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Dental caries and it is association with body mass index among primary school children in Babylon City, Iraq

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***Abstract*---**Back ground: It's very important to know how common tooth decay is and how it spreads so that preventive measures can be planned and carried out in the right way. The study's aim is to examine the association between tooth decay and body mass index.Materials and methods**:** A cross-sectional study was conducted in Al-Hilla city, Babylon Governorate, Iraq, to investigate the relationship between caries and body mass index. The study period was from November 1st, 2021, until March 1st, 2022. Oral health was assessed according to World Health Organization criteria using the decayed-missing-filled teeth index (DMFT). BMI is calculated using the weight and height of the child [weight in kg/(height)2 in meter]. Results: The mean ± SD of their ages was 8.98± 1.756 years. The age range at the time of the study was between 6-13 years. The highest percentage (38.8%) was in the age group (10–11 years) and the lowest percentage (4.7%) was in the age group (12–13 years). The highest percentage (87.30%) of males and females have neutral eating habits, while the lowest percentage (2.50%) of males and (2.80%) of females have unhealthy eating habits. The results of this study indicated that there is a significant association between both tooth decay and body weight (p. value = 0.001*). Conclusion: A high percentage of schoolchildren have dental caries. There was a statistically significant association between BMI and dental caries.

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***Keywords*---**Dental caries, primary school children, tooth decay.

Introduction

Overweight and dental caries are multifaceted disorders having numerous causes, which include dietary behaviors, dietary accessibility, dental well-being, and salivary wellness (Lempert et al., 2014) .Tooth decay is an irreversible microbiological illness that affects the calcified tissues of the teeth. It is distinguished by the demineralization of the inorganic component of the tooth and the destruction of the organic content of the tooth, which both commonly result in cavities (Sivapathasundharam & Raghu, 2020). Obesity is described as an abnormally large buildup of fat in the body that poses a medical issue(Karadeniz & Can, 2019). Some studies indicate that there is no correlation between dental caries and obesity(Wu et al., 2013). Another study reveals that dental caries is inversely associated with dental caries Ashour et al., (2018). Additionally, numerous studies (KIZILCI et al., 2022)and (Schmidt et al., 2022) have discovered that decay is closely related to BMI and that caries is more common in obese and overweight people.

Methodology

Design and period of the study:

A descriptive cross-sectional study performed on 422 students in Al Hilla city in the Babylon governorate. The data have been collected at the period between (November 1st, 2021, to march 1, 2022).

Setting of the study

The study was performed in Al Hilla city. There were 170 primary schools (90 for boys and 80 for girls). The search was performed in Al Hilla city centre on twelve schools selected randomly (6 schools for boys and 6 schools for girls).

Sample size

The sample size was detected by using the formula proposed by (Kotrlik & Higgins, 2001). $N = p*(1-p)*z^2/d^2$. The z-value was set to 1.96 for a 95% confidence level. The obtained sample size was determined to be 422.

Data collection method

The questionnaire is an official assessment tool used by the researcher through a set of questions and direct interviews with the students after obtaining approval from their parents. The interview takes about 15 minutes for each student.

Health assessment of oral health status of students:

The World Health Organization's guidelines were used to evaluate the oral well-being of schoolchildren (World Health Organization, 2013). DMFT, dmft scores of

zero are considered no caries, less than 2.7 are considered low caries, 2.7 to 4.4 are considered moderate caries, and 4.5 and higher are considered high caries.

Anthropometric measurement for the school children:
BMI is calculated from the child's weight and height by dividing the weight in kilograms by the square height in meters according to the following formula:

BMI = (weight in kilogram) / (height in meter) ^{2}
According to a specified CDC growth chart the BMI was calculated based on age and gender (Kuczmarski, 2000)**.**

Statistical Analysis

The data through the questionnaire, the information for each question was transferred to code sheets, the data was entered into the personal computer, and then the data was analyzed by the statistical package available from SPSS-25. Data were showed in simple measures of frequency, percentage, mean, standard deviation, and range (minimum and maximum values). The significance of the difference for different percentages (qualitative data) was tested using the Pearson Chi-square test (χ2-test). Statistical significance was taken into account when the P-value was equal to or less than 0.05.

