ORIGINAL ARTICLE

CONTENTS

Gingival health status and tooth wear in relation to nutritional status among primary school children in Al-Najaf city

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ABSTRACT

Aim: To assess the gingival health status and tooth wear in relation to nutritional status among primary schoolchildren in Al-Najaf city.

Materials and Methods: In this study, 1010 children (476 males and 534 females) from primary schools were included with age range 6-14 years old. The gingival inflammation was evaluated by the application of Gingival Index of Löe and Silness. Nutritional status assessed by using body mass index for age. Data collected through clinical examination with the consent of parents and teachers.

Results: Prevalence of gingivitis was 47% mild gingivitis, 6.5% moderate gingivitis, and 0.8% sever gingivitis. The higher percentage of mild gingivitis was found with underweight group 46.2% for male and 60.7% for female. For total sample, the higher mean value of Gingival Index was found with underweight group 0.67, with significant relation between groups of nutritional status p=0.013. Prevalence of tooth wear was about 29.1%. The percentage of tooth wear was higher in female 32.4% than male 25.4% with significant relation p=0.009.

Conclusions: Mild gingivitis was higher than moderate and sever gingivitis. Gingivitis is higher in females than males. A highly significant relation was recorded between gingivitis and gender. A significant association between gingivitis and nutritional status. Gingivitis was found higher with underweight group than other groups of nutritional status. A higher percentage of tooth wear was found with underweight children.

KEY WORDS: Gingival Health, Gingivitis, Tooth Wear, Nutritional Status, Body Mass Index

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ABBREVIATIONS
GI: Gingival Index
BMI: Body Mass Index
PD: Periodontal Diseases

INTRODUCTION

One of the most prevalent chronic illnesses that have afflicted people for ages is periodontal disease (PD). Gingivitis, or localized gingival inflammation, is the first sign of Parkinson's disease. Gingivitis is a frequent oral health issue and a mild manifestation of Parkinson's disease [1]. The causative factor is dental plaque. Although gingivitis is curable, if left untreated, it frequently develops into periodontitis, a more serious illness. Because of this, prompt gingivitis treatment keeps the periodontium from being destroyed [2]. The body mass index (BMI), which is a measure of weight adjusted for height and is computed as weight (in kilograms) divided by the square of height (in meters) (kg/m2), is the most widely used index to assess body fat. In the realm of nutrition, the term body mass index (BMI) is frequently used. BMI determines if a person's weight is within a healthy range [3]. An essential element of oral health is nutrition. In both health and illness, nutrition and the integrity of the mouth cavity work in constant harmony. The development of the oral cavity and the advancement of oral disorders can be impacted by malnutrition due to changes in tissue homeostasis, decreased resistance to microbial biofilms, and diminished tissue healing ability. Oral health influences nutrition, and nutrition influences oral health. Because of this mutually reinforcing link, dental health is positively correlated with nutritional health. There is a complicated relationship between diet and periodontal disease. Periodontal disease cannot be prevented or stopped by dietary consumption of micronutrients or macronutrients, but their deficiency may increase the risk of periodontal inflammation [4]. Tooth wear or tooth surface loss, also known as non-carious loss of tooth tissue, is a common occurrence that can occur on various surfaces for a variety of reasons [5]. Diet, dentition, enamel structure and hardness, jaw

muscles, and chewing habits can all affect the pattern and degree of tooth wear. Other factors that may affect this include the load placed on opposing surfaces, the length of time that opposing surfaces are in contact with one another, and the relative speed and direction of movement of opposing surfaces [6]. In the current study, we evaluated the nutritional quality of elementary kids in Najaf City in connection to their gingival health and tooth wear.

AIM

The aim of this study is to assess the gingival health status and tooth wear in relation to nutritional status among primary schoolchildren in Al-Najaf city.

MATERIALS AND METHODS

STUDY DESIGN AND SETTING

This cross-sectional study was conducted in March/2024 to June/2024 in Al-Najaf city, Iraq. Using a straightforward random selection technique, five elementary schools were chosen at random from the city's school districts.

