Dental Caries in Relation to Nutritional Status among a Group of Children

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ABSTRACT

Dental caries and malnutrition appear to be serious public health concerns among school-aged children. This study was conducted to examine the influence status of nutritional on oral variables such as gingival health, oral hygiene, and caries in relation to age and gender on randomly selected 512 children (316 male and 196 female) aged 3-16 years old, who presented to the preventive and pedodontics department of a dental hospital in Baghdad. The plaque and gingival indices were employed to evaluate dental plaque and gingival health condition with a diagnose of dental caries. The anthropometric measurement (height and weight) was employed to measure the nutritional status and the body mass index (BMI) of the children. The results showed that entire children were caries-active. Highest dmfs values obtained for age group of 6-11 (9.71±056.), while highest DMFS was found in children aged 12 and above (12.36±0.89) with highly significant differences in dmfs/ DMFS among all age groups. Differences in DMFS in relation to BMI was highly significant with a highest value (8.45±0.64) obtained in underweight group. The findings indicated that children aged 12 and older having the highest PlI. Children with normal BMI had a greater PlI mean than overweight and underweight children, with no significant variations between the two groups. It was concluded that higher DMFS-based caries severity in underweight children was measured, indicating the need of preventive and public programs among this group to prevent the development of dental caries.

Key Words: Body mass index, Dental caries, Oral health status

INTRODUCTION

Caries is a chronic condition that results in the hard tissue of teeth being affected by microorganism activity and an imbalance between demineralisation and remineralisation. The dentition and oral cavity serve a particular function in the process of nutrient absorption [1]. Malnutrition may result from the difference between ingestion and the need for nutrition. It has the potential to have an irreversible impact on the development of oral soft and hard tissues. Caries is a condition that may result in pain and discomfort, which can affect the weight, life quality, and development of children [2]. Malnutrition is the result of an imbalance between ingestion and the need for nutrition, which is essential for the normal function of organs, growth, and the production of energy, as well as for the maintenance of healthy living[3]. Body mass index has consistently been regarded as a simple way to analyse nutritional status. It is an indicator of overall adiposity and represents weight levels that are associated with the lowest overall health risks[4]. The relationship between BMI and caries is affected by many factors, such as genetics, biological, socioeconomic, dietary, cultural, lifestyle, and environmental concerns[5]. The nutritional status across various age groups of children and geographical locations in Iraq was the subject of numerous studies. The results indicated that oral health may be influenced by nutritional status[6, 7]. Other studies indicated that the nutritional status of adolescents did not influence their oral hygiene, gingival health, or caries occurrence[8, 9]. This experiment was carried out to examine the relationship between oral health conditions and nutritional status of patients aged 3-16 who visited the preventive and pedodontics department of a dental hospital**.**

MATERIALS AND METHODS

The work in this project was started from November 2022 until February 2024 participants included 512 children aged 3-16 who attended the preventive and pedodontics department of a dental hospital for regular check-ups and treatment. Anthropometric measurements, including height and body weight in kilograms, were used to assess children's nutritional status. A portable glass electronic digital scale was used to record body weight with minimum clothing and without shoes. Children's height was measured using wall-mounted tape that was aligned perpendicular to the ground. The BMI was calculated to determine if weight was suitable as per the height. The BMI was computed by dividing weight in kilograms by the squared value of height (in meters)[10]. BMI classification comprised underweight (BMI<5th percentile), healthy (BMI between 5th-85th percentile), overweight (BMI≥85th percentile), obese (BMI≥95th percentile), and severely obese (BMI≥120% of the 95th percentile or ≥35kg/m^2) [11]. The clinical examination of teeth was carried out using a dental mirror and an explorer for caries. The decayed, missing, and filled teeth and surfaces (DMFS) index was employed to assess and document caries according to WHO's criteria [12]. Oral health state was assessed using Silness-Löe's plaque index (PlI), calculus index (CalI) using Ramfjord index, and Silness-Löe's gingival index[13-15]. Statistical analyses were performed on IBM® SPSS® 26. Descriptive statistics were employed to get the mean and standard error. Interferential statistics encompassed chi-square and Student's t-test, and a nova test. The level of confidence was 95%.

