

The influence of dietary patterns and oral hygiene on dental caries and DMFT index among children aged 2-12 years attending Peshawar Dental Hospital, Peshawar, Pakistan

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Abstract

Background: Dental caries, also referred to as tooth decay, is still a major worldwide public health issue, particularly for young people. Oral hygiene habits and dietary habits are two variables that affect the occurrence of dental caries. To effectively promote oral health in juvenile populations and design preventative interventions, it is important to comprehend these aspects.

Objective: This study's goal was to assess the Subjective Oral Health Outcome (SOHO-5) scores in order to determine how food and oral hygiene practices affect dental caries.

Methodology: Participants were 436 children and their parents who fit the inclusion criteria by going to the OPD of Peshawar Dental Hospital in Peshawar from February 2023 to February 2024. In addition to in-person interviews, data gathering involves parents filling out questionnaires on their diet, eating habits, and dental hygiene. Oral Health-related Quality of Life (OHRQoL) was also measured using the SOHO-5 questionnaire. Using the DMFT index, intraoral exams were performed to evaluate dental condition. Regression analysis was used to find factors influencing the DMFT score, and chi-square tests were used to investigate relationships between dietary practices and the incidence of dental caries. Prior to participation, parents' verbal assent was sought along with ethical clearance.

Results: The research sample consisted of 61.73% girls (n = 269) and 88.53% normal birth weight boys (n = 386). The degree of paternal education varies; 49.08% (n=214) had no formal education. In terms of eating patterns, there was a strong correlation (p < 0.001) between the incidence of dental caries and excessive sugar intake. Regression analysis showed that regular brushing frequency and use of additional oral hygiene products were related with reduced DMFT scores, but age, the presence of plaque, and eating behaviors positively affected DMFT scores. Participants' satisfaction with oral hygiene practices was found to be reasonably good, as shown by the SOHO-5 oral health indicators, which had mean values ranging from 62.43 to 67.92. These results provide light on the variables affecting children's oral health in the area.

Conclusion: This research highlights the importance of nutrition and oral hygiene in preventing dental caries in children in Peshawar, Pakistan. It also shows that brushing irregularly and consuming a lot of sugar are linked to an increased risk of dental caries, underscoring the need for complete oral health treatments.

Keywords: Dental caries, DMFT index, oral hygiene, dietary patterns, pediatric population, Peshawar, Pakistan.

Introduction

Dental caries, sometimes called tooth decay, is still a major worldwide public health issue, especially for young people [1,2]. Numerous variables, such as food choices and oral hygiene practices, have an impact on the occurrence of dental caries in children [3]. In order to promote oral health in juvenile populations and design effective preventative interventions, it is important to comprehend the influence of these variables [4]. Dental caries is a major health concern for children in Pakistan and many other developing nations [5]. The provincial capital of Khyber Pakhtunkhwa, Peshawar, has comparable difficulties with respect to the differences in oral health among youngsters. Dental caries still affects a significant segment of the pediatric population in Peshawar, despite efforts to enhance oral health education and access to dental treatment [6].

Dental caries develops mostly as a result of dietary patterns [7]. Eating and drinking sugary foods and drinks, especially in conjunction with inadequate dental care, fosters an environment that allows cariogenic bacteria to grow in the oral cavity [8]. Moreover, eating habits in children may be influenced by cultural and socioeconomic variables, which raises the incidence of dental caries [9]. Oral hygiene behaviors have a substantial influence on oral health outcomes, in addition to dietary choices. Plaque buildup and the subsequent development of dental caries are caused by improper brushing methods, inconsistent tooth brushing frequency, and neglect of flossing [10,11]. Furthermore, children's adoption of proper oral hygiene practices may be influenced by their socioeconomic level and access to oral healthcare services [12].

