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The impact of dental caries on oral health related quality of life amongst adult population in Lahore, Pakistan

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Abstract

Background: Dental caries in adults is a public health problem. A comprehensive assessment of the association between caries and Oral Health Related Quality of Life (OHRQoL) measures is essential for understanding how it impacts the daily life of people and for assessing their oral health needs. **Methods**: The survey was conducted at Rashid Latif Dental Hospital, from March–June 2019. A total of 373 adults aged 18–80 years were randomly enrolled in the study. Dental caries was the main exposure, measured clinically. The OHRQoL was measured through Oral Impacts on Daily Performance (OIDP) questionnaire. Caries was dichotomized and the relationship to OHRQoL was determined. **Results**: The results showed that 87.6% of the people presenting to the hospital had one or more carious teeth. Difficulty eating, and relaxing/sleeping were among the top reported impacts. Adults with caries showed higher odds for reporting higher oral impacts compared to those without caries. For every added carious tooth, there is 1.38 times increase in OIDP score. **Conclusion**: Individuals with caries were more likely to report more frequent and severe oral impacts that manifested into their daily lives through difficulty eating or relaxing. OIDP score increased linearly with increased exposure to caries.

Keywords: adult, dental caries, oral health, quality of life

Introduction

Oral diseases are a universal problem, but because they are rarely life-threatening, their prevention or treatment are often a low priority for policy makers.[1] World Dental Federation has defined oral health to be multi-faceted as the ability to speak, smile, smell, taste, touch, chew, swallow and convey a range of emotions through facial expressions with confidence and without pain, discomfort and disease of the craniofacial complex.[2] So, health is not merely the absence of disease but constitutes a relationship between social and psychological wellbeing.[3] Oral diseases, such as untreated caries, severe periodontitis, and severe tooth loss, were listed among the top 100 Global Burden of Diseases in 2010, collectively affecting 3.9 billion people worldwide. Untreated caries in permanent teeth was the most prevalent condition evaluated for the entire Global Burden of Disease 2010 Study (global prevalence of 35% for all ages combined).[4]

Dental caries is a progressive disease characterised by localized destruction of the tooth. Organic acids produced by tooth-dwelling bacteria dissolve the mineralized tissues of the tooth. The resulting carious lesion progresses inward from the tooth surface.[5] Left untreated, caries will progress to involve the dentin and eventually the pulp.[5] Dental caries and its consequences cause a lot of pain and suffering.[6] Treatment requires time and is costly, which may in turn require time off from work or school, which in turn would create an imbalance in work performance for adults or educational performance for children.[7]

This century has seen a shift from infectious diseases to non-communicable diseases.[8] The majority of the population in this era is suffering from some form of chronic ailment. Many treatments for chronic diseases include management of symptoms and do not eradicate the disease itself, and in so doing elevate the need for subjective outcome measures.[8] Also, with the longevity of an individual's lifespan and increase in aging population, there is more demand for improving people's life conditions.[9] Quality of Life (QoL) is defined as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns".[10] It is a

comprehensive and multidimensional concept that includes both negative and positive aspects of physical and psychological states, social relationships, independence levels, personal beliefs and environmental features.[10] In epidemiological studies, measure of QoL along with clinical measures complement needs.[9] Subjective measures are not aimed at replacing clinical measures but to complement them, providing information about patients' functional, social and psychological wellbeing.[11] They help to understand the influence of oral health as well as clinical interventions on patients' wellbeing, at individual and population level.[12] Subjective measures allow healthcare professionals to evaluate the efficacy of treatment protocols from patients' perspectives.[13] These measures take into account aspects of everyday life that patients deem to be important.[9] QoL is increasingly acknowledged as a valid, appropriate and significant indicator of service need and intervention outcomes in research and practice.[14]