PARTICIPANTS

A total of 1010 children, aged 6-14 years, were recruited from the selected primary schools. All children attending the selected schools within the specified age range were eligible for inclusion. Exclusion criteria (e.g., presence of systemic diseases affecting oral health, orthodontic treatment, use of medications known to affect gingival tissues), the final sample consisted of 476 males and 534 females.

DATA COLLECTION

Data collection was performed by calibrated examiners. Clinical examinations were conducted in a standardized manner, using a dental mirror and a periodontal probe (WHO probe) under adequate lighting by dental chair light.

GINGIVAL ASSESSMENT

Gingival inflammation was assessed using the Gingival Index (GI) of Löe and Silness (1963) [7]. The GI was recorded for six index teeth [teeth #3, #9, #12, #19, #25, #28 (Universal numbering system)]. Each tooth was divided into four gingival units (mesiobuccal, midbuccal, distobuccal, and lingual/palatal), and each unit was scored as zero for normal gingiva while mild inflammation as slight change in color, slight edema and no bleeding on probing was given score one. Score two was given to moderate inflammation by which is characterized redness, edema, glazing and bleeding on probing. Severe inflammation manifested by marked redness and edema, ulceration, tendency to spontaneous bleeding was given score 3.

NUTRITIONAL STATUS ASSESSMENT

The Body Mass Index (BMI) for age, which is computed as weight (in kilograms) divided by height (in meters squared) (kg/m ²), was used to evaluate nutritional status. Weight was measured using a digital scale with children wearing light clothing and no shoes. Children were measured for height using a portable stadiometer while standing upright, barefoot, and with their upper back, buttocks, and heels touching the device. The growth charts were used to calculate BMI-for-age percentiles [8]. WHO Child Growth Standards, CDC Growth Charts categorized Underweight below the 5th percentile while healthy weight ranges from 5th to < 85th percentile.

Overweight and obesity were categorized as (85th to < 95th percentile) and (≥ 95th percentile) respectively.

TOOTH WEAR ASSESSMENT

A dichotomised scoring system based on Bardsley et al. (2004) [9] was used to evaluate tooth wear. The labial, incisal, and lingual/palatal surfaces of the six upper and lower anterior teeth as well as the occlusal surfaces of the four first permanent molars were among the forty surfaces that were inspected. Each surface was scored as follows:

- 0 = No wear or wear confined to enamel
- 1 = Wear exposing dentine (including cupping of dentine)

CALIBRATION AND RELIABILITY

All examinations were carried out by a single trained and calibrated examiner (Dr. A.H.F) to eliminate inter-examiner variability. Dr. A.H.F re-examined 10% of the participants n=101 one week after the initial examination. Intra-examiner agreement, assessed using Cohen's Kappa, was 0.92 for GI and 0.88 for tooth wear.

STATISTICAL ANALYSIS

Microsoft Excel 2013 and SPSS version 23 (IBM Corp., Armonk, NY) were used to analyse the data. For every variable, descriptive statistics such as means, standard deviations, percentages, and frequencies were comput-

Table 1. Distribution and percentage of sample according to nutritional status

Gender	Total No.	Under weight		Healthy weight		Over weight		Obese	
		No.	[%]	No.	[%]	No.	[%]	No.	[%]
Male	476	78	16.4	312	65.5	54	11.4	32	6.7
Female	534	61	11.4	305	57.1	87	16.3	81	15.2
Total	1010	139	13.8	617	61.1	141	13.9	113	11.2

Table 2. Distribution and percentage of sample according to gingival status and gender with significant relation

Gender	Total No.	Healthy gingiva		Mild gingivitis		Moderate gingivitis		Sever gingivitis		x^2 p-value
		No.	[%]	No.	[%]	No.	[%]	No.	[%]	
Male	476	249	52.3	189	39.7	32	6.7	6	1.3	0.001
Female	534	212	39.7	286	53.5	34	6.4	2	0.4	
Total	1010	461	45.7	475	47	66	6.5	8	0.8	