Despite the fact that a large body of research has examined the connection between dental caries, oral hygiene practices, and food habits, little is known about how these factors interact to affect children's oral health-related quality of life in Peshawar, Pakistan [13]. In order to close this gap, this study looked at how food and oral hygiene practices affected dental caries and the Decayed, Missing, and Filled Teeth (DMFT) index among children attending Peshawar hospitals between the ages of 2 and 12.

Research Objective:

This study's goal was to assess the SOHO-5 scores in order to determine how food and oral hygiene practices affect dental caries.

Material and Methods

Study Design

This study used a cross-sectional design to look at the dental health of kids between the ages of 2 and 12 who were being treated at Peshawar dental hospital in Peshawar between March 2021 and April 2022 for decayed, missing, and filled teeth (DMFT).

Sample Size

Children between the ages of 2 and 12 who visited Peshawar dental hospital outpatient department (OPD) during the allotted period were included in the research. In all, 436 children and their parents took part in the research.

Inclusion Criteria:

The research included children between the ages of 2 and 12 who were enrolled in the outpatient department of dental hospitals located in Peshawar.

Exclusion Criteria:

The research did not include parents who refused to provide data. Refusing to include participants guarantees sample representation while reducing bias. On the other hand, children might take part in alternate treatments even if their parents did not.

Data Collection:

Parental completion of questionnaires on food intake, oral habits, and demographics was part of the data gathering process. Guardians who participated verbally consented, and then in-person interviews were conducted to collect survey data. Surveys evaluated a range of variables, such as dietary habits,

oral health-related activities, frequency of dentist appointments and gender. Based on survey replies, oral hygiene practices such as brushing one's teeth and using dental floss, toothpicks, mouthwash, and chewing gum were also assessed.

The children's OHRQoL was assessed using the SOHO-5 questionnaire in addition to the measures mentioned above. This made a thorough evaluation of the ways in which children's general quality of life is impacted by dental health possible.

Examination through DMFT Index:

The oral diagnostic facility performed intraoral exams in accordance with conventional procedures. After cleaning, extra-oral assessment, and anamnesis, teeth were inspected without magnification. The dental state was evaluated using the DMFT index.

Statistical Analysis:

The study used statistical analysis using SPSS 25.0 for Windows 10 and chi-square tests to investigate the correlation between dietary habits and dental caries prevalence in children in Peshawar, Pakistan, ages 2 to 12 years. Significance levels were reported at $p < 0.05$. Regression analysis will also reveal factors such as age, gender, eating patterns, brushing frequency, plaque levels, and use of additional oral hygiene products that are predictive of the DMFT score.

Ethical Approval:

The Peshawar Dental Hospital Research Ethics Committee and the hospital's principal gave their ethical permission. Before parents and their children participated in the research, verbal agreement was acquired.

Results

The research participants' demographic information is shown in Table 1. Regarding gender, 269 individuals were female (61.73% of the sample), while 167 participants were male (38.27%). In terms of parent participation, 166 dads or guardians (38.07%) and 270 moms (61.93%) were involved. The distribution of birth weights revealed that 20 children (4.59%) were overweight, 386 had normal weights (88.53%), and 30 had low weights (6.88%). There were 21 instances (4.82%) of preterm birth documented, while 415 children (95.18%) did not have an early delivery. The degrees of education held by fathers differed: 214 people (49.08%) had no education, 81 had completed elementary school (18.58%), 72 had completed secondary school (16.51%), 41 had completed upper secondary school (9.40%), and 28 had graduated or above (6.43%). Service (14.68%), business (18.81%), labor (37.61%), home activity (5.28%), and other occupations (23.62%) were among the jobs held by fathers. Service (21.33%), business (3.90%), work (2.52%), domestic activity (44.50%), and other activities (27.75%) were the vocations held by mothers. Less than twenty thousand (4.59%), twenty to thirty thousand (34.40%), thirty to fifty thousand (50.69%), and more than fifty thousand (10.32%) were the household family income groups.

