as those formulated by the World Health Organization (WHO) and International Labor Organization (ILO) and national regulations such as the provision of Mines Act and/or provision of essential safety equipment in the 1923 Act, irregularities and violations have been reported. Safety equipment to protect against the emission of deadly gases are also either not available or not in the use of the coal miners. In the absence of implementation of standardized protocols, the coal miners are at serious risk of occupational hazards including health hazards.[8,9]

From reviewing the literature, it was found that significant gaps existed in exploring predisposing risk factors to occupational hazards associated with conventional non-mechanized coal mining particularly in Baluchistan, Pakistan. Therefore, this study aims to develop an understanding of occupational risk factors contributing to lower back pain and disability in coal miners. The objective of this study is to determine the occupational and personal factors associated with lower back pain (LBP) and disability in coal miners of Chamalang, Baluchistan.

MATERIALS AND METHODS

This cross-sectional study was designed whereby a validated Oswestry Lower Back Questionnaire was used to record lower back pain and disability in coal miners from Chamalang, Baluchistan. A hypothetico-deductive approach was adopted to investigate the relationship between musculoskeletal and respiratory condition with the nature of work performed by coal miners in Chamalang. Al-Shifa Eye Trust IRB provided ethical approval for this study as part of the Masters in Public Health Degree Course (MSPH-IRB-02/02-04).

The data collection took four months. Adult underground coal miners aged 20 years and above were included in the study, primarily males owing to the protracted and laborious nature of the work and cultural and ethnic restrictions to women from working in the field.

The probability multistage sampling technique was used for the selection of an appropriately sized sample. Randomly, through a lottery, amongst all the coal mines in the Chamalang area, one was selected for this study. The owner of the coal mine provided the researchers with an attendance sheet of 1200 coal miners attending

DOI:10.33897/fujd.v1i1.273

the mine. They were stratified into 400 were surface coal miners and 800 underground coal miners. Surface coal miners were excluded from the study. Based on the nature of work they do, amongst the 800 underground coal miners, there were 600 loaders, 100 drillers and 100 blasters working in the coal mine. The statistical formula $n = (z)^2 p (1 – p) / d^2$ was used to calculate a sample size representative of the proportion of underground coal miners in each sub-group having lower back pain. A total sample size of 375 was calculated. To obtain this sample size, using a simple random sampling technique, every third loader, every third blaster and every third driller was selected for data collection. The final sample included 282 loaders, 46 blasters and 46 drillers. Figure 1 illustrates the sampling technique used for the study.

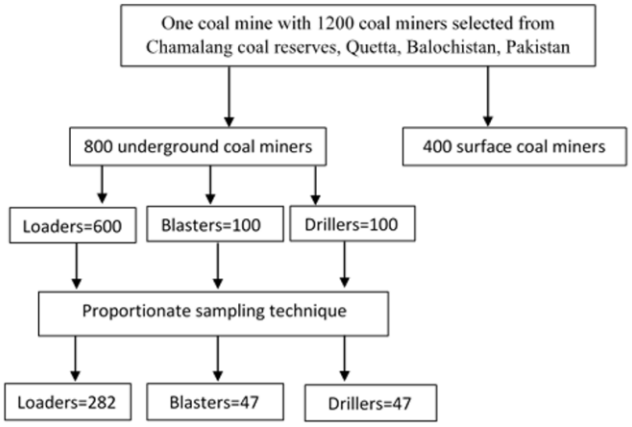

Figure 1: Flow chart showing sampling technique used for the study.

The study excluded surface coal miners, miners who were suffering from a systemic health condition and lower back pain before starting work at the mines and those miners unwilling to participate in the study.

The data collection tool was a validated, structured questionnaire that was initially pilot tested for reliability and validity and then revised to fulfil the requirement of this study. Since most coal miners were unfamiliar with the English language owing to the cultural backdrop and literacy levels of the study population, to compensate for the language barrier, a notarized translation of the tool into the Urdu language was done for the convenience of the miners. To assess the degree of disability in coal miners, the Oswestry Disability Index (ODI)[10] derived from the Oswestry Lower Back Pain Questionnaire11 was used. A validated Urdu translation of the ODI done by the Notary Public in Quetta was used.

The data collected were analysed using statistical software Statistical Package for Social Sciences® version 20.0. Descriptive statistics and chi-square statistical tests were performed on the data, by the authors. The study population was not blinded.

This study was a part of a research project for the completion of a post-graduate program and was self-funded. The respondents were not blinded. However, all data collected was following informed consent while confidentiality and privacy of the responses were maintained, at all times.

RESULTS

Data of 376 underground coal miners from the Coal Mining Sector of Baluchistan (Pakistan) was collected. Respondents were between 20 years to 50 years with the majority between 31-41 years of age (50%). 207 respondents had a work experience of 5-10 years (55.1%) working in Chamalang coal mines. 270 respondents were smokers (71.8%). Seventy-five per cent of the total study population was of loaders.

Results on basic demographic and occupational variables, as shown in Figure 2, revealed 330 respondents claiming lower back pain, 244 were diagnosed with a respiratory condition, 293 had worked in confined spaces, and 290 had an experience of trunk twisting during work.

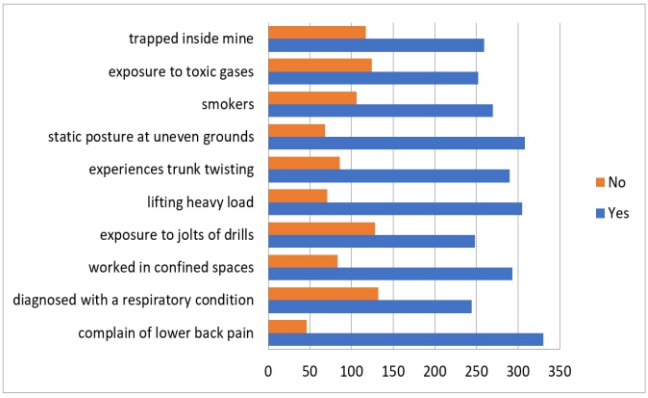

Figure 2: Assessment of lower back pain in underground conventional coal miners in Chamalang

Results of the study revealed an alarming 87.8% of the respondents having complaints of Lower back pain. Amongst the respondents, 134 aged 20-30 years, 168 aged 31-41 and 28 aged 42-50 complained of lower

DOI:10.33897/fujd.v1i1.273

back pain during the last 3 months. Results also showed that 220 respondents were diagnosed with a respiratory condition and had a complaint of lower back pain. No significant association was found between job satisfaction and the lifting of heavy loads. Table 1 shows the association of, lifting heavy loads and job satisfaction of respondents with a complaint of lower back pain in the last three months.