RESULTS

The entire sample distribution of by gender, age, and percentiles is shown in Table (1). Of the 512 children (3–16 years old) that attended the Dental Hospital, 316 (61.7%) were male and 196 (38.0%) were female. Age-wise, the distribution was split into three groups: 3-5, 6-11, and ≥12 years old. The majority of the patients fell into the normal weight range according to the BMI percentile, with men representing the highest gender distribution

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Table 1. The study sample Frequency distribution of by age, gender and BMI for age and gender percentiles

		N	%
Age Group (years)	**(3-5)**	92	18
	(6-11)	286	55.9
	(12 and above)	134	26.2
Gender	**Male**	316	61.7
	Female	196	38.3
BMI percentile groups	**Underweight**	92	18
	Normal	238	46.5
	Overweight	182	35.5
Total		512	100

Table (2) displays the significant difference between gender and age and with regard to Body Mass Index (BMI). (6–11 years old) age group represented the largest number of underweight individuals, and a highly significant difference was discovered for all age groups. The relationship between body mass index (BMI) and gender was shown in the same table; most men and women fwithin the normal weight range, but no discernible difference between the two groups

Table 2. The age and gender distribution of patients according to nutritional status

		BMI percentile							
		Underweight		**Normal**		**Overweight**		**Total**	
		N	%	N	%	N	%	N	%
Age group	**3-5**	6	6.5	31	13	55	30.2	92	18
	6-11	55	59.8	124	52.1	107	58.8	286	55.9
	12 and above	31	33.7	83	34.9	20	11	134	26.2
Difference		Highly significant							
Gender	**Male**	316	59.8	145	60.9	116	63.7	316	61.7
	Female	196	40.2	93	39.1	66	36.3	196	38.3
Difference		NS							

Table (3) displays oral hygiene (PlI, GI, CalI) mean difference in by Body Mass Index (BMI). A significant difference was not identified, the highest mean difference in plaque was recorded in relation to normal weight. Gingival index was recorded highest mean difference in relation to overweight.

Table 3. Mean plaque, gingival and calculus indices mean difference in by BMI percentile

BMI		**Plaque index**	**Gingival index**	**Calculus**
Underweight	**Range**	1.84	0.91	0.5
	Mean	0.88	0.0.14	0.06
	SE	0.06	0.02	0.01
	N	92	92	92
Normal	**Range**	1.96	1	0.5
	Mean	0.94	0.1	0.06
	SE	0.04	0.02	0.01
	N	238	238	238
Overweight	**Range**	4.47	1	0.5
	Mean	0.9	0.14	0.06
	SE	0.06	0.02	0.01
	N	182	182	182
Total	**Range**	4.2	1	0.5
	Mean	9.22	0.12	0.06
	SE	0.03	0.01	0.01
	N	512	512	512
Difference ANOVA test		NS	NS	NS

Table (4) shows oral hygiene (PlI, GI, and CalI) mean difference by age group. A highly significant difference was identified for PlI alone. The mean difference in PlI was highest at ≥12 years old, while highes mean difference in GI was t at 3-5 years. CalI represents the highest mean difference at age 6-11 years old.

Table 4. The mean difference in PlI, GI, and CaLI according to age

			Plaque index	**Gingival index**	**Calculus**
Age Group	**3-5 years**	**Range**	1.96	0.91	0.5
		Mean	0.77	0.14	0.05
		SE	0.05	0.02	0.01
		N	92	92	92
	6-11 years	**Range**	4.47	1	0.5
		Mean	0.89	0.12	0.07
		SE	0.04	0.01	0.01
		N	286	286	286
	12 and above	**Range**	1.96	1	0.5
		Mean	1.09	0.12	0.05
		SE	0.05	0.02	0.01
		N	134	134	134
	Total	**Range**	4.47	1	0.5
		Mean	0.92	0.12	0.06
		SE	0.03	0.01	0.01
		N	512	512	512
	Difference ANOVA test		Highly Significant	Not Significant	Not Significant

Table (5) shows that oral hygiene (PlI, GI, and CalI) mean difference in between females and males was not significant, with the highest mean difference in plaque index being 0.93 in females.

Table 5. The mean difference in PlI, GI, and CalI according to gender

		Plaque index	**Gingival index**	**Calculus**
Male	**Range**	1.97	1	0.5
	Mean	0.92	0.12	0.06
	SE	0.03	0.01	0.01
	N	316	316	316
Female	**Range**	4.44	1	0.5
	Mean	0.93	0.13	0.06
	SE	0.06	0.02	0.01
	N	196	196	196
Difference ANOVA test		NS	NS	NS

The caries experience mean difference by age, gender, and body mass index (BMI) is displayed in Table (6). The mean DMFs for each age group showed a very significant difference, with the largest DMFs occurring at ≥12 years of age and 6-11 years of age, respectively. Women had the largest mean difference in DMFS with significant differences by gender. However, males had the largest mean difference in dmfs, with highly significant disparities. The overweight represented the highest mean difference of DMFS, but the significant difference was not detected, while the underweight represented the highest mean difference of DMFS with a highly significant difference in the same table.