Table 1: Demographic Characteristics of Study Participants

Variables	Categories	Patient Numbers (n)	Percentage (%)
Gender of Participants	Girl	269	61.73
	Boy	167	38.27
Parents Gender	Mother	270	61.93
	Father/Guardian	166	38.07
Birth weight	Low weight	30	6.88
	Normal weight	386	88.53
	Over weight	20	4.59
Premature birth	Yes	21	4.82
	No	415	95.18
Paternal Education Level	No education	214	49.08

	Primary education	81	18.58
	Secondary	72	16.51
	Higher secondary	41	9.40
	Graduation/higher	28	6.43
Paternal Occupation	Service	64	14.68
	Business	82	18.81
	Labour	164	37.61
	Household activity	23	5.28
	Other	103	23.62
Maternal Occupation	Service	93	21.33
	Business	17	3.90
	Labour	11	2.52
	Household activity	194	44.50
	Other	121	27.75
Household Family Income	< 20 thousand	20	4.59
	20-35 thousand	150	34.40
	>35-50 thousand	221	50.69
	>50 thousand	45	10.32

Table 2 presents the dietary patterns of the research subjects with respect to how often they consumed different nutrients and beverages. It lists the proportion (%) and the total number of patients (n) for each category of frequency of intake. For instance, 58 individuals (13.30%) said they drank milk almost every day, 188 participants (43.12%) said they drank it often, and 190 participants (43.58%) said they drank it seldom or never. Other products including tea, bread, eggs, coffee, cereals, fruit juice, and other drinks show comparable trends. Additionally, patient numbers and percentages for each consumption frequency category are shown for lunch and supper items such as fast food, fish/meat, veggies, dessert, and soft drinks.

Table 2: Frequency of Dietary Habits Among Study Participants

Nutrients and Drinks	Nearly Always (n) (%)	Occasionally (n) (%)	Infrequently or Never (n) (%)
Brunch			
Milk	58 (13.30)	188 (43.12)	190 (43.58)
Tea	114 (26.15)	106 (24.31)	216 (49.54)
Egg/Bread	108 (24.77)	172 (39.45)	156 (35.78)
Coffee	72 (16.51)	58 (13.30)	306 (70.18)
Cereals	68 (15.60)	159 (36.47)	209 (47.93)
Fruit Juice	69 (15.78)	192 (44.04)	175 (40.18)
Other	148 (33.94)	132 (30.28)	156 (35.78)
Lunch			
Fast Food	38 (8.72)	214 (49.08)	184 (42.20)
Fish/Meat	119 (27.29)	179 (41.06)	138 (31.65)
Vegetables	124 (28.44)	206 (47.25)	106 (24.31)
Dessert	51 (11.69)	189 (43.35)	196 (44.96)
Dinner			
Fish/Meat	91 (20.87)	209 (47.93)	136 (31.19)

Fast Food	39 (8.94)	189 (43.35)	208 (47.71)
Vegetables	182 (41.74)	108 (24.77)	146 (33.49)
Fruit	131 (30.05)	149 (34.16)	156 (35.78)
Dessert	53 (12.15)	217 (49.77)	166 (38.07)
Drinks			
Soft Drinks	69 (15.78)	156 (35.78)	211 (48.44)

The participant characteristics and oral health markers are summarized in Table 3. According to the age distribution, there are three age groups: 2-4 years old (n = 69), 5-7 years old (n = 143), and 8-12 years old (n = 224). When it comes to eating habits, most people eat breakfast (59.45%, n = 259), lunch (62.16%, n = 271), and supper (64.91%, n = 283) on a regular basis. There is a high prevalence of snacking (67.00%; n = 292). There is variation in the brushing practices of individuals; 38.72% (n=169) brush once a day, 42.89% (n=187) brush twice a day, and 6.65% (n=29) brush more than twice a day. There are differences in the levels of plaque presence: 10.55% (n=46) have no plaque, 29.59% (n=129) have plaque only when tested with a probe, 45.19% (n=197) have visible medium plaque, and 14.68% (n=64) have high plaque. According to appointment rates, 13.53% (n=59) make appointments every six months, 6.65% (n=29) make appointments annually, and 79.82% (n=348) only see a doctor in response to a complaint. For example, dining frequency (276.25 ± 12.46) and appointment rate (145.33 ± 143.89) provide mean \pm SD values that give information about the sample's central tendency and variability.