Table 1: Association of Lower back pain with occupational variables

	Lifting of heavy loads		Job satisfaction		Age of respondents			Diagnosed respiratory condition	
Any episode of pain in lower back/ buttocks/legs during last 3 months	**YES**	**NO**	**YES**	**NO**	**20-30 years**	**31-41 years**	**42-50 years**	**YES**	**NO**
YES	72.1%	15.7%		22.4%	35.6%	44.7%	7.4%	58.5%	29.35
NO	9.0%	3.2%	28.2%	8.5%	4.3%	5.3%	2.7%	6.4%	5.9%
χ^2	1.776		0.053		7.807			3.722	
Df	1		1		2			1	
p-value	0.183		0.818		0.02			0.042	

77.9% of this population owed LBP to confined space in coal mines, 66% attributed LBP to jolts of drilling machines, 81.1 % identified lifting heavy loads as a contributing factor to LBP, 77.1% experienced trunk twisting, 81.9% complained of static posture at the uneven ground as a predisposing condition to LBP and 59 % of the total respondents associated LBP with the repetitiveness of work.

Out of the total study population, 259 (68.9%) miners had been trapped inside a mine at least once in their mining careers. An alarming 67% reported exposures to toxic gases during mining.

A relatively significant proportion of respondents reported severe disability, i.e., 34.8% blasters, 33.9% loaders and 39.2% drillers. From 46 blasters there were 7 mildly disabled, 10 moderately, 16 severely, 8 crippled and 5 exaggerated their complaints. From 283 loaders, there were 25 mildly disabled, 78 moderately, 96 severely, 63 crippled and 20 were exaggerating. There were 8 persons from the drilling category with mild disability, 9 moderately disabled, 18 severely disabled and 10 were crippled. Figure 3 illustrate the degree of disability reported by miners in the blasting, loading and drilling groups.

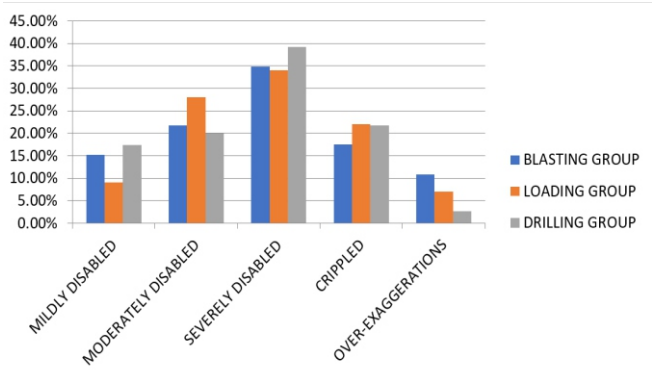

Figure 3: Degree of disability in underground conventional coal miners, in Chamalang

DISCUSSION

The scarcity of research on non-mechanized conventional coal mining particularly in Pakistan was a major contributing factor to the design and formulation of this study investigating the relationship between muscular-skeletal problems such as lower back pain and occupational experiences of coal miners. Research has shown that since underground mining is dangerous and involves serious risks to health and safety, devising protocols and national-level regulations to incorporate applied principles of ergonomics has become essential to ensure the former.[12]

DOI:10.33897/fujd.v1i1.273

Amongst the 376 respondents aged between 20-50 years, 259 responded with having been trapped in mines during their work experience to date of data collection. In this study, the majority of the participants complained of LBP. Similar studies have been reported which showed LBP being the major complaint among the coal miners.[13-15] Besides LBP, 58.5% of the study participants also diagnosed with respiratory conditions as an occupational variable. Recently, a study was performed which assessed disability degree in coal miners using pulmonary function and hypoxemia with Pneumoconiosis and a result showed significant association.[16] Coal mine dust causes a spectrum of lung diseases collectively termed coal mine dust lung disease (CMDLD). A study has shown that coal mine dust remains a relevant occupational hazard and miners remain at risk for CMDLD.[17]

A significant 77.9% associated their lower back pain with working in confined spaces in the mines. Another significant finding from the study was the contribution of working in static postures at uneven grounds to lower back pain of coal miners. These findings are coherent with MSD risk factors reported in scientific literature, associated with obstructive work environments including low ceiling heights, hot humid temperatures at/inside physically laborious work sites.[18-20]

In this study, a strong association between bending, the repetitiveness of work, twisting, jolts of drilling machine occupational risk factors and reports of LBP with varying degrees of disability were observed which is coherent with the previous studies.[21-24] Identification of these occupational risk factors provides valuable information for planning, implementation and evaluation of injury prevention programs and devising guidelines for the management of occupation hazards for coal miners. Another significant finding was the exposure of the coal miners to toxic gases. A recent study has shown similar findings where coal mine dust lung disease contributes to significant morbidity and mortality among those exposed.[25] Through active participation from all stakeholders' procedures for hazard identification, risk assessment, evaluations for improvements, policing of implementation of these procedures and follow-ups conducted with due diligence can facilitate creating a support structure to minimize these occupational health hazards related to coal mining in Pakistan.

Inaccessibility and poor infrastructure approach to Chamalang coal mines was a major limiting factor while conducting this study. The area is remote, under-developed and sensitive owing to local disputes and the prevailing uncertain law and order situation were an additional challenge to reaching the coal mine for data collection. The researchers were able to build trust and rapport for data collection from the miners through strong advocation and personal acquaintances with the locals. Limited resources such as accommodation and lodging for the researchers, funding and human resource for data collection also posed constraints in conducting this study.

This study was a first step towards identifying the prevalence of lower back pain and associated disability in underground non-mechanized coal miners and personal and occupational factors that contribute towards lower back pain and associated levels of disability. The researchers suggest further research and organized efforts in this field to identify and bring to light the issues relating to the health and quality of life of underground coal miners in Pakistan. Moreover, the health challenges associated with the general working milieu and safety of the coal miners in rural Balochistan discovered in the study need to be highlighted at public health forums. Periodic medical examinations and the provisions of universal health care need to be made accessible at affordable costs to coal miners to address the degree of disability associated with their occupation.