Table 3. Number and percentage of gingival health status according to nutritional status and gender

Gender	Total No.	Gingival status	Under weight		Healthy weight		Over weight		Obese	
			No.	[%]	No.	[%]	No.	[%]	No.	[%]
Male	476	Healthy	37	47.4	169	54.1	26	48.1	17	53.1
		Mild	36	46.2	116	37.2	23	42.6	14	43.8
		Mod.	4	5.1	23	7.4	4	7.4	1	3.1
		Sever	1	1.3	4	1.3	1	1.9	0	0
Female	534	Healthy	20	32.8	116	38	39	44.8	37	45.7
		Mild	37	60.7	170	55.8	38	43.7	41	50.6
		Mod.	3	4.9	19	6.2	9	10.3	3	3.7
		Sever	1	1.6	0	0	1	1.2	0	0
Total	1010	Healthy	57	41	285	46.2	65	46.1	54	47.8
		Mild	73	52.5	286	46.4	61	43.3	55	48.7
		Mod.	7	5	42	6.8	13	9.2	4	3.5
		Sever	2	1.4	4	0.6	2	1.4	0	0

ed. Associations between categorical variables (such as gingival status and gender, tooth wear and nutritional status) were evaluated using the chi-square test. To compare the mean GI scores among the various nutritional status groups, a one-way ANOVA was designed.

ETHICAL APPROVAL

The University of Kufa's College of Dentistry's Local Ethical Committee granted ethical approval (Reference number 745). All participating children's parents or legal guardians gave their informed consent, and the children themselves gave their assent. The study complied with the Declaration of Helsinki's guidelines

RESULTS

Table 1 demonstrated the distribution and percentage of sample according to nutritional status. In both male and female, the higher percentage 65.5% and 57.1% respectively was recorded with healthy weight groups. For male, the lower percentage 6.7% was found with obese groups, while foe female, the lower percentage 11.4% was recorded with underweight group.

Table 2 illustrated the distribution and percentage of sample according to gingival status and gender with significant relation. The higher percentage of gingival status was found with healthy gingiva 52.3% for male, and mild gingivitis 53.5 for female. The lower percentage of gingival status was recorded with sever gingivitis 1.3% for male and 0.4% for female. Using chi-square test, a high significant relation was recorded between gingival status and gender p=0.001. Prevalence of gingival health status was recorded about 45.7% healthy gingiva, 47% mild gingivitis, 6.5% moderate gingivitis, and 0.8% sever gingivitis as in Figure 1.

