Association between dental caries, nutritional status and socioeconomic status in a group of Egyptian children aged 6-12 years

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لا يزال تسوس الأسنان من أهم أولويات الصحة العامة التي يمكن الوقاية منها، وهو مرض شائع في البلدان النامية، بما في ذلك مصر. كان الهدف من هذه الدراسة هو تقييم العلاقة بين التسوس، ومؤشر كتلة الجسم (BMI) والعوامل الاجتماعية والاقتصادية (SES) بين الأطفال المصريين.

أجريت هذه الدراسة المقطعية في القاهرة بمصر، وتألفت العينة من ٧٥٠ من أطفال المدارس الابتدائية الذين تتراوح أعمارهم بين ٦-١٢ سنة، وتم إجراء الفحص الشفوي وفقًا لمعايير منظمة الصحة العالمية، وتم الحصول على الوزن والطول. لقد وجد أن تسوس الأسنان كان الأعلى في الوزن الطبيعي والأدنى في النحافة الشديدة، وكان الأعلى في الوضع الاجتماعي والاقتصادي المرتفع وفي الحالة الاجتماعية والاقتصادية المنخفضة.

الخلاصة: لا توجد علاقة معنوية بين العناية بالأسنان ومؤشر كتلة الجسم والحالة الاجتماعية والاقتصادية.

Abstract:

Background: Tooth decay as a significant but preventable public health priority continues to be a common disease in developing countries, including Egypt. The aim of this study was to evaluate the correlation between caries, body mass index (BMI) and socioeconomic factors (SES) among Egyptian children.

Methods: This cross sectional study conducted in Cairo Egypt, the sample consisted of 750 primary school children aged 6-12 years, oral examination was done according to WHO criteria, weight and height was obtained.

Results: dental caries was highest in normal weight and lowest in severe thin, and was highest in high socioeconomic status and lowest in low socioeconomic status.

Conclusion: there was insignificant correlation between dental caries and BMI, socioeconomic status.

Keyword: dental caries, nutritional status, socioeconomic status.

Introduction:

Dental caries is a global public health problem influencing the overall health of children. The risk factors for caries include biological, socio behavioral and environmental factors **(El Amin et al., 2018).**

Despite the many preventive measures, dental caries is one of the most common public health problems among children causing a social, physical, mental, and financial burden. **(Bud el al, 2021).**

Obesity and dental caries are multifactorial conditions, both having comprehensive etiology and factors such as dietary habits and available nutrients, oral hygiene, or saliva. Changes in diet and lifestyle, such as an increase in wealth and access to carbohydrate-rich, high-calorie food and drinks could be attributed to the increase in the prevalence of both dental caries and obesity. **(Swaminathan et al; 2019).**

World Health Organization **WHO (2013)** defines body mass index (BMI) as an index of weight for height that is commonly used to classify underweight, normal weight overweight and obesity in children and adults. BMI is calculated by dividing the weight in kilograms by the square of the height in meters kg/m2, **(Ahmed and Abuaffan, 2015).**

Subject and method:

This cross sectional study was conducted in Cairo Egypt. The study sample included 750 school age children of both sexes. Samples were collected from primary schools, and children aged between 6-9 years (250 male, 320 female) and 9-12 years (85 male, 95 female).

- **Inclusion criteria:**
    - Apparently, healthy children free, from genetic disorders, and any systemic or chronic diseases (from school medical insurance files).
- **Exclusion criteria:**
    - Children with history of any chronic or genetic diseases.
    - Children less than 6 years or more than 9 years.
    - Non-Egyptian children.

1- Clinical examination of the children:

A- Dental examination

Dental examination of children was done under a light source with a disposable probe and mouth mirror. Visible caries on tooth surface were registered.

A semi-structured chart was designed for detection of dental caries according to **WHO (2013)** criteria, using the DFT (decayed, filled primary teeth) and DMFT (Decayed, Filled, Missed Permanent teeth) values. Missing primary teeth (m= missing) will not be registered because the examined children were expected to be in the mixed dentition stage making it hard to identify the exact reason for missing primary teeth according to **Ahmed and Abuaffan, 2015**.