CONCLUSION

The compelling percentage of underground coal miners having lower back pain and varying degrees of disability associated with personal factors such as age, years of work experience and existing spinal injury and/or respiratory conditions and occupational variables such as nature of work, posture, bending of the trunk during work, lifting of heavy loads suggest a significant association of these occupational and personal factors with musculoskeletal issues in miners.

ACKNOWLEDGMENTS

We would like to extend our gratitude to the faculty of Al-Shifa School of Public Health, Al-Shifa Trust Eye and our families and friends for their support and encouragement.

DOI:10.33897/fujd.v1i1.273

DISCLAIMER

None.

CONFLICT OF INTEREST

None to declare.

ETHICAL STATEMENT

Al-Shifa Eye Trust IRB provided ethical approval (MSPH-IRB-02/02-04) for this study as part of the Masters in Public Health Degree Course.

AUTHORS CONTRIBUTION

Conception and design of the study: M. Arif, A.B. Kawish

Acquisition of data: M. Nasim

Analysis and interpretation of data: M. Nasim, A. Zeb

drafting of the manuscript: M. Nasim

Critical review of the manuscript: M. Nasim, A. Zeb

Approval of the final version of the manuscript to be published: M. Arif, A.B. Kawish, M. Nasim, A. Zeb

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ORIGINAL ARTICLE

DOI:10.33897/fujd.v1i1.265

Prevalence of Dental Caries among 5–11-Years-Old Children in Ibrahim Hyderi, Coastal Area of Karachi

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Received: 15 May 2021 / Revised: 9 June 2021 / Accepted: 12 June 2021 / Published online: 02 July 2021

ABSTRACT

Objective: Dental caries is the most common oral health disease of school-aged children globally. This study aimed to determine the prevalence of dental caries among 5–11-years-old children in Ibrahim Hyderi, a coastal area of Karachi.

Materials and Methods: This was a descriptive cross-sectional study in which 350 children aged 5–11 years were investigated. Dental examination was performed according to the World Health Organization criteria. Socio-demographic data were collected using a structured questionnaire. The data were analyzed using SPSS version 23.0. Descriptive statistics were employed to compute the mean and standard deviation of quantitative variables. Frequencies (numbers and proportions) were implemented to assess the prevalence of dental caries among groups as $p<0.05$ was considered statistically significant.

Results: A total of 182 (52%) male and 168 (48%) female participants, with 96 (27.4%) aged 5-6 years old, 148 (42.2%) aged 7-9 years old and 106 (30.2%) aged 10-11 years old group participated in the study. The overall prevalence of dental caries among the participants was 91.3%, with the male participants having a higher prevalence (52.1%) than the female counterparts (39.2%). Following the age of the participants, the prevalence of dental caries in primary, permanent, and whole dentition among children was 248 (70.8%), 172 (49.1%), and 310 (88.5%), respectively. Moreover, the odds of decaying permanent teeth were significantly higher in boys ($p = 0.04$), and in children whose fathers are unemployed ($p = 0.02$) compared to their counterparts.

Conclusion: The prevalence of dental caries among the studied children in mixed dentition was high and associated with sociodemographic factors. It is important to provide and implement preventive, therapeutic and informative programs for the control of dental caries at individual and school levels for local health policymakers.

Keywords: Dental Caries, Children, Prevalence, Sociodemographic Factors, Public Health

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How to cite this Article:

Patoli S, Jabeen N, Zareef U, Hameedi S, Arshad MB, Farid H. Prevalence of Dental Caries among 5–11-Years-Old Children in Ibrahim Hyderi, Coastal Area of Karachi. Found Univ J Dent. 2021;1(1):25-31.

ORIGINAL ARTICLE
DOI:10.33897/fujd.v1i1.265

INTRODUCTION

Dental caries is a preventable childhood disease, but public health efforts are hindered due to limited information on associated factors in vulnerable populations. It is a chronic, non-communicable disease of the tooth structure, characterized by alternating phases of demineralization and remineralization, which can lead to cavitation of the tooth structure and eventually tooth loss.[1,2] The earlier the problem is diagnosed, the fewer problems it can cause and since children are the most valuable assets for any community, it is imperative to know the dental caries status of children in our region.

According to reports published by the WHO in 2010, dental caries remains a major public health problem in many countries affecting 60-90% of school-age children[3] where more than 60% of children suffer from tooth decay at the age 5 to 11 years due to lack of awareness and improper brushing. Perhaps, the most widely reported at-risk groups are those in the lower socio-economic groups among whom higher caries levels are consistently reported.[4] Although a decline in caries has been observed in most industrialized countries over the past 20 years, mainly a result of various preventive public health measures such as adequate dental exposure to fluoride, especially in toothpaste along with better living conditions and improved oral hygiene practices and promotion, the situation is still far from being completely under control in both the developed and developing world.[5]

Several studies have shown that the prevalence of dental caries may vary with geographic locations owing to the fluoride and mineral content of the water and food being consumed in that region. A study conducted in coastal areas of West Bengal demonstrated that the prevalence of caries in children had been significantly less as compared to those in other parts of India, probably due to the high content of fluoride in the form of fish and fewer carbohydrates in their diet.[6] On the contrary, studies also prove that children coming from the low socioeconomic background, with parents having low education level, are more likely to have caries at a younger age than those in whom those risk factors are not present.[7] Likewise, the fishermen community living in the coastal areas of Karachi have a socially isolated and economically struggling lifestyle where men are out in the sea for several days and their families left behind with meagre resources and minimal access to health facilities.

This raises the need to estimate the prevalence of dental caries in the children of coastal areas of Karachi. The estimation of caries in such children will highlight the treatment need and will be helpful in the reorientation of oral health services towards the more caries susceptible areas of the city. Therefore, the objective of this study was to determine the prevalence of dental caries in children in a local population of the coastal area of Karachi.

MATERIALS AND METHODS

This was a descriptive, cross-sectional study carried out at Liaquat College of Medicine and Dentistry, Karachi after obtaining ethical approval (Ref. No: LCMD/ERC/2020/22) from the Ethics Committee of the institute. The subjects were children aged 5-11-years-old who were referred from a private dental clinic located in Ibrahim Hyderi Coastal Area of Karachi, from July 2020 to December 2020. Informed consent for participation in the study by the children was obtained from their parents/guardians before the commencement of the study.