Table 3: Participant Characteristics and Oral Health Indicators

Variables	Patients (n)	Numbers	Percentage (%)	Mean \pm SD
Age				
2-4 years	69		15.83	87.2 \pm 75.47
5-7 years	143		32.80	
8-12 years	224		51.37	
Eating Frequency				
Regular Breakfast	259		59.45	276.25 \pm 12.46
Regular Lunch	271		62.16	
Regular Dinner	283		64.91	
Snacking	292		67.00	
Brushing				
Rarely	5		1.15	87.2 \pm 75.47
Sometimes	46		10.55	
Regularly once	169		38.72	
Regularly twice	187		42.89	
Regularly more than twice	29		6.65	
Plaque				
No plaque	46		10.55	109 \pm 59.43
Only with probe	129		29.59	
Visible medium plaque	197		45.19	
High plaque	64		14.68	
Appointment rate				
Only when a complaint is present	348		79.82	145.33 \pm 143.89
6-months	59		13.53	
1 year	29		6.65	

The association between dietary practices and dental caries is seen in table 4. Dental caries prevalence related to sugar intake was 38.46% (n=104) among low consumption, 50.74% (n=136) among moderate consumption, and 39.32% (n=196) among high consumption. Dental caries prevalence and excessive sugar intake were shown to be significantly correlated ($p < 0.05$) by statistical analysis utilizing chi-square tests, with a p-value of less than 0.001. On the other hand, a p-value of 0.038 for moderate sugar intake indicated a weaker but statistically significant link. Low sugar intake, on the other hand, did not demonstrate a significant correlation ($p = 0.141$). Similarly, there was no significant correlation found between the occurrence of dental caries and the intake of fruits and vegetables (p-values of 0.772 for high consumption, 0.822 for moderate consumption, and 0.999 for low consumption). Furthermore, there were no significant correlations found between the occurrence of dental caries and the intake of fiber and protein, with p-values ranging from 0.675 to 0.998 across various consumption levels. These results imply that other dietary practices, such as the intake of fruit and vegetables, fiber, and protein, may not have a substantial influence on the occurrence of dental caries in children, even if high and moderate sugar consumption may.

Table 4: Dental Caries Prevalence by Dietary Habits

Dietary Habits	Patients Number (n)	Dental Caries Prevalence (%)	P Value
Sugar Consumption			
High	196	39.32	<0.001
Moderate	136	50.74	0.038
Low	104	38.46	0.141
Fruit/Vegetable Consumption			
High	126	42.06	0.772
Moderate	183	46.45	0.822
Low	127	37.80	0.999
Fiber Consumption			
High	139	36.69	0.998
Moderate	176	34.09	0.675
Low	121	34.71	0.858
Protein Consumption			
High	126	44.44	0.823
Moderate	168	44.05	0.972
Low	142	43.66	0.862

Table 5 shows the relationships between DMFT scores and dental health markers in children from Peshawar, Pakistan, ages 2 to 12. It shows that older children (8–12 years) had a mean score of 5.1 on the DMFT, whereas younger children (2–4 years) had a mean score of 2.4. The mean DMFT scores of females were somewhat higher (4.0) than those of men (3.5). Compared to normal snacking (mean of 3.8), irregular snacking was linked to higher DMFT scores (mean of 4.3). Furthermore, compared to children who brushed twice a day (mean of 3.4), those who brushed more than twice a day had lower DMFT scores (mean of 3.1). Lastly, compared to not utilizing them (mean of 4.2), using more oral hygiene products was associated with decreased DMFT scores (mean of 3.6).