DISCUSSION

Caries is a multifactorial disease that affects teeth and is one of the major public health problems. It can cause pain and suffering and is

Table 6. DMFS and dmfs mean difference by gender, age group, and BMI percentile

		dmfs					DMFS				
		Range	**Mean**	**SE**	**N**	**P**	**Range**	**Mean**	**SE**	**N**	**P**
Age Group	**3-5**	36	6.97	0.7	92	H.S	6	0.37	0.12	92	H.S
	6-11	45	9.71	0.56	286		15	4.73	0.26	286	
	12 and above	2	0.22	0.06	134		41	12.63	0.89	134	
Gender	**Male**	40	7.66	0.47	316	H.S	22	5.4	0.32	316	S
	Female	45	5.23	0.63	196		42	7.01	0.7	196	
BMI Centile	**Underweight**	45	6.62	1.18	92	NS	20	8.45	0.64	92	H.S
	Normal	40	6.47	0.57	238		42	6.25	0.53	238	
	Overweight	36	7.14	0.51	182		42	4.48	0.51	182	

H.S: Highly Significant; **S**: Significant

influenced by both modifiable and non-modifiable risk factors, including water fluoride levels, dietary factors, frequency of dental brushing, past caries occurrences, and socioeconomic status. The present emphasis is on modifiable factors, particularly food, in the prevention of tooth decay. Caries have a detrimental effect on an individual's quality of life, which can affect their nutritional status, masticatory function, and dietary preferences. Nutrition and diet have both local and systemic impacts on the pathogenesis and aetiology of caries [16-18]. BMI is an anthropometric calculation that quantifies the weight in relation to one's height. Despite its frequent use in estimating body fat levels in individuals, it is an exceptional indicator of the health risks associated with obesity [19, 20].

The study aimed to examine the oral health status of minors aged 3-16 who were receiving treatment at the Dental Teaching Hospital in Baghdad. A highly significant difference between DMFS-based caries occurrence and BMI-based nutritional status was recorded. This difference may be attributed to complex societal and behavioural factors, including genetics, physical activity, and personal lifestyle. An identical outcome was documented by Ngoenwiwatkul [21]. Additionally, other researchers did not identify any correlation between dental caries and BMI. This may be attributed to the fact that malnourished individuals are more prone to caries due to negative eating habits, such as being fussy, which leads to the inability to consume food adequately and, consequently, malnutrition. This affects the composition, morphology, and eruption time of teeth, as evidenced by the results recorded by Buttriss, Van Gemert-Schriks and Norberg [22-24]. Being underweight represents the highest mean difference in DMFS, with a highly significant difference. This could be attributed to the disparity in habits, knowledge, and behaviours, as a highly significant association was recorded between age and DMFS-based caries occurrence. This indicates that DMFS-based caries occurrence increases with age, which agrees with the findings of previous Iraqi studies [25-28]. It may be related to the irreversible and accumulative character of caries[16].

Several Iraqi epidemiological studies have examined oral hygiene, with a focus on various age groups and geographic regions[6,7]. This experiment did not reveal a significant association between nutritional status with PlI and GI. This is due to the fact that oral health problems are multifactorial and can be influenced by diet, tooth brushing, and dental visits. Other studies have reported similar results [7,9], while many have reported that malnutrition can increase the prevalence of oral health problems [1, 5]. The presence of significant variance between PlI and age may be attributed to the fact that the quantity of plaque is influenced by oral hygiene and a variety of plaque retention factors that increase the risk[29]. Age and gender directly correlate with oral health status, as indicated by numerous studies[20, 30]. Other studies did not demonstrate a statistically significant difference in oral health status prevalence based on age or gender [9].

CONCLUSION

The present study showed a highly significant difference between DMFS-based caries occurrence and all age groups, as well as a highly significant difference between DMFS and BMI. No significant difference was recorded between dmfs and BMI. Moreover, oral health cleanliness was not influenced by the nutrition status of children aged 3-16. Thus, these children need public health programmes, including the assessment of nutritional status and caries treatment, to prevent further progression of decay.