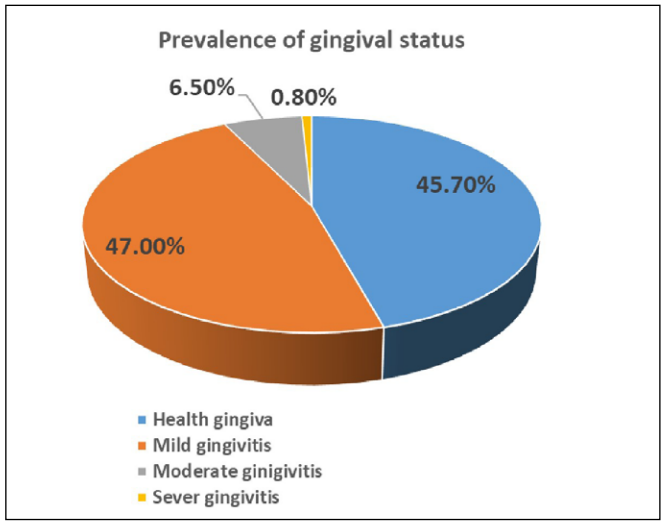

Fig. 1. Prevalence of gingival health status

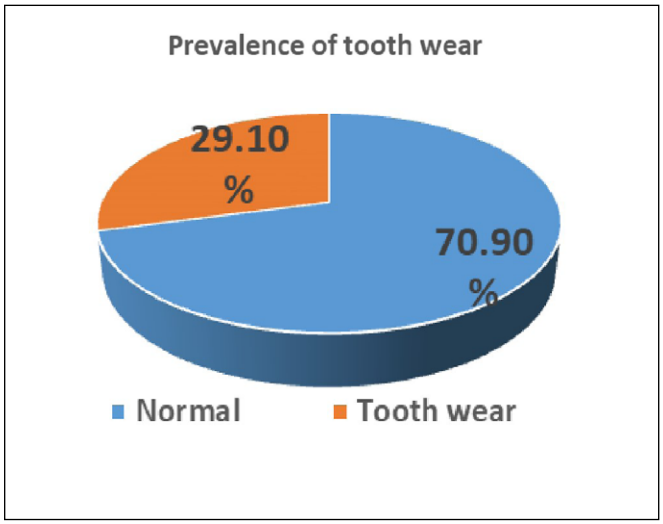

Fig. 2. Prevalence of tooth wear

Table 3 demonstrated the number and percentage of gingival health status according to nutritional status and gender. For healthy gingiva, the higher percentage was recorded with healthy weight group 54.1% for male, and with obese group 45.7% for female. For mild gingivitis, the higher percentage was found with underweight group 46.2% for male and 60.7% for female. For moderate gingivitis, the higher percentage was recorded with health and overweight group for male 7.4% and with overweight group for female 10.3%. Finally for sever gingivitis, the higher percentage was found with overweight group 1.9% for male and with underweight group 1.6% for female.

Table 4 illustrated mean and standard deviation of GI according to the gender with highly significant relation. For male, the higher mean value of GI was found with overweight group 0.63, with no significant relation between groups of nutritional status p=0.269. For female, the higher mean value of GI was found with underweight group 0.75, with significant relation between groups of nutritional status p=0.003. For total sample, the higher mean value of GI was found with underweight group 0.67, with significant relation between groups of nutritional status p=0.013. Prevalence of tooth wear 29.1% was recorded as in Figure 2.

Table 5 illustrated the distribution and percentage of tooth wear types according to gender with significant relation. The higher percentage of tooth wear was found with enamel 17.8% for male and 25.6% for female, while the lower percentage of tooth wear was concluded with pulp 1.9% for male and 0.2% for female. By using chi-square test, a high significant relation was found between tooth wear types and gender p=0.001.

Table 6 recorded the distribution and percentage of tooth wear according to nutritional status and gender with significant relation. For male, the higher percentage of tooth wear was found with underweight group 28.2% with no significant relation p=0.979. For female, the higher percentage of tooth wear was recorded with underweight group 37.7% with no significant relation p=0.637. The percentage of tooth wear was higher in female 32.4% than male 25.4% with significant relation p=0.009.

DISCUSSION

In the present study prevalence of gingivitis among children was recorded at about 54.3%. Other studies had results higher than this percentage. The differences may be attributable to the difference in method of evaluation and age group and geographic area. Variable not only between races but also between different individuals of the same race [10]. In the current study, a highly significant relation was recorded between gingivitis and gender. Gingivitis is higher in female 60.3% than male 47.7%. In contrast other studies showed gingivitis in males is higher than females [11-12]. This difference could be due to the lack of proper supervised tooth brushing in young children. It can also be speculated that boys are less likely to follow oral hygiene instructions when compared to girls [13]. Other study showed no differences in gingival disease between male and female [14-15], this related to the poor oral hygiene practice among both genders. In this study, the higher mean value of GI was found with underweight group, with significant relation between GI and nutritional status. This result in line with many studies, like study by Inaam M S and Wesal A. (2103) [16], study by Harun et al (2016) [10], and study by Martens et al (2017) [17]. It is caused by the high amount of calculus in the oral cavity, and economic and social condition.