B- Anthropometric Measurements

• Height will be measured using stadiometer. Participants will be asked to remove shoes before stepping on stadiometer placed on a flat floor

along the wall. Height measurement will then be carefully read to the nearest 0.1 cm.

According to the **WHO (2007)** Z-Score, the (weight / height) and body mass index (BMI) was classified as follows:

- Severe thin: BMI / WHZ < -3 SD score.
- Thin: BMI / WHZ < -2 SD score. Percentile: 0 < 3.
- Normal weight BMI / WHZ ≥ -2 and ≤ +1 SD score. Percentile: ≥ 3 and ≤85.
- Overweight: BMI / WHZ > +1 and ≤ +2SD score. Percentile > 85 and ≤ 97.
- Obese: BMI / WHZ > +2 SD score. Percentile > 97.

W/H was calculated for children from 6-9 years, while BMI was calculated for children 9-12 years.

C- Socioeconomic level assessment

Socioeconomic level was assessed according to Fahmy and El-Sherbini modified index **(Fahmy, 2015)**. This index was designed for the evaluation of social level of families, to be used in health research in Egypt.

The examiner asked the questions to one /or both parents (face to face or by telephone) of each child and filled the index.

Results:

The study included 750 Egyptian children aged 6-9 years (group I) and 9-12 years (group II). There was a significant difference (P < 0.05) in all descriptive parameters. Regarding sex, females were 56.14% in-group

I and 52.80% in-group II that was significantly higher than males (43.86% in group I and 47.22 % in group II). In W/H or BMI, normal was significantly the highest (77.89% in-group I and 72.78% in group II) while severe thin was significantly the lowest (0.35% in-group I and 1.67% in group II). In DMF, no caries was significantly higher than with caries in-group I (74.91%) while in-group II those with caries were higher than with no caries (60.56%). In dft, those with caries were significantly higher than with no caries in both groups (81.75% in-group I and 57.78% in group II). In SES, high was significantly the highest (42.63% in-group I and 38.89% in group II) while low was significantly the lowest (19.82% in-group I and 25.56% in group II) as presented in table (1).

Association between dental caries & demographic data:

For the association between DMF with nutritional status and socioeconomic status, it was found that there was a significant difference between distribution of DMF (no caries & with caries) among W/H or BMI and SES except in SES (no caries) category in-group II it was insignificant. In W/H or BMI, “normal” was significantly the highest (77.28%% no caries category, 79.72%% with caries category in group I and 69.01% no caries category, 75.23% with caries category in group II), while “severe thin” was significantly the lowest (0.47%% no caries category, 0% with caries category in group I and 4.23% no caries category, 0% with caries category in group II). In SES, “high” was significantly the highest (43.79%% no caries category, 39.16%% with caries category in group I and 40.85% no caries category, 37.61% with caries category in group II), while “low” was significantly the lowest (18.27% no caries category, 23.78% with caries category in group I and

26.76% no caries category, 24.77% with caries category in group II), as presented in table (2).

For DFT, there was a significant difference between distribution of DFT (no caries & with caries) among W/H or BMI and SES. In W/H or BMI, “normal” was significantly the highest in both groups (72.12%% no caries category, 79.72%with caries category in group I and 64.47% no caries category, 78.85 % with caries category in group II), “sever thin” was significantly the lowest (0.00% no caries, 0.43% with caries in group I and 2.63% no caries, 1.92% with caries in group II). In SES, “high” was significantly the highest in no caries group I (57.69%) and with caries group II (41.35 %) and “medium” was the highest in with caries group I (40.13%) and no caries group II (39.47%), while “low” was significantly the lowest (16.35% no caries category, 20.39% with caries category in group I and 25.00% no caries category, 25.96% with caries category in group II), as presented in table (2).