Several instruments have previously been used to assess subjective oral health issues, hence Oral Health Related Quality of Life (OHRQoL). Different age groups and genders may consider OHRQoL impacts differently. Young people might consider aesthetics (staining, holes, malalignment) to be more important and having larger impacts, while the elderly population may consider impacts of functional limitations (eating, speaking) to be far significant.[15]

In Pakistan, according to the latest 2004 WHO report, the DMFT (Decayed Missing and Filled Teeth) value for 12–15 year old children is 1.38.[16] There is little information about the oral health of adults in Pakistan. Around 90% of oral diseases in Pakistan remain untreated.[17] Health services in Pakistan give oral problems the least priority and where treatment is available, it is usually palliative or symptomatic only.[17] A lack of perceived dental treatment needs in adults seems to be an important factor for not seeking treatment.[16] These lacking perceptions of need, or "absence of toothache", delay required treatments until a severe condition arises.[18] This study aims to find the link between impacts of caries and OHRQoL, that is how caries impacts the daily life of people and causes them to come forward for treatment.

Methods

This research was conducted in the Diagnostic Department of Rashid Latif Dental Hospital, Lahore. It was completed in 4 months (March to June 2019) with a sample size (N) of 373 aged between 18–80 months. The size of the sample was calculated based on an expected prevalence of 30% and 95% CI and z value of 1.96 level. A minimum sample size of 322 people was defined and further increased to compensate possible

losses. Inclusion criteria comprised all randomly selected healthy adults 18–80 years of age. Adults having any systemic illness were excluded from the study. Also, persons refusing to take part in the study were excluded. Three examiners were trained and calibrated against a gold standard to perform all oral examinations following WHO guidelines.[19] Intra-observer agreement after 2 days of examining the same patients was found to be 98.5% for caries.

The respondents were asked about the effect oral impacts on their daily life in the last six months. The Oral Impacts on Daily Performance (OIDP) questionnaire based on Locker's models from the World Health Organisation's (WHO) classification of impairments, disabilities and handicaps was used.[20] It measures the impact of oral conditions in capacity of performing basic daily life activities in terms of severity of the self-reported impacts.[20] Both English and Urdu version of OIDP were on hand for ease of management. Responses were coded from 0 (no effect) to 5 (severe effect). To determine the prevalence of each oral impact, original responses were dichotomised. Two separate dichotomisations were made. One variable presented the prevalence of oral impact reported with any severity score (>0), while the second used a much stricter cut-off point (≥3) to determine prevalence of oral impacts that were scored 3 or above only. The total OIDP score was calculated by adding the numerical values for individual responses respectively, dividing by the maximum score (45) and multiplying by 100. Thus, the score ranges between the values of 0 to 100. Higher OIDP scores represent poorer OHRQoL in terms of severe oral impacts. For regression analysis linear regression was used to see association of number of carious teeth with the continuous scale of total OIDP score. Afterwards, the total OIDP score (0–100) was divided into three categories of low impact score (0–33.3), medium impact score (33.4–66.6) and high impact score (66.7–100). Ordered Logistic regression was run as all three categories of the score were equal.

The intraoral examinations were performed on dental chair under dental unit light, using probes, and mouth mirrors as recommended by the WHO. Data for dental caries included primary caries (visual and cavitated) and recurrent caries in both crowns and roots. Diagnostic criteria for primary caries included a lesion in a pit or fissure, or on a smooth surface, that has an unmistakable cavity or undermined enamel, or a detectably softened floor or wall on a tooth. Caries immediately adjacent to previously placed fillings or fissure sealants was diagnosed as recurrent or secondary caries. It is expected that both, crown and root caries have a similar impact on OHRQoL of individuals. Caries was simply dichotomised into the basic two categories of either being caries free or having caries. Pulpal involvement, Fistula and Abscess

were included in the analysis under heading of caries as they initiate and progress from caries. The other clinical variables used in the analyses were number of missing teeth and number of previously filled teeth.