Table 4. Mean and standard deviation of GI according to the gender with highly significant relation

Gender	Nutrition status	GI		p-value
		Mean	SD	
Male	Under	0.6	0.65	0.269
	Healthy	0.56	0.69	
	Over weight	0.63	0.7	
	Obese	0.5	0.56	
Female	Under	0.75	0.62	0.003
	Healthy	0.68	0.59	
	Over weight	0.68	0.71	
	Obese	0.58	0.57	
Total	Under	0.67	0.64	0.013
	Healthy	0.62	0.64	
	Over weight	0.66	0.71	
	Obese	0.56	0.57	

Table 5. Distribution and percentage of tooth wear types according to gender with significant relation

Gender	Total No.	No tooth wear		Tooth wear enamel		Tooth wear dentin		Tooth wear pulp		x^2 p-value
		No.	[%]	No.	[%]	No.	[%]	No.	[%]	
Male	476	355	74.6	85	17.8	27	5.7	9	1.9	0.001
Female	534	361	67.6	137	25.6	35	6.6	1	0.2	
Total	1010	716	70.9	222	22	62	6.1	10	1	

Table 6. Distribution and percentage of tooth wear according to nutritional status and gender with significant relation

Gender	Nutritional status	No.	Without Tooth wear		With Tooth wear		x^2 p-value	x^2 p-value
			No.	%	No.	%		
Male	Underweight	78	56	71.8	22	28.2	0.979	0.009
	Healthy	312	234	75	78	25		
	Overweight	54	41	75.9	13	24.1		
	Obese	32	24	75	8	25		
	Total	476	355	74.6	121	25.4		
Female	Underweight	61	38	62.3	23	37.7	0.637	
	Healthy	305	210	68.9	95	31.1		
	Overweight	87	56	64.4	31	35.6		
	Obese	81	57	70.4	24	29.6		
	Total	534	361	67.6	173	32.4		

Social-economic influences plaque index because the behavior of children with bad nutrition, they don't know how to maintain their oral hygiene and bad nutrient may cause the weakness of immune system response and it may relate to the increase of dental plaque [16]. One of the most common causes of tooth wear is bruxism. It is seen as a multifactorial parafunction with a complex and contentious aetiology that is regulated centrally as opposed to peripherally [18]. The prevalence of tooth wear in this study was found to be 29.1%. Marianna et al.'s investigation from 2021 revealed the similar prevalence of 29% [19]. The percentage of tooth wear prevalence was higher in other research than in this one [20–21]. There are many different reasons of tooth wear, and from a therapeutic perspective, it's crucial to distinguish between the many types [22]. A few research examined the relationship between the prevalence of tooth wear and nutritional variables. The prevalence of tooth wear and dietary status did not significantly correlate in the current investigation. These findings are consistent with

those of earlier investigations [23–24]. In the current study, children who were underweight had a higher rate of tooth wear. This finding is consistent with research by Francisco et al. (2015), which found that hunger may be one factor compromising salivary gland function in children who are underweight. Reduced salivary gland function has been linked to deficiencies in some nutrients, including protein, minerals, and vitamins. Saliva plays a crucial role in providing sufficient protection against oral illnesses, particularly tooth wear, as studies on children have demonstrated a correlation between the degree of protein-energy deficiency and the degree of decrease in stimulated salivary secretion rate [25].

CONCLUSIONS

About 54.3% of children were found to have gingivitis. More people had mild gingivitis than moderate or severe gingivitis. Gingivitis and gender were shown to be significantly correlated. Females are more likely than guys to have gingivitis. A strong correlation between dietary status and gingivitis. Underweight groups had higher rates of gingivitis than other nutritional status groups. Among schoolchildren, the prevalence of tooth wear was 29.1%. The prevalence of tooth wear and dietary status did not significantly correlate. The proportion of tooth wear was higher in children who were underweight.

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DATA ACCESS

The data generated anzzd analyzed in the present investigation can be made accessible upon a fair request.

CONFLICT OF INTEREST

The Authors declare no conflict of interest

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