Table (1): Comparison between frequency and percentages of descriptive data

Egyptian		Group I		Group II	
		6-9 years (570 = 76%)		>9-12 years (180= 24%)	
		N	%	N	%
sex	Male	250	43.86	85	47.22
	Female	320	56.14	95	52.80
	P value	0.001*		0.34	
W/H BMI	severe thin	2	0.35	3	1.67
	underweight	14	2.46	9	5.00
	normal	444	77.89	131	72.78
	overweight	71	12.46	22	12.22
	obese	39	6.84	15	8.33
	P value	0.001*		0.001*	
DMF	no caries	427	74.91	71	39.44
	with caries	143	25.09	109	60.56

	P value	0.001*		0.001*	
dft	no caries	104	18.25	76	42.22
	with caries	466	81.75	104	57.78
	P value	0.001*		0.004*	
SES	high	243	42.63	70	38.89
	medium	214	37.54	64	35.56
	low	113	19.82	46	25.56
	P value	0.001*		0.008*	

Table: (2) Comparison between frequency and percentages of DMF and dft distribution among different categories of BMI and SES

			Egyptian children								
			Group I					Group II				
			No caries		With caries		r	No caries		With caries		r
			N	%	N	%		N	%	N	%	
DMF	W/H BMI	Severe thin	2	0.47%	0	0.00%	0.05	3	4.23	0	0.00	0.02
		Underweight	14	3.28%	5	0.00%		3	4.23	5	4.59	
		Normal	330	77.28%	82	79.72%		49	69.01	82	75.23	
		Overweight	54	12.65%	14	11.89%		9	12.68	14	12.84	
		Obese	27	6.32%	8	8.39%		7	9.86	8	7.34	
		P value	0.001*		0.001*			0.001*		0.001*		
	SES	High	187	43.79%	56	39.16%	0.04	29	40.85	41	37.61	-0.027
		Medium	162	37.94%	53	37.06%		23	32.39	41	37.61	
		Low	78	18.27%	34	23.78%		19	26.76	27	24.77	
		P value	0.001*		0.003*			0.07		0.03*		
dft	W/H BMI	Sever thin	0	0.00%	2	0.43%	-0.08	2	2.63	2	1.92	-0.009
		Underweight	3	2.88%	10	2.15%		7	9.21	2	1.92	
		Normal	75	72.12%	369	79.18%		49	64.47	82	78.85	
		Overweight	12	11.54%	60	12.88%		8	10.53	13	12.50	
		Obese	14	13.46%	25	5.36%		10	13.16	5	4.81	

		P value	0.001*		0.001*			0.001*		0.001*		
	SES	High	60	57.69%	184	39.48%	0.05	27	35.53	43	41.35	-0.04
		Medium	27	25.96%	187	40.13%		30	39.47	34	32.69	
		Low	17	16.35%	95	20.39%		19	25.00	27	25.96	
		P value	0.001*		0.001*			0.06		0.01*		

Discussion:

Child obesity and dental caries in children constitute two major health problems in a large majority of countries nowadays and present great challenges for public health, **(Torres et al., 2017).**

Dental caries and obesity are both serious health problems which need increase in awareness among the population and organized preventive programs, **(Ahmed and Abuaffan, 2015).**

In 1948, the World Health Organization (WHO) had a new view for health, stating that health shouldn't be defined as not only the absence of disease and disability but also by the presence of physical, mental, and social well-being. (**ElShazly and Hegazy, 2017).**

This study was conducted to answer an important question "Is there an association between dental caries and childhood obesity, socioeconomic status?" which are considered risk factors that may affect both dental and general health conditions of the child with the result of so many difficult burdens on the child ,the family as well as the community in general.

This study was done by participation of 750 Egyptian aged 6-9 years (group I) and 9-12 years (group II), 250 male and 320 female in group I and 85 males and 95 females in group II in which weight / height

were calculated for group I and it is defined as weight for height z score (WHZ) while body mass index (BMI) was calculated for group II according to **(de Onis, 2007).** It was found that in W/H or BMI, "normal" was significantly the highest while "severe thin" was significantly the lowest, this results goes with (**Abbass et al., 2019)** but in India (**Swaminathan el al., 2019)** showed that overweight is the lowest percentage.