The inclusion criteria were the child being healthy and being a permanent resident of Ibrahim Hyderi coastal area, aged between 5-11-years old, must be accompanied by a parent/guardian who is willing to provide informed consent for the child's dental examination. The exclusion criteria included children in whom there was significant dental anxiety and who refused to have their teeth examined and children with special needs such as mental or physical handicap, syndromic patients and those with dental anomalies as well as medically compromised.

For the present study, a three-stage stratified clustered random sampling method was implemented. Based on the previous survey which showed an estimate of 62%, with a confidence interval of 95% and using the single population proportion formula, the calculated sample size came out to be 350 for this study.

Sociodemographic characteristics, such as the participant gender (male/female), age (5-, 6-, 7-, 8-, 9-, 10- and 11-year-old), parents' education level (primary, high school, college/university), and parents' professional situation (employee/not employed), were collected using a structured questionnaire.

DOI:10.33897/fujd.v1i1.265

A comprehensive intraoral dental examination was performed in the out-patient department using routine examination instruments i.e., dental mirror, probe and tweezers for all selected participants by two professionals and calibrated dentists (kappa = 85%) according to the World Health Organization (WHO) dental caries diagnosis guideline.[8] Then using a dental chart, the numbers of decayed teeth, teeth missing due to caries, and filed teeth for primary teeth (dmft) and permanent teeth (DMFT) were recorded. The dmft/DMFT index was used to describe children's caries experience.

The data collected were analysed using statistical software Statistical Package for Social Sciences® version 23.0 (SPSS, Inc., Chicago, Illinois, USA). For each group, the prevalence of dental caries was computed as the number of affected children divided by group size. Descriptive statistics and frequencies were used for quantitative variables and to assess the prevalence of dental caries among groups, respectively. The Chi-square test was used for bivariate analyses of the dependent variable and independent categorical variables. The socioeconomic characteristics were independent variables, and dental caries (present, not present) in children was the dependent variable. The significance level was set at $p < 0.05$.

RESULTS

Out of 350 children, a total of 182 (52%) male and 168 (48%) female participants, with 96 (27.4%) aged 5-6 years old, 148 (42.2%) aged 7-9 years old and 106 (30.2%) aged 10-11 years old group participated in the study (Table 1).

Table 1: Sociodemographic characteristics of the children and their parents.

Characteristics	Children (n=350)	Percentage (%)	Mean ± SD
Gender			
Male	182	52%	-
Female	168	48%	
Age Group			
5-6 years	96	27.4%	5.3±0.6
7-9 years	148	42.2%	8.5±0.54
10-11 years	106	30.2%	10.1±0.72
Father Education			
Primary	174	49.7%	
High School	42	12%	-
College/University	3	0.85%	
Father Occupation			
Employed	129	36.8%	-
Unemployed	221	63.1%	
Mother Education			
Primary	105	30%	
High School	29	8.2%	-
College/University	4	1.1%	
Mother Occupation			
Housewife	289	82.5%	-
Not Housewife	61	17.4%	

All the children who received and returned the consent forms attended the survey, made a response rate of 100%. The prevalence of dental caries according to gender is presented in Table 2. The overall prevalence of dental caries among the participants was 91.3%, with the male participants had a higher prevalence (52.1%) than the female counterparts (39.2%).

DOI:10.33897/fujd.v1i1.265

Table 2: Prevalence of dental caries according to gender

Gender	No. of Children examined	Children without caries N (%)	Children with caries N (%)	dmft Mean±SD	DMFT Mean±SD
Male	182	87 (13.7)	95 (52.1)	1.92±2.09	1.21±1.35
Female	168	102 (60.7)	66 (39.2)	1.63±2.13	0.85±1.23

The prevalence of dental caries in the surveyed children according to sociodemographic variables and dentition type is given in Table 3. Following the age of the participants, the prevalence of dental caries in primary, permanent, and whole dentition among children was 248 (70.8%), 172 (49.1%), and 310 (88.5%), respectively. A significant association was found in the prevalence of dental caries in the age groups of the studied children in both primary ($x^2 = 100.1, p < 0.001$) and permanent teeth ($x^2 = 27.3, p < 0.001$). In addition, the odds of decaying permanent teeth were significantly higher in boys ($p = 0.02$), and in children whose fathers are unemployed ($p = 0.04$) compared to their counterparts. Moreover, the caries prevalence, neither in the primary dentition nor in the permanent dentition, was not significant in terms of the mother's occupation conditions (p = 0.41 and p = 0.93) and mother's education status (p = 0.84 and 0.29).

Table 3: Prevalence of dental caries according to sociodemographic characteristics and dentition type (n=350).

Characteristics	Children (n=350)	Primary teeth		Permanent teeth	
		Caries, n (%)	*p*-value	Caries, n (%)	*p*-value
Gender					
Male	182	142 (78.0)	0.31	96 (52.7)	0.02
Female	168	106 (64)		76 (45.2)	
Age **Group**					
5-6 years	96	87 (90.6)		21 (21.8)	
7-9 years	148	123 (83)	< 0.001	62 (41.8)	< 0.001
10-11 years	106	38 (35.8)		89 (83.9)	
Total	350	248 (70.8)		172 (49.1%)	
Father Education					
Primary	174	141 (81.0)	0.62	34 (19.5)	0.05
High School	42	38 (90.4)		27 (64.2)	
College/University	3	2 (66.6)		1 (33.3)	
Father Occupation					
Employed	129	103 (79.8)	0.15	76 (58.9)	0.04
Unemployed	221	145 (65.6)		96 (43.4)	
Mother Education					
Primary	105	98 (93.3)	0.84	80 (76.1)	0.29
High School	29	18 (62.0)		19 (65.5)	
College/University	4	2 (50)		3 (75)	
Mother Occupation					
Housewife	289	189 (65.3)	0.41	118 (40.8)	0.93
Not Housewife	61	59 (96.7)		54 (88.5)	