Demographic variables included gender and marital status. The independent variables studied were categorized. Age was divided into three groups: young adults 18–30, middle age adults 31–50, and older adults 51–80 years old. Education was classified into four groups: "Primary," "Secondary," "University" and "No education". Occupations were classified into four groups: Manager, Employed, Manual Labour and Unemployed.

Ethical permission was obtained from Rashid Latif Dental College Research Department. Verbal consent was taken from all participants before clinical examination and questionnaire. All participants were informed of their voluntary participation, data protection and option of opting out at any time. All data collected was entered into statistical software package STATA-14 (STATA Corp, College Station, Texas, USA) for further analysis. Chi-squared test and fishers exact test were used along with linear regression and ordered logistic regression. 95% significance level ($p < 0.05$) was selected for *p*-value.

Results

A final sample size of 373 participants was selected. The sample was composed of more female participants (68.7%) than males. The mean age was 33.7 years (95% CI 30.7–36.7), with young adults (18–30 years) representing 57.5% and middle age adults (31–50 years) representing 31.5% of the sample. Majority of the sample was educated to some extent, and 69.8% of the sample was either unemployed or a homemaker (Table 1). Majority of the sample (87.6%) had either one or more carious teeth and the mean for number of carious teeth was 3.1 (95% CI 2.4–3.8).

The mean OIDP score among participants was 23.43 (95% CI 17.1–29.7). In the sample 94.6% of the participants reported to have any difficulty in their daily performance (OIDP > 0). Difficulty eating (76.7%) was the highest prevalent impact followed by difficulty relaxing/sleeping (41.1%). 5.4% of the sample was completely free from oral impacts on daily performance, while 33.4% had more than 5 oral impacts scored > 0. Using the stricter cut-off point of impacts scored 3 and above (OIDP ≥ 3), 63.1% of the participants reported having oral impacts. The highest prevalence was found for difficulty eating (52.1%), followed by difficulty relaxing/sleeping (30.1%). 36.9% of the population was free from severe oral impacts and only 22.1% experienced more than 5 oral impacts scored ≥ 3. Table 2 shows the prevalence for all the impacts with both cut-off points.

Table 1. Characteristics and Socio-demographics of study sample (N = 373)

Variables	N (%)
Gender	
Male	117 (31.3%)
Female	256 (68.7%)
Age	
Young Adults	215 (57.5%)
Middle Age Adults	117 (31.5%)
Older Adults	41 (11.0%)
Education	
Primary	102 (27.4%)
Secondary	100 (26.0%)
University	116 (31.5%)
No Education	55 (15.1%)
Occupation	
Manager	5 (1.3%)
Employed	46 (12.3%)
Manual Labour	62 (16.4%)
Unemployed	260 (69.8%)

Table 2. Prevalence and mean OIDP reported >0 and >3 (N = 373)

Item	OIDP>0 (%)	OIDP ≥3 (%)
Difficulty eating	76.7	52.1
Difficulty speaking	24.6	12.3
Difficulty cleaning teeth	35.6	21.9
Difficulty going out	17.8	10.9
Difficulty relaxing	41.1	30.1
Difficulty smiling/laughing	32.8	24.6
Difficulty carrying out work	24.6	19.1
Difficulty with emotional stability	32.58	21.6
Difficulty enjoying contact with others	24.6	19.1
Overall	94.6	63.1
Mean Score (95% CI)	23.43 (95% CI 17.1– 29.7)	

Table 3. Association of oral impacts through OIDP>0 and OIDP>3 with caries (N = 373)

Variables	OIDP>0		OIDP≥3	
	%	p	%	p
Caries				
No Caries	22.2		66.6	
Caries	96.8	0.01	67.1	0.04

Table 2. Ordered Logistic regression for association between Caries and Categories of OIDP score (Low, Medium, High): Odds ratio, 95% confidence intervals, *p*-value (N = 373)