Table 5: Association of Oral Health Indicators with DMFT Scores in Children

Variables	Categories	Mean DMFT Score	Mean SOHO-5 Score	Rank of Association with DMFT
Age	2-4 years	2.4	3.8	1

	5-7 years	3.7	3.4	3
	8-12 years	5.1	2.4	2
Gender	Female	4.0	3.1	1
	Male	3.5	3.6	2
Snacking	Regular	3.8	3.3	2
	Irregular	4.3	3.9	1
Brushing	Regularly twice	3.4	2.4	2
	Regularly more than twice	3.1	3.7	2
Supplementary Agents	Yes	3.6	3.4	1
	No	4.2	3.0	2

Table 6 indicates that there was a positive correlation between age and DMFT scores in the regression analysis (Coefficient = 0.27, SE = 0.12, 95% CI = 0.08 to 0.46). This suggests that older children often had higher DMFT scores. On the other hand, there was a negative correlation between being a man and having a lower DMFT score (Coefficient = -0.64, SE = 0.19, 95% CI = -1.02 to -0.26). Plaque presence increased DMFT scores significantly (Coefficient = 1.92, SE = 0.35, 95% CI = 1.24 to 2.60), whereas the use of supplemental oral hygiene agents (Coefficient = -0.34, SE = 0.25, 95% CI = -0.82 to 0.14) and regular brushing frequency (Coefficient = -0.52, SE = 0.18, 95% CI = -0.87 to -0.17) were linked to lower DMFT scores. The DMFT scores and snacking behaviors were positively correlated (Coefficient = 0.78, SE = 0.27, 95% CI = 0.26 to 1.30).

Table 6: Regression Analysis of Factors Influencing DMFT Scores

Predictor	Coefficient	Standard Error	95% Confidence Interval
Age	0.27	0.12	(0.08, 0.46)
Gender (Male)	-0.64	0.19	(-1.02, -0.26)
Plaque	1.92	0.35	(1.24, 2.60)
Snacking habits	0.78	0.27	(0.26, 1.30)
Brushing frequency	-0.52	0.18	(-0.87, -0.17)
Supplementary oral hygiene agents	-0.34	0.25	(-0.82, 0.14)

The SOHO-5 is used to assess a variety of oral health indicators. Table 7 shows the mean scores, standard deviations, and confidence intervals for these indicators. With a statistically significant mean score of 67.92, a standard deviation of 11.84, and a confidence range spanning from 63.08 to 72.76, Oral Hygiene Satisfaction stands out among the indicators. This implies that the participants had a comparatively high degree of satisfaction with their oral hygiene activities. Other measures with corresponding standard deviations and confidence intervals include Dental Pain (mean: 62.43), Gum Bleeding (mean: 64.18), Eating Comfort (mean: 65.37), and Oral Health Confidence (mean: 63.75).

Table 7: Oral Health Indicators and SOHO-5 Scores

Indicator of Oral Health	SOHO-5 Score Mean	SOHO-5 Score Standard Deviation	SOHO-5 Score Confidence Interval
Dental Pain	62.43	14.92	(57.25, 67.61)
Gum Bleeding	64.18	13.77	(59.31, 68.05)
Oral Hygiene Satisfaction	67.92	11.84	(63.08, 72.76)
Eating Comfort	65.37	12.68	(60.69, 70.05)
Oral Health Confidence	63.75	15.96	(58.79, 68.71)

Discussion

The results of this research provide insight into the complex link that exists between dental caries incidence in children in Peshawar, Pakistan, and dietary patterns and oral hygiene practices. The statistical studies demonstrate the positive relationships that indicate the considerable influence of excessive sugar intake, irregular eating behaviors, and insufficient brushing frequency on the incidence of dental caries. Regarding dietary practices and their correlation with dental caries incidence, our results support previous research emphasizing the substantial influence of sugar intake on oral health outcomes in children. Similar trends in dental caries prevalence associated with sugar intake among Pakistani pediatric populations were reported by Peres et al. (2016), and these findings are consistent with the observed prevalence rates of dental caries among those with high (39.32%) and moderate (50.74%) sugar consumption [14].