DOI:10.33897/fujd.v1i1.265

DISCUSSION

Dental caries is a prevalent oral health issue among developing countries and influences 60-90% of school-aged children.[3] Coastal communities are among the most marginalized and hard-to-reach groups and have been largely neglected in health research. The present study documented extensive neglect of the oral health of the coastal area of Karachi. Research being carried out in Pakistan have mostly investigated the tooth caries among children at the two age groups: less than or equal six and 12 or higher years. The present study has provided data on the prevalence and associated factors of dental caries at the mixed dentition stage among 5–11-year-old children. The caries prevalence of primary, permanent, and whole dentition obtained in this study were much higher than the criteria set by the WHO[9] and the values presented in similar age groups of children in developed countries.[13,14] Moreover, the caries prevalence found in this study resulted higher than those reported in several studies carried out in other Asian countries.[14, 15] The possible reasons could be first, the people living in areas of social deprivation are far from the localities who have possible access for dentists. Secondly, the oral health care system in Pakistan especially for such communities of coastal regions are not sufficiently developed, and the cost of dental caries treatment is very expensive.[16] Finally, despite the consumption of fluoride-rich seafood and low intake of sugar and refined diet by the studied participants, cultural norms, and levels of parents' oral health knowledge, attitude, and practices among children of the Asian countries might influence the differences.[17]

While assessing the characteristics and associated factors with dental caries, the results of this study showed that as age increased, caries prevalence of primary teeth among children significantly decreased however, caries prevalence of primary teeth was high as compared to permanent teeth. This may be due to a lack of awareness about health caring and retaining primary teeth as well as the parental attitude that the primary teeth are exchangeable by permanent teeth and are not important.[18] Thus, early exfoliation and extraction or both of the teeth results which caused a reduced number of primary teeth at older ages. This result is per the findings reported in the previous studies.[19,20]

In this study, the prevalence of dental caries among the sexes (male and females) is statistically significant. The prevalence rate found was 52.1% in males, whereas it was 39.2% in females. The possible reason could be the presence of gene-by-sex interactions that are involved in the dental caries experience.[21] On the contrary, girls were found to have higher caries prevalence in a study done by Sofia Papadaki and colleagues.[22] Moreover, the study done by Shaffer and colleagues[23] found no difference in caries prevalence between boys and girls. A recent study on Iranian school children also showed more girls to be affected by dental caries than boys.[7] This wide variation observed among different studies may be attributed to the different age groups and geographic locations studied in the surveys.

This study also showed that the presence of caries in permanent teeth among children was associated with the father's occupation, such that the likelihood of caries experience in children whose fathers were unemployed was higher than their associate peers. Previous studies have shown that the socioeconomic conditions of parents are correlated with the dental caries experiences of children.[24,25] Families with higher income could better provide and have more accessibility to oral health care instruments and treatment needs compared with lower-income families. Targeted strategies are needed to facilitate the use of preventive measures and dental health services especially in families of lower status.

The present study had some limitations which addressing them could be considered in future studies. The detection of dental caries presence in the children was performed without taking radiography. Furthermore, the associated factors of dental caries in children could be better detected and evaluated in a longitudinal study with larger sample size.

CONCLUSION

There was a high prevalence of dental caries among 5-11 years old children of Ibrahim Hyderi coastal area Karachi, with the highest risk among the age group of 7-9 years. Despite the consumption of fluoride-rich seafood and low intake of sugar and refined diet, the children in these areas are at higher risk of dental decay possibly due to lack of education and awareness among families, low socioeconomic conditions and inaccessibility to oral health facilities.

DOI:10.33897/fujd.v1i1.265

DISCLAIMER

None to declare.

CONFLICT OF INTEREST

None to declare.

ETHICAL STATEMENT

The study was approved by the Ethical Review Committee of Liaquat College of Medicine and Dentistry before data collection.

FUNDING DISCLOSURE

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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DOI:10.33897/fujd.v1i1.265

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ORIGINAL ARTICLE

DOI:10.33897/fujd.v1i1.269

Anti-Inflammatory Effect of Eugenia Jambolana on Epithelial Thickness in Induced Gingivitis

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Received: 25 May 2021 / Revised: 10 June 2021 / Accepted: 12 June 2021 / Published online: 02 July 2021

ABSTRACT

Objective: The objective of this study was to correlate the histological changes in gingival epithelium, after tropical application of Eugenia jambolana and to observe the effect of Eugenia jambolana extract on the thickness of epithelium on induced gingivitis in albino rats.

Materials and Methods: This experimental study was conducted in the animal house, Anatomy Department, Post Graduate Medical Institute, Lahore, Pakistan. A total of 48 albino rats were selected and were further divided into three main groups i.e. Group A (Control; healthy mucosa, no intervention), Group B (Experimental B; inflamed mucosa with an application of extract), and Group C (Experimental C; inflamed mucosa with no intervention) having 4 subgroups each based on the number of days i.e. 3rd, 4th, 10th and 20th day. Histological changes in the buccal mucosa were observed on the respective days, after inducing the gingivitis in both the control and experimental group.

Results: Results were recorded on the 3rd, 4th, 10th and 20th days. On the 3rd day, signs of severe gingivitis appeared in both experimental groups 1B and 1C. An epithelial thickness of 12.00±2.160µm was observed in group 1B and, 10.2/5±1.708 µm in group 1C. On day 4th, in group-2B, the epithelial thickness was 12µm±1.633µm. The epithelial thickness was 10.25µm±1.708µm in group C. On day 10th, group 3B exhibited, a thickness of 20.00 µm±1.633µm. In group 3C, the thickness of epithelium was 23.75µm±1.258µm. On day 20th, the thickness was 23µm ±1.155µm in group 4B. In group 4C, the thickness was 24µm ±1.414µm.

Conclusion: This study proved the beneficial effects of Eugenia jambolana on the healing of gingivitis. The contents in Eugenia jambolana have an anti-inflammatory action on soft tissues which could be beneficial to treat gingivitis.

Keywords: Anti-inflammatory, Buccal mucosa, Eugenia Jambolana, Gingivitis, Healing

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How to cite this Article:

Chaudhry S, Munir N, Hameedi S, Zia S, Ahmed A, Wajahat M. Anti-Inflammatory Effect of Eugenia Jambolana on Epithelial Thickness in Induced Gingivitis. Found Univ J Dent. 2021;1(1):32-38.