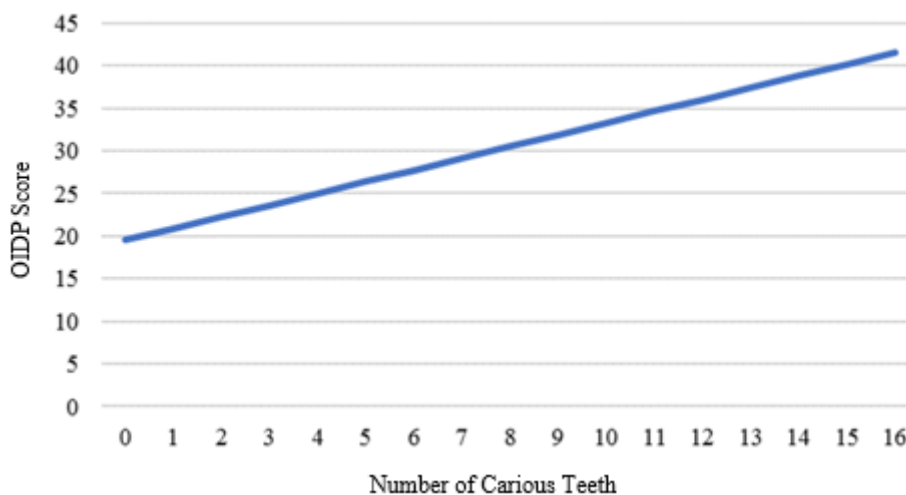| Variables	Odds Ratio	95% CI	p
Caries	1.66	1.4–5.9	0.01
Gender	0.30	0.1–0.8	0.01
Age	0.77	0.3–0.9	0.04
Occupation	0.37	0.1–0.9	0.03
Education	1.01	0.5–1.7	0.94
Marital Status	0.75	0.1–3.2	0.70

Figure 1. Graphical representation of linear association of caries and continuous scale OIPD score

The bivariate association was performed between OIDP scores and caries. Table 3 shows the association between OIDP impacts and caries using the Chi-squared test and Fishers exact test. Overall the results revealed that caries was significantly associated with higher impact scores.

Linear regression analysis showed us that for every added carious tooth, there is 1.2 (95% CI 0.9–3.3) increase in total OIDP score. Constant is 56.2 and *p*-value is 0.02. After accounting for all sociodemographic variables, every added carious tooth caused an increase of 1.6 (95% CI 1.2–3.7) in total OIDP score. Constant for OIDP score was 58.2 and *p*–value of 0.03. It was seen that age and education and marital status were not significantly related to the result. After accounting for

previously filled teeth and missing teeth, the coefficient dropped to 1.4 (95% CI 0.9–3.4) and the constant came down to 19.5 and *p*-value 0.01 which is significant. It shows that for every unit increase in caries there is 1.4 increase in OIDP score with a constant of 19.5 after accounting for all variables. It can be represented as the following equation; OIDP Score = 19.5 + (1.38 x number of carious teeth)

The graphical representation can be seen in Figure 1. For ordered regression analysis between the three ordered categories of OIDP score and caries, we see that people with caries are 2.4 (95% CI 1.7–5.8) times more likely to be in the higher categories of OIDP score when compared to people without caries. It was significant with a *p*-value of 0.01. After

adjusting for sociodemographic variables, Table 4, the odds ratio (OR) drops to 1.66 (95% CI 1.4–5.9) but remains significant at *p*-value 0.01. We again see that education and marital status are not significant in the analysis. Overall the results revealed that caries was significantly associated with higher scores (poor OHRQoL) of oral impacts.

Discussion

At the time of the study, 87.6% of the population had one or more carious tooth. Difficulty eating, and relaxing/sleeping were the top reported impacts. In general, the association between caries and OIDP was strong for both cut-off points used highlighting that caries had a significant impact irrespective of severity. Multivariable models estimate that having caries increased chances for having higher impacts on OHRQoL. Linearly for every added carious tooth, there is 1.38 increase in OIDP score after adjusting for socio-demographics and clinical presence of previously filled and missing teeth.