Results

Table 1 shows the distribution of the studied sample according to demographic characteristics. The mean ± SD of their ages was 8.98± 1.756 years. The age range at the time of the study was between 6-13 years. The highest percentage (38.8%) was in the age group (10–11 years) and the lowest percentage (4.7%) was in the age group (12–13 years). The current study shows that the highest percentages (41.7% and 35.4%) of the studied sample are their fathers and mothers who completed high education, respectively. Also, the study shows 72.1% of participants' mothers were not employed. Regarding the occupation of fathers, the study reveals that the highest percentage (43.8%) of children's fathers were self-employed.

Table (1): The Distribution of the Studied Sample According to Demographic Characteristics.

Demographic characteristics		**No.**	**Percent (%)**
Age groups (Per years)	6-7 year	91	23.7
	8-9 year	126	32.8
	10-11 year	149	38.8
	12-13 year	18	4.7
	Mean± SD (Range (Min-Max))	8.98± 1.756 (6-13)	
Sex	Male	204	53.1
	Female	180	46.9
Socio economic status	Low	164	42.7
	Moderate	152	39.6

	High	68	17.7
Father level of education	Illiterate	29	7.6
	Primary	94	24.5
	Secondary	101	26.3
	High education	160	41.6
Occupation of the father	Employed	159	41.4
	Self-employed	168	43.8
	Not employed	57	14.8
Mother level of education	Illiterate	20	5.2
	Primary	109	28.4
	Secondary	119	31.0
	High education	136	35.4
Occupation of the mother	Employed	94	24.5
	Self-employed	13	3.4
	Not employed	277	72.1

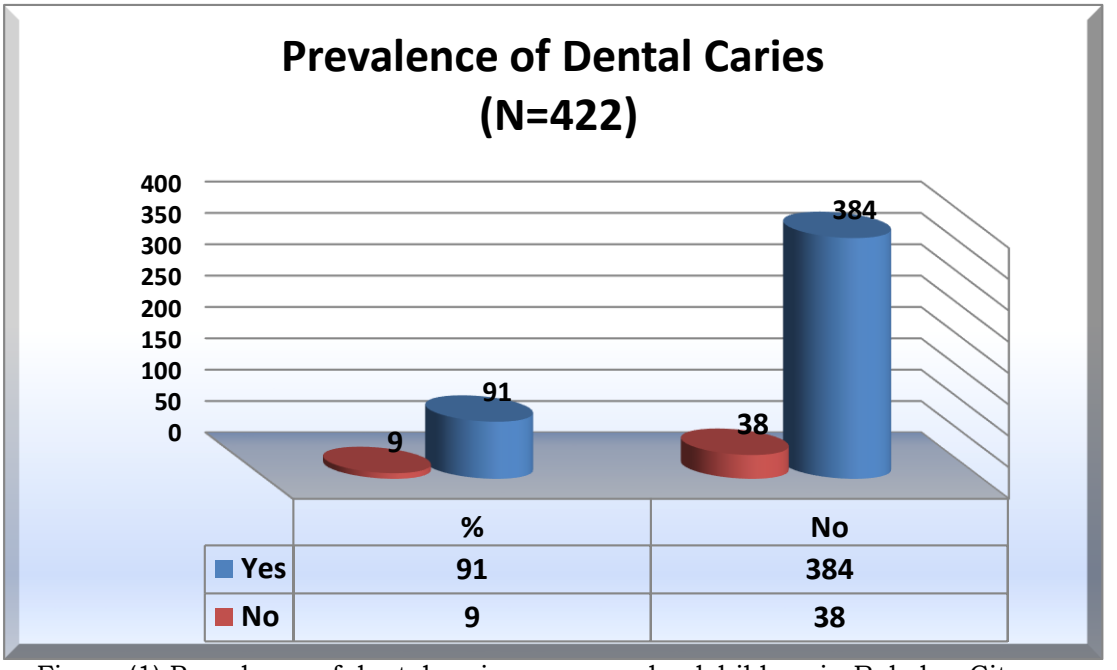

Figure (1) Prevalence of dental caries among schoolchildren in Babylon City

Figure (1) reveals that 384 (91.0%) out of 422 school children have dental caries, while 38 (9.0%) of them do not have dental caries.