ORIGINAL ARTICLE
DOI:10.33897/fujd.v1i1.269

INTRODUCTION

The oral cavity is lined by the mucous membrane called oral mucosa which is histologically a stratified squamous epithelium and has a protective function as a barrier against pathogens.[1] The mucosa of lips or cheeks transcends towards the mucosa of the alveolar process by forming a vestibular fold. Oral mucosa is folded in the cheek area, where it is known as the buccal frenulum and on the median part of the upper and lower lip area is the labial frenulum.[2]

The part of the oral mucosa that immediately surrounds the erupted teeth is called the gingiva. Gingiva consists of the mucosal tissue surrounding the roots of the teeth and covering the tooth-bearing part of the mandible and maxilla. The gingival tissue is stippled, pink in colour. Periodontal diseases such as periodontitis and gingivitis are inflammatory processes that destroy the periodontal tissues supporting the gums, the periodontal ligaments and the alveolar bone, affect about 50% of the world population.[3] When plaque accumulates around the gingival margin, inflammation begins within gingival connective tissue and epithelium. Within 3 to 4 days connective tissue destruction starts, 70% of collagen lost. Masticatory mucosa has orthokeratinized epithelium, in which stratum granulosum is not so prominent and covers those regions of the mouth which are exposed to strong forces such as hard palate, attached gingiva and tongue.[4]

The histological evaluation shows that in the absence of the concerned etiological factor, gingival mucosal changes involve lamina propria as well as the epithelium of the gingiva. The epithelium becomes enlarged and connective tissue shows more fibrosis which extends with various levels of inflammation in all gingival overgrowth lesions.[5] Epithelial thickness increases with elongated papillae in gingival overgrowth and fibrosis occur in the lamina propria with an increased number of fibroblasts. The thickness is 5 to 10 times greater than the normal gingiva.

Eugenia jambolana is an evergreen plant is originally from India, Pakistan, and Indonesia. Leaves, bark, stems and seeds of the plants are used herbally. Eugenia jambolana contains anthocyanins which suppress inflammation. Effective application of the extract may assist in the healing of inflamed gingiva. Extract of seeds of Eugenia jambolana was found to have anti-diabetic, anti-inflammatory, hepatoprotective, antihyperlipidemic and antibacterial properties.[6] The antioxidant capacity of anthocyanins prevents oxidants from destroying connective tissue in capillaries.[7] Based on its medicinal properties the objective of this study was to correlate the histological changes in gingival epithelium, after tropical application of Eugenia jambolana and to observe the effect of Eugenia jambolana extract on the thickness of epithelium on induced gingivitis in albino rats.

MATERIALS AND METHODS

This experimental animal study was conducted at the Experimental Research Laboratory of Post Graduate Medical Institute Lahore. The purpose was, to study histological changes in the buccal side of the gingival mucosa of 1st right maxillary molar of adult albino rats on the 3rd, 4th, 10th and 20th day after inducing gingivitis. Adult animals weighing 200-250 gm of both genders, were chosen. The reagent used in this study was Eugenia jambolana known as Jamun. The study protocol was approved by the Advanced Studies and Research Board of the University of Health Sciences, Lahore and the Ethical Committee of Postgraduate Medical Institute, Lahore.

Forty-eight adult albino rats were procured from the National Institute of Health Islamabad. All animals used in this study were handled with the international, natural, and institutional guidelines for care and use of laboratory animals in biomedical research as promulgated by the Canadian Council of Animal Care - 1984.[8] Following acclimatization for one week, the procedure was started. Each animal was weighed before and at the end of the study. Rats were divided into three equal groups by using a random number generator as shown in Table 1. Histological changes of the buccal mucosa were studied on the 3rd, 4th, 10th and 20th day after induction of gingivitis in both control and experimental group animals.

The rats were anaesthetized with ketamine (100 mg/kg body weight) and xylazine (10mg/kg body weight) by intraperitoneal injection.[9] The area selected for inducing gingivitis was cleaned with pyodine to remove saliva or any food particles that may be present. The cotton thread was placed between the first and second maxillary molars of the right quadrant of the group B and C rats for inducing gingivitis.

DOI:10.33897/fujd.v1i1.269

Table 1: Details of study groups

Groups	Subgroups	Number Of Animals	Remarks
Control group A	1A (day3)	4	Without given any dose
	2A (day4)		
	3A (day10)		
	4A (day 20)		
Experimental group B	1B (day3)	4	Without Eugenia jambolana extract
	2B (day4)		
	3B (day10)		
	4B (day 20)		
Experimental group C	1C (day3)	4	With Eugenia jambolana extract
	2C (day4)		
	3C (day10)		
	4D (day20)		

Eugenia jambolana seeds were obtained by getting fruit from the University of Punjab. Ethanolic extract of *Eugenia jambolana* seeds was prepared by 100 gm of seed-kernel powder which was suspended in 250 ml of distilled water and allowed to stand overnight in the refrigerator. After sieving, the filtrate (water extract) was discarded. The residue was extracted with 95% ethanol using sox halation/ wherein ethanol was evaporated in a rotatory evaporator at 40–50 ºC. The yield of the kernel was 3.2 g/100 g of seed powder. The extract of Eugenia jambolana was given orally with the help of an insulin syringe for 10 days.

On 3rd day after inducing gingivitis, four animals from each group were placed in a chloroform chamber and decapitated under deep anaesthesia. The rest of the animals were decapitated by the same procedure and number on the 4th, 10th and 20th day after inducing gingivitis. The whole right maxillary quadrant was dissected and after washing with saline it was fixed in neutral 10% buffered formalin for 48 hours at room temperature. Later, the specimens were processed for histological slides stained with Eosin and Haematoxylin before the microscopic study.

RESULTS

The general histological study of a normal gingival mucosa revealed the following layers: the epithelium and lamina propria. The normal gingiva in the control group had a scalloped margin, pink in colour with an epithelial thickness of 23.25±1.500µm. The lamina propria had fine bundles of collagen.

On day-3, gross examination of the selected area in both experimental groups (1B and 1C) showed marked redness, hypertrophy, slight ulceration and a tendency to bleed spontaneously. Junctional epithelium migrated apically from the cementoenamel junction, and the gingival sulcus depth increased in experimental groups 1B and 1C. The inflamed gingiva was swollen and puffy with rolled margins. The selected area was viewed under a light microscope. Signs of severe gingivitis including inflammation on the buccal surface of the maxillary right quadrant was also observed. An epithelium thickness of 12.00±2.160µm and 10.25±1.708 (Table 2) was noted which is less than the normal thickness. There was evidence of fibrosis with short rete pegs.