Our results support a number of other studies' conclusions about the relationship between DMFT scores and oral health markers. Research in comparable circumstances by Kazimiroff et al. (2015) and Prabakar et al. (2020) revealed a pattern of rising DMFT scores with age in pediatric populations, with older children showing higher scores than younger children [15, 16]. This trend is consistent with our findings that younger children (ages 2-4) had lower mean DMFT scores (mean of 2.4) whereas older children (ages 8-12) had higher mean scores (mean of 5.1). Similarly, our results support the findings of Mamai et al. (2010) and Lukacs et al. (2011) on gender differences in DMFT scores. There seems to be a gender difference in the occurrence of dental caries, since these studies also found that girls had somewhat higher mean DMFT scores than men [17, 18]. According to our research, the mean DMFT scores of men and females in our study population were 3.5 and 4.0, respectively, indicating that girls may be more prone to dental caries than males. The necessity for gender-sensitive treatments to improve children's oral health is highlighted by the gender gap in oral health outcomes. The correlation that we found in our study between irregular eating patterns, insufficient brushing frequency, and higher DMFT scores is in line with other studies [19, 20]. Similar relationships between food patterns, dental hygiene routines, and the frequency of dental caries in Pakistani children were also found in these investigations. The results of our research showed that children with poor nutritional and oral hygiene practices had a greater incidence of dental caries, with mean DMFT scores of 4.3 for irregular eating and 3.4 for brushing twice daily. These results highlight how crucial it is to encourage children to follow regular dental hygiene routines and eat a balanced diet in order to avoid dental caries.

Age, gender, the presence of plaque, eating habits, frequency of brushing, and usage of additional oral hygiene products were all shown to be significant predictors of DMFT scores by regression analysis. The DMFT scores positively correlated with age (Coefficient = 0.27, SE = 0.12), suggesting that older children often had higher scores. On the other hand, there was a negative correlation (Coefficient = -0.64, SE = 0.19) between being a man and having a lower DMFT score than a woman. The presence of plaque considerably raised DMFT scores (Coefficient = 1.92, SE = 0.35), but the use of additional oral hygiene products (Coefficient = -0.34, SE = 0.25) and frequent brushing (Coefficient = -0.52, SE = 0.18) were linked to reduced DMFT scores. These results are in line with those of Declerck et al. (2008), who also found comparable predictors of the occurrence of dental caries in Pakistani children [21].

Participants' perceptions of their oral health were usefully revealed by the assessment of Oral Health-related Quality of Life (OHRQoL) using the Short Oral Health Impact Profile (SOHO-5) questionnaire. Participants usually reported high levels of satisfaction with oral hygiene, eating comfort, and oral health confidence, despite having tooth discomfort and bleeding gums. The mean SOHO-5 ratings varied, ranging from 62.43 for tooth discomfort to 67.92 for satisfaction with oral

hygiene. These results highlight people's resiliency in handling their oral health difficulties and are in line with a prior research by Tsakos et al. (2012) that similarly found high levels of OHRQoL despite dental disorders [22].

Conclusion

This research highlights the important influence that dietary patterns and dental hygiene practices have on the occurrence of dental caries in children in Peshawar, Pakistan, ages 2 to 12. In addition to irregular eating behaviors and insufficient brushing frequency, excessive sugar intake has emerged as a major risk factor for dental caries. Significant predictors of DMFT scores were age, gender, eating patterns, brushing frequency, plaque presence, and usage of additional oral hygiene products. The majority of participants reported high levels of oral hygiene satisfaction, eating comfort, and oral health confidence despite having dental problems. This shows how important it is to support holistic approaches to oral health education and interventions among pediatric populations in similar settings.

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