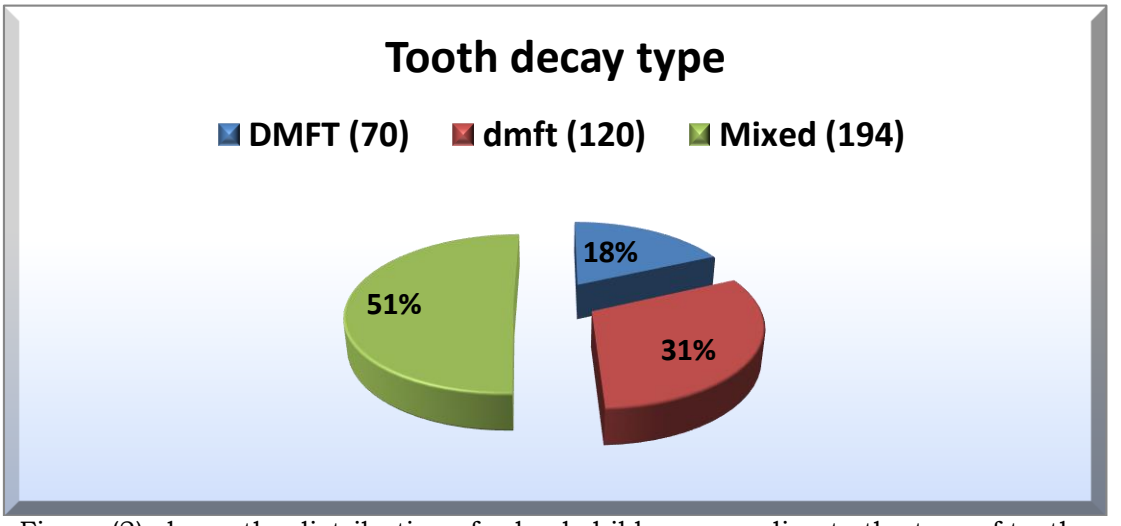

Figure (2) shows the distribution of school children according to the type of tooth decay

Figure (2) reveals that 194 (51%) of children have mixed tooth decay; 120 (31.0%) of them have primary (DMFT) tooth decay; and 70 (18.0%) of the participants have permanent tooth decay**.**

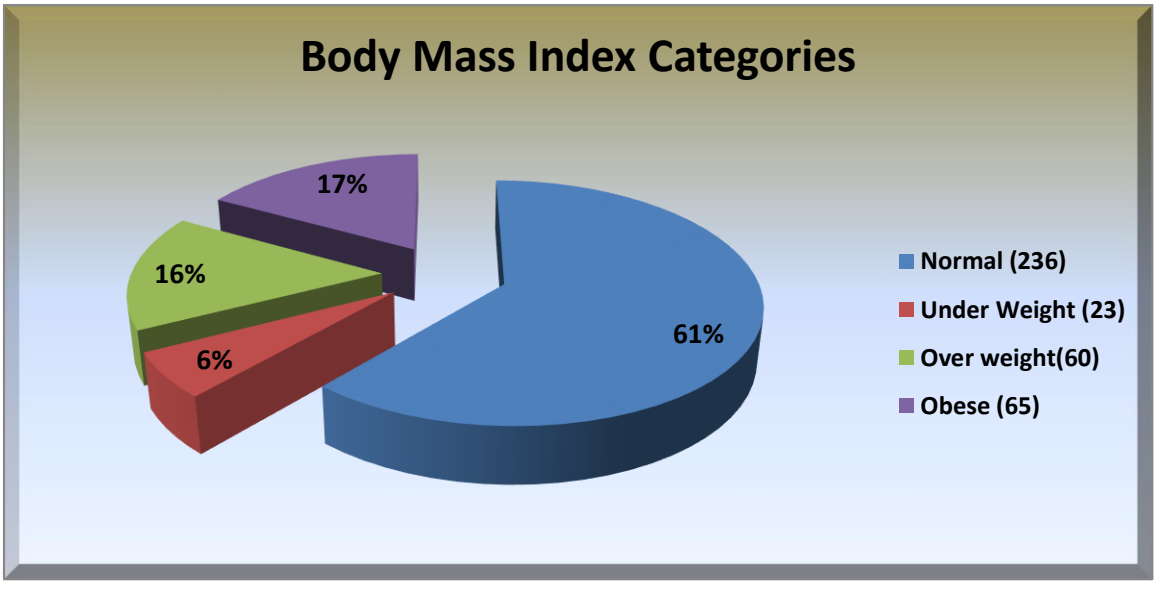

Figure (3) shows the distribution of the studied samples according to body mass index

Figure (3) The current study found that 61% of participants had normal BMI, followed by 17% of them being obese, while 16% were overweight. Finally, 6% of them were underweight.