On day-4, group 2B exhibited epithelial breaks and short rete pegs with an epithelial thickness of 12µm±1.633µm. In group 2C, long rete pegs were seen, fibrosis was near to normal. It was observed that attaining the thickness of epithelium in group 2C was faster than that in experimental group 2B. The epithelium thickness was measured to be 10.25µm±1.708µm in group 2C. The difference between the epithelial thickness of the two groups was

DOI:10.33897/fujd.v1i1.269

TABLE 2: Comparative analysis of epithelial thickness (µm) between groups on Day-3, -4, -10 and -20.

Parameter	Days	Control Group (mean ± S.D)	Experimental group 1 (mean ± S.D)	Experimental group 2 (mean ± S.D)	Number of animals (N)	*p*-value
Thickness of epithelium (µm)	3	24.00±1.414	12.00 ± 2.160	10.25 ± 1.708	4	<0.001
	4	23.50±1.291	12.00 ± 1.633	10.25 ± 1.708		
	10	23.25±1.500	20.00 ± 1.633	23.75 ± 1.258		
	20	23.25 ±1.500	23.00 ± 1.155	24.00 ± 1.414		

found to be statistically significant as shown in Table 2.

On day 10, there was a prominent increase in the thickness of epithelium in both groups. The gingival epithelium was closer to attain its normal thickness. In group 3B, the keratinized stratified squamous epithelium of a mean thickness of 20.00 µm±1.633µm (Table 2) was present. The epithelium consisted of a single layer of large columnar cells constituting stratum basale, 4-5 layers of polyhedral cells forming stratum spinosum and 2-3 layers of flat cells with keratohyalin granules forming stratum granulosum (on top). In group-3C however, the keratinized stratified squamous epithelium was about the mean thickness of 23.75µm±1.258µm (Table 2). The epithelium thickness was normal as compared to group 3B. The difference in values of thickness of epithelium in the two groups was statistically significant as shown in Table 2.

On day 20, there was complete regaining of gingival epithelium in experimental groups 4B and 4C. The gingival epithelial thickness was 23µm ±1.155µm in group 4B. In group 4C, the gingival epithelial thickness was 24µm ±1.414µm. Normal stratification of cells was visible. Collagen bundles were seen in the connective tissue. Healthy mucosa was seen in both experimental groups. Rete ridges moved up towards the cornified layer. Connective tissue showed fibroblasts and loosely arranged collagen fibres. There was also slight evidence of collagen bundle formation. The gingival epithelium and connective tissue of both experimental groups were almost similar to the gingival epithelium and connective tissue of the control group.

DISCUSSION

In the current study, on day-0, gingivitis was induced on the buccal surface of the gingival mucosa of the first right maxillary molar. On day-3, the gingiva became inflamed. Margins of this swollen and reddish gingiva were rolled instead of scalloped. According to Amoian and colleagues[10], bleeding occurs during probing and brushing because of moderate gingivitis. Researchers consider that bleeding on probing is the result of an inflammatory reaction in the tissues surrounding the epithelial junction and it is an objective sign of incipient periodontal changes. According to Dongari-Bagtzoglou and colleagues, gingival overgrowth was accelerated by plaque accumulation.[11] Many events occurred due to the attachment of pathogens on the gingival tissue disturbing connective tissue homeostasis and alveolar bone starts destroying. Gingival overgrowth can be idiopathic, inherited or associated with other systemic diseases (such as renal or hepatic diseases). It was believed that in all gingival lesions, connective tissues become more fibrotic with varying degrees of inflammation and an increase in size occurs in the gingival epithelium. The dose, duration and identification of the drug were the main factors affecting the degree of inflammation, cell sample and fibrosis.[12]

On day-4, group 2B rats showed the signs of acute gingivitis. The thickness of the epithelium was reduced. Subjects in which bleeding on probing occurred showed more connective tissue than epithelium. A significant rise in the inflamed component caused an overall increase in the connective tissue and because of this increase, epithelial thickness decreased. A study done

DOI:10.33897/fujd.v1i1.269

by Polson and co-workers[13] stated that the structural and functional integrity of epithelium was dependent on the status of connective tissue. This was based on the concept that very thin epithelium is present in the inflamed connective tissue.

In contrast to this, in group 2C, the thickness of the gingival epithelium was reduced as compared to the control group. The extract of Eugenia jambolana was given so that the thickness of epithelium was more than the group 2B rats. Rapid healing in group 2C was observed. The leaf extract of Eugenia jambolana was found to be rich in flavonoids. The anti-inflammatory activity of Eugenia jambolana has been correlated with the methanolic leaf extract of Eugenia jambolana, as closely related species containing the same flavonoids present in Eugenia jambolana.[14] Researchers showed that some isolated flavonoids and catechins were possessing anti-inflammatory, anti-allergic and analgesic activities.[15] On the other hand, crude extracts of Eugenia jambolana administered orally in rats showed gastroprotective[16] and antiulcer properties due to the presence of tannins. However, Eugenia jambolana leaves or flowers contained few known flavonoids.

On day-10, the thickness of the gingival epithelium of group 3B rats was near to attain the normal thickness. Histology of lamina propria and epithelium of the gingiva was found to be disturbed. According to a study by Bartold and Narayanan[17], in all gingival lesions, extensive fibrosis occurred in connective tissue which became enlarged with varying degrees of inflammation and inflamed gingival epithelium. Immediately after plaque deposition started to the gingival margin, subjacent connective tissue became infiltrated with inflammatory cells and initiated destruction. At the same time, tissue repair occurred, showing fibrosis at the site of inflammation. The sequence of events in the development of periodontal diseases was the severity of inflammation, tissue destruction and healing. The main function of CTGF was to activate fibroblasts to produce extracellular matrix constituents, that produced more collagen fibres.[18,19]

In contrast to group 3B, group 3C attained normal thickness. The healing was more rapid in group 3C as compared to group 3B because the Eugenia jambolana extract was given. The inflammatory cell count was low. Group 3C showed almost complete healing at day 10. The gingival index showed a grade of 0, which means no inflammation. According to the previous studies on periodontal diseases, in epithelial hypertrophy, the stratified squamous epithelium was thicker due to the increase of the spinous layer (acanthosis) associated with acantholysis.[5, 20] The ratio between keratinized and non-keratinized areas was also affected. Rete pegs were formed by the deep epithelial bending into the lamina propria.