This study showed that the average number of affected teeth was 3.1 with the highest frequency of 16 carious teeth. This was similar to the WHO 2004 estimate of 18 carious teeth. Men reported greater impacts on OHRQoL than women, although statistically women were observed clinically to have higher caries prevalence. Differences in the perception of OHRQoL between the genders may be due to individual subjective concepts formed through social meetings and personal needs.[21] In Pakistani society women may still be far less socially interactive than men. Participants with higher age were significantly associated with lower OIDP score. Most probably due to higher missing teeth in older adults as dentistry in Pakistan favours extractions due to economic reasons. Fewer number of teeth equals fewer teeth with caries and the easier it is to maintain good oral hygiene.[22] Trend could be seen that more educated people visited the hospital for treatment. Around 89% of the sample had at least some formal education. Educated individuals may have better knowledge of their underlying disease, compelling them to get treatment when impacts surfaced.[23] There were clear trends for managerial occupations for having low impacts and manual occupations having more impacts. This may be because socioeconomic status is related to inequalities in health, and socioeconomically disadvantaged people have higher risks of disease and suffer more from health conditions.[24]

The results of this study are comparable with previous researches done around the world on OHRQoL. Another study showed that caries in need of treatment impacted OHRQoL negatively.[21] The study obtained a prevalence ratio 1.29 which is similar to OR of 1.66 for this study. The study also found that having low income was

significantly related to OHRQoL for having higher impact scores. The authors chose the sample from a clinical setting just like the present study. Previous study found that adults with caries were more likely to report a high impact on OHRQoL. The authors used a random sample of 611 participants invited from a clinical setting, with a limited age group of 16–32 years. Their study presented OR 2.14 for having more impacts in participants with caries, as compared to OR 1.66 for this study. This higher OR may be due to use of DMFT and its 5 categories, which may also include filled and missing teeth in the score and cannot be generalised to caries alone.

Dentistry is facing serious challenges and threats, addressing them will require major changes in strategy. In epidemiological studies, strategies need to take into account both normative and subjective needs as assessed by professionals and socio-dental indicators respectively.[25] Measuring OHRQoL matters, as individuals with similar clinical status may have different perceptions about their health and can have drastically different responses to the same diagnosis.[15] It would be baseless and unethical to treat a person not wanting to be treated. Subjective measures add that missing link of why that person wants treatment and the "why" can only be understood by understanding the impacts on the persons daily life.

Due to its cross-sectional nature, this study is not suitable to evaluate causal relationships. There is no information regarding timeline to exposure and its impact. Potential limitations may also include change of exposure over the assessment period and onset of exposure may take more time to express. Also, OHRQoL data being self-reported has the disadvantage for being varied from individual to individual. Different combination of responses for impacts can also lead to the same score and are difficult to interpret because of the absence of meaningful benchmarks.[15] Being self-reported there is a chance for having recall bias. The study may be over reporting the results as all the sample was taken from a hospital setting. Another limitation would be the demarcation for categorisation of caries used for this study (yes/no). One might argue that higher levels of caries may lead to higher impacts than low levels of caries, and thus may require more elaborate categorisation. Further research is needed to confirm these findings, using longitudinal studies looking at the association between caries and OHRQoL, to have more information to see the causal relationships.

Conclusion

At the time of the study, 87.6% of the population had one or more carious tooth. Difficulty eating, and relaxing/sleeping were the top reported impacts. Participants with caries were more likely to report

higher scores and increased number of impacts on their OHRQoL than people without caries. In this sample, education did not appear to play a role in the association between dental caries and OHRQoL. This study lends support to the hypothesis that adverse health effects trickle down into everyday life and are revealed as difficulties in the simplest of tasks of eating and relaxing.

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Conflict of Interest Statement

Authors declare no conflict of interest in this research.

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