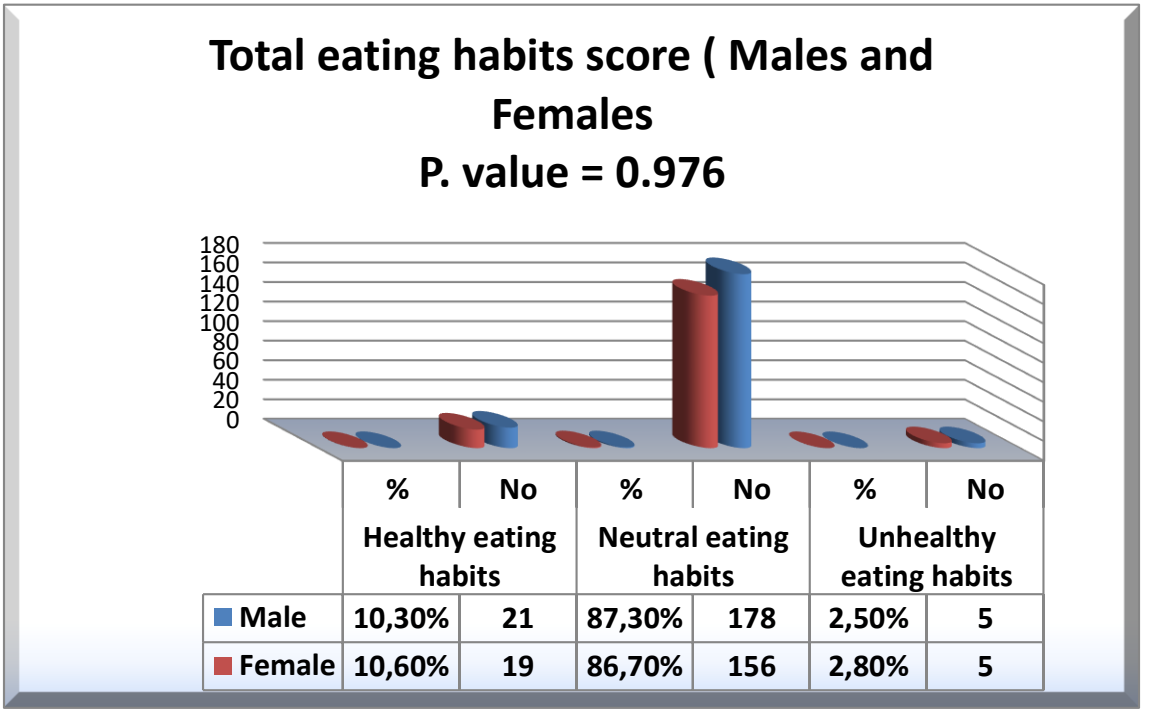

Figure 4: Assessment of Eating Habits Among Males and Females.

Figure (4) reveals that the highest percentage (87.30%) of males and (86.70%) of females have neutral eating habits, while the lowest percentage (2.50%) of males and (2.80%) of females have unhealthy eating habits.

Table (2) represents the association between dental caries in schoolchildren and body mass index. The results of this study indicated that there is a significant association between both tooth decay and body weight. There was a negative correlation between BMI and caries (lower BMI, more severity of caries; higher BMI, lower severity of caries).