On day-20, group 4B showed complete healing. The thickness of the epithelium was normal. Lymphocytes and neutrophils were present. The gingival index showed grade 0, which means no inflammation. Gingival tissues could repair, regenerate, renew and healing after inflammation. This regeneration ability of the gingival epithelium was necessary for maintaining homeostasis in the gingival mucosa. Lamina propria also healed very rapidly after inflammation due to this regenerative ability. Similarly, group 4C also showed complete healing. Microscopic examination revealed normal histology. Researchers showed interest in the natural processes which control periodontal tissue's response to wounding and how cellular interaction occurred between different periodontal tissues.[21]

In one of the studies conducted in Bangladesh, by Zakaria and colleagues[22] it was investigated that majority of the rural people, living in villages, were suffering from dental problems mainly swollen gums, toothache, dental caries, halitosis, gingivitis. They were also suffering from eye problems like conjunctivitis. For treating oral diseases, one kaviraj (people living in the village) used the paste formed by crushing the roots of Eugenia jambolana. The powder was formed by crushing roots of Mangifera indica in combination with the roots of Areca catechu and Aegle marmelos. This mixture was added to the Eugenia jambolana paste. This paste was applied for treating tooth problems like gingivitis and halitosis.

According to one of the recent studies in India by Sangeeta and Mall[23], rural people of the Bahraich district are socioeconomically very poor so these uneducated poor people were completely dependent on the previous knowledge of herbal medicines for the treatment of different ailments. These people were aware of the medicinal importance of these herbal plants because of the knowledge transferred from their forefathers. The rural people of Bahraich chewed two leaves of Eugenia

DOI:10.33897/fujd.v1i1.269

jambolana daily to treat gingivitis. The leaves of Eugenia jambolana had an anti-inflammatory effect so that gingivitis healed rapidly.

CONCLUSION

The Eugenia jambolana is a cheap fruit and part of everyday life in the lower socioeconomic class. This study proved its beneficial effects on the healing of gingivitis. There was a marked difference in the healing pattern between the two experimental groups. In the Eugenia jambolana extract group, there was marked acceleration in the healing pattern, epithelium regenerated more rapidly. Oral intake of Eugenia jambolana can heal gingivitis rapidly. The contents in Eugenia jambolana have an anti-inflammatory action on the soft tissue. Results suggest that epithelial changes seen in the experimental group-C could be a result of constant healing caused by the anti-inflammatory nature of Eugenia jambolana.

DISCLAIMER

None.

CONFLICT OF INTEREST

None to declare.

ETHICAL STATEMENT

The study protocol was approved by the Advanced Studies and Research Board of the University of Health Sciences, Lahore and the Ethical Committee of Postgraduate Medical Institute, Lahore.

FUNDING DISCLOSURE

The author(s) received no financial support for the research, authorship, and/or publication of this article.

AUTHORS CONTRIBUTION

Conception and design of the study: S. Chaudhry

Acquisition of data: S. Chaudhry

Analysis and interpretation of data: S. Chaudhry

drafting of the manuscript: N. Munir

Critical review of the manuscript: M. Wajahat, S. Zia

Approval of the final version of the manuscript to be published: S. Chaudhry, N. Munir, S. Hameedi, S. Zia, A. Ahmed, M. Wajahat

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LETTER TO THE EDITOR

DOI:10.33897/fujd.v1i1.252

Digital Dentistry to the Rescue

Hassam Anjum Mir[1]

Received: 29 April 2021 / Revised: 12 June 2021 / Accepted: 13 June 2021 / Published online: 02 July 2021

The pandemic of coronavirus disease (COVID-19) is a public health emergency of global concern. All professional fields including dentistry have been greatly affected. Dental procedures create a high risk of transmission due to the proximity of the dentist to the patient and the generation of aerosols. Limiting dental procedures to emergency and urgent care procedures has been recommended.[1] However, the symptoms of caries and periodontal disease usually present when the disease has advanced from a moderate to a severe stage which may lead to irreversible damage to the dentition.[2] Thus providing dental treatment at an early stage becomes a necessity. Delaying routine dental visits in this pandemic is causing the creation of more complex dental issues which increase the burden of cost on the patient or government where dental treatment is provided free of cost to the population. There is now a need to re-establish routine dental care. The dental profession is now adapting to this pandemic and return to routine dental care is gradually taking place.[3] One of the ways in returning to routine practice is to incorporate digital dentistry in our dental practice. Digital dentistry involves the incorporation of digital devices (intraoral and extraoral scanners, cone-beam computed tomography (CBCT), and processing software (computer-assisted-design/computer-assisted-manufacturing (CAD/CAM) prosthetic software, software for planning implant surgery, together with new aesthetic materials and powerful manufacturing and prototyping tools (milling machines and 3D printers) thus transforming the dental profession. The advantage of going digital includes reduced chairside time, reduced number of appointments, less contact with patients' oral fluids, less need for disinfection of instruments and clinic surfaces and less number personnel handling patient's dental records.[4] Today, the digital revolution is changing the workflow and consequently changing operating procedures. One example is intraoral scanners[5] that allow us to take an accurate optical impression of the oral cavity, using only a beam of light. The optical impression is now replacing the classic method of taking an impression with a tray which was never liked by patients and often technically difficult, is likely to disappear in coming years. Moreover, the information on dentogingival tissues acquired from an optical impression can be used not only to make a diagnosis and for communication, but also to design prosthetic restorations. This not only minimizes the risk of cross-infection but also improve patient acceptability to dental treatment in the pandemic. Adopting digital dentistry in daily practice can be a way forward as more restoration options are available delivering longer lifetimes, and better aesthetics.

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DISCLAIMER

None.

CONFLICT OF INTEREST

None to declare.

ETHICAL STATEMENT

Not applicable.

FUNDING DISCLOSURE

The author received no financial support for the research, authorship, and/or publication of this article.

AUTHORS CONTRIBUTION

Conception and design, drafting, critical review and approval of the final version of the manuscript to be published: H.A. Mir

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How to cite this Article:

Mir HA. Letter to the editor: Digital Dentistry to the Rescue. Found Univ J Dent. 2021;1(1):39-40.

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- A clinical trial number should be included for all randomized controlled trials

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