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REFERENCES

1. Kidd EA. Clinical threshold for carious tissue removal. Dent Clin North Am 2010;54(3):541-9.
2. Caufield PW, Li Y, Dasanayake A. Dental caries: an infectious and transmissible disease. Compend Contin Educ Dent 2005;26(5 Suppl 1):10-6.
3. Junaidi J, Julia M, Hendratini J. Hubungan keparahan karies gigi dengan konsumsi zat gizi dan status gizi anak sekolah dasar di Kecamatan Lhoknga Kabupaten Aceh Besar. J Gizi Klinik Indones 2007; 4(2), 92-6.
4. Al-Fatlawi AHF, Radhi NJM. Oral health status in relation to nutritional status among institutionalized autistic children and adolescents in Baghdad city, Iraq. J Bagh College Dent 2017; 29(1): 117-24.
5. Bassa S, Workie SB, Kassa Y, et al. Prevalence of dental caries and relation with nutritional status among school-age children in resource limited setting of southern Ethiopia. BMC Oral Health 2023;23(1):84.
6. Al-Ghalebi SA, El-Samarrai SK. Oral health status and treatment needs in relation to nutritional status among 9-10 year-old school children in Nassiryia City/Iraq. J Bagh College Dent 2012;24(1): 133-7.
7. Hassan Z, Al-Taai A. Pattern, severity of dental caries and treatment needs among five years kindergarten children in Baghdad Iraq. Iraqi J Comm Medi 2006;19(3):280-5.
8. AL Khafaji SY, Al Rawi NA. Oral health in relation to nutritional status among 10 years old primary school children in Al-Hillah city/ Iraq. J Bagh College Dent 2019;31(4): 46-50.

9. Chaloob EK, Qasim AA. Nutritional status in relation to oral health status among patients attending dental hospital. J Bagh College Dent 2013;25(Special Issue 1):114-9.
10. Lutter CK, Rivera JA. Nutritional status of infants and young children and characteristics of their diets. J Nutr 2003;133(9):2941S-9S.
11. Al-Zaidi RR. Oral Health Status among a Group of Population with Chronic Kidney Disease in Iraq. Int J Drug Deliv Technol 2022;12(1):51-4.
12. Munther S, Majid AY. Nutritional Status among a Group of Preschool Children in Relation to Concentration of Selected Elements in Saliva and Caries Severity (A Comparative Study). J Bagh College Dent 2016;28(1):147-52
13. Silness J, Loe H. periodontal disease in pregnancy II. Correlation between oral hygiene and Pd condition. Acta Odontol Scand 1964;22:121-35.
14. Loe H, Silness J. periodontal disease in pregnancy1prevalence and severity. Acta Odontol Scand 1963;21:533-51
15. Ramfjord SP. indices for prevalence and incidence of periodontal disease. J Periodontal 1959;30:51-9
16. Rao A, Sequeira SP, Peter S. Prevalence of dental caries among school children of Moodbidri. J Indian Soc Pedod Prev Dent 1999;17(2):45-8.
17. Yousif SH, Qasim AA. Correlation of dental caries severity with physical properties of saliva in connection with nutrition status among a group of adolescent. Med J Babylon 2023;20(4):715-20
18. Ali RA, Radeef SM, Mohammed NB, et al. Oral health related quality of life among dental implant patients in relation to temporomandibular joint function. Med J Babylon 2022;19:609-14.
19. Al-yasiry RZ, Jwad MA, Hasan MF, et al. How obesity affects female fertility. Med J Babylon 2022;19:111-4.
20. Komiya H, Masubuchi Y, Mori Y, et al. The validity of body mass index criteria in obese school aged children. Tohoku J Exp Med 2008; 214(1): 27- 37.
21. Ngoenwiwatkul Y, Leela-adisorn N. Effects of dental caries on nutritional status among first-grade primary school children. Asia Pac J Public Health 2009;21(2):177-83.
22. Weichselbaum E, Buttriss J. Nutrition, health and schoolchildren. Nutr Bull 2011;36:295–355
23. van Gemert-Schriks MC, van Amerongen EW, Aartman IH, et al. The influence of dental caries on body growth in prepubertal children. Clin Oral Investig 2011;15(2):141-9.
24. Norberg C, Hallström Stalin U, Matsson L, et al. Body mass index (BMI) and dental caries in 5-year-old children from southern Sweden. Community Dent Oral Epidemiol 2012;40(4):315-22.
25. Dhuha M, Baydaa H. Oral health status among kindergarten children in Karbala city\Iraq. J Bagh College Dent 2017;29(4):82-8.
26. Wen A, Goldberg D, Marrs CF, rt al. Caries resistance as a function of age in an initially caries-free population. J Dent Res 2012;91(7):671-5.
27. Al-Tamimi HK, Al-Rawi NA. Effect of ageing on selected salivary chemical compositions and dental caries experience among group of adults. J Bagh College Dent 2019;31(3):1-9.
28. Al-Zaidi RR. Oral Health Status in Autism Patients Children in Iraq. NeuroQuantology. 2021; 19(6):54-60.
29. Alwan AH. The Impact of Age and Gender on Periodontal Conditions in Iraqi People: A Retrospective Study. Rafidain J Med Sci 2024;7(2):38–42.
30. Qasim AA. Oral health status among secondary school students in Mosul City Center /Iraq. Rafidain Dent J 2007;7(2): 180-5.