In DMF group I, "no caries" was significantly higher than "with caries" similar to **(Mulu et al., 2014).** While in group II "with caries" was significantly higher than "no caries". In dft, "with caries" was significantly higher than "no caries" in both groups similar to **(Mulu et al., 2014)** in which the majority 24 (75%) had primary tooth decay. This finding could be due to presence of many primary teeth present in the oral cavity compared to permanent teeth.

In SES, "high" was significantly the highest while "low" was significantly the lowest in both groups, while in contrast (**Naskova et al., 2017)** found that "medium" was the highest while "high" was the lowest.

Association between dental caries and demographic data:

There were a significant difference between distribution of DMF and dft (no caries & with caries) among BMI in both groups. "Normal" was significantly the highest (79.72% in DMF) and (79.18% in dft), "severe thin" was the lowest in DMF and dft (0%). Correlation between DMF & BMI was calculated by using Spearman`s correlation coefficient which revealed insignificant correlation in all categories both groups, these weak correlation findings were similar to **(Gerdin et al., 2008 and Ahmed and Abuaffan, 2015)** in contrast **(Bud et al., 2021)** found that

patients with a high BMI percentile, corresponding to overweight, have a significantly higher DMFT number than the other groups of patients, the possible explanation was that both obesity and dental caries are multifactorial in etiology and various genetic and environmental factors have an impact on them. However **(Perez et al., 2010)** stated that the overweight children had a lower caries index. For dft, correlation between dft and demographic factors revealed insignificant correlation with BMI, this finding was similar to **(Lee et al., 2016)** study which revealed that there were no statistically significant differences in dft index values between BMI-categorized groups, likewise, **(Hong et al., 2008)** reported that there was no significant relationship between obesity and dental caries in a study of US children aged 2-6 years. In this study, higher prevalence of dental caries in primary teeth were found in underweight groups; this finding is relevant to the results of Cameron et al in UK when 165 children aged 3-11 years were examined and severe dental caries was associated with underweight children. **(Cameron et al., 2006).**

In SES there was a significant difference in both groups DMF and dft except in “no caries” category of DMF group II and “no caries” category of dft group I, it was found that “high” was significantly the highest in both DMF and dft except in dft, “medium” was significantly the highest in “no caries” group II (39.47%) and “with caries” group I (40.13%) while “low” was significantly the lowest in both groups, (18.27%) in DMF and (16.35%) in dft. Correlation between DMF, dft and demographic factors was calculated by using Spearman`s correlation

coefficient which revealed insignificant correlation with SES, group I (r = 0.04), group II (r = -0.027) in DMF and (r = 0.05) in group I and (r = -0.04) in group II, in contrast **(Ain et al., 2016; Gokhale and Nuvvula, 2016; Engelmann et al., 2016)** found that there is significant correlation between dental caries and SES, frequency of dental caries was found to be higher in low socioeconomic class children as compared to that in upper socioeconomic class, One possible explanation is that the lack of economic resources and empowerment of deprived individuals do not allow them to make healthy choices, which make them more likely to engage in deleterious behaviors affecting their oral health (**Engelmann et al., 2016)**, reverse results was found by **(Mohamed et al., 2020),** the study suggest that Kuwaiti children have significantly higher caries prevalence than Egyptian children. may be due to the socioeconomic development as the cultural habits changed since the 1970s rise in oil prices and may be led to diet rich in refined carbohydrates.

(Alshihri et al., 2019) concluded that both obesity and dental caries are multifactorial conditions, and it is difficult to assess all of the associated risk factors simultaneously. The association is far more complex than can be explained by a single common risk factor or dietary habits alone.

Limitations of this study

Covid-19 pandemic was one of the most difficult challenges we met which was a barrier for our entrance in hospitals.

Conflict of interests

There was no conflict of interests in this study.

Conclusion

It can be concluded that there is relationship between dental caries and BMI, SES and eating and oral hygiene habits in Egyptians, the correlation between dental caries, BMI, SES, eating and oral hygiene habits were insignificant except in Q 8 (tooth brushing renewal frequency) in dft group I and Q 9 (consultation in dental office) the correlation was significant weak positive.

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