Table 2 shows the relationship between dental caries and body mass index in schoolchildren

Association between dental caries and BMI			DMFT/dmft			Total
			Low (<2.7)	Moderate (2.7-4.4)	High (>=4.5)	
State	Normal	No	65	63	108	236
		%	27.5%	26.7%	45.8%	100.0 %
	Under Weight	No	6	5	12	23
		%	26.1%	21.7%	52.2%	100.0 %
	Over	No	23	17	20	60

	weight	%	38.4%	28.3%	33.3%	100.0 %
	Obese	No	35	12	18	65
		%	53.8%	18.5%	27.7%	100.0 %
Total		No	129	97	158	384
		%	33.6%	25.3%	41.1%	100.0 %

Table (3) represents Pearson's correlation coefficients between body mass index and the mean score of dental caries. It shows that there is a highly significant negative correlation (P value 0.001) between body mass index and the mean score of dental caries (r = -0.274).

Table (3): Pearson's correlation coefficients between body mass index and mean score of dental caries

Pearson's correlation coefficients		**Mean score of dental caries**
Body Mass Index	Pearson Correlation	-0.274-**
	P. value	<0.001
	N	384

Discussion

As regarding the distribution of the studied sample, The mean ± SD of their ages was 8.98± 1.756 years. The age range at the time of the study was between 6-13 years. The highest percentage (38.8%) was in the age group (10–11 years) and the lowest percentage (4.7%), was in the age group (12–13 years). These results agreed with the study findings conducted in Iran (Youssefi and Afroughi, 2020) which found that the mean ± SD of their ages was 9.5± 1.55 years. There was a distinct male preponderance of 53.1%, which agreed with the study done by Aung *et al.*, (2021) who revealed 50.7% of the participants were boys. Also, it corresponds with another study that found The average age of the children in the study was 9.26 years, with a standard deviation of 1.83 years; males made up 51.62 percent of the sample (Alsadat *et al.*, 2018).

The current study shows that the highest percentages (41.7% and 35.4%) of the studied sample are their fathers and mothers who completed high education, respectively. Also, the study shows 72.1% of participants' mothers were not employed. These findings were consistent with the findings of (Youssefi and Afroughi, 2020) who discovered that the majority of participants' fathers (42.8%) graduated from university, while 86.5% of their mothers were housewives. Regarding the occupation of fathers, the study reveals that the highest percentage (43.8%) of children's fathers were self-employed. This result is in agreement with the study findings conducted by (Ezo & Gashawbeza, 2021) which found that 54.7% of participants had fathers who had private businesses.

The study reveals that 384 (91.0%) out of 422 school children have dental caries, while, 38 (9.0%) of them do not have dental caries. These results are consistent

with the published study findings conducted in Syria(Alhaffar et al., 2019) which found that at least 86% of the participants had dental caries. The results reveal that 194 (51%) of children have mixed tooth decay, 120 (31.0%) of them have primary (DMFT) tooth decay; and 70 (18.0%) of the participants have permanent tooth decay**.**

Regarding body weight distribution, the current study found that 61% of participants had normal BMI, followed by 17% of them were obese, while 16% were overweight, and finally, 6% of them were underweight. These results agreed with the previous study findings by Demir, (2020) who revealed that 59.1% of children in private school were normal, followed by 17.3% were obese, and 15.3% of them were overweight. Finally, 8.3% of children were underweight.

Also, the results showed that the highest percentage of 178 (87.30%) males and 156 (86.70%) females have neutral eating habits, while the lowest percentage of 5 (2.50%) males and 5 (2.80%) females have unhealthy eating habits. These results disagreed with the study findings conducted by (Bargiota *et al.*, 2013) which revealed that 52% of males had poor eating habits and 50% of females had fair eating habits. The fact that the comparison study was done in rural areas where vegetables and fruits are grown could be a reason for this result.

The results of this study indicated that there is a significant association between both tooth decay and body weight (p. value = 0.001*). There was a negative correlation between BMI and caries (lower BMI, more severity of caries; higher BMI, lower severity of caries). These results agree with (Shi *et al.*, 2022), and (Reddy *et al.*, 2019) who revealed that there was a significant association between caries frequency and underweight among schoolchildren. The reason may be that both tooth decay and fatness are complex illnesses. Lower severity of caries and excess weight may result from elevated high-fat food intake that is linked to fatness instead of tooth decay, or malnutrition may be linked to caries through enamel hypoplasia, salivary glandular hypofunction, and saliva compositional alterations. Untreated caries, on the other hand, can cause considerable discomfort and pain in youngsters, causing them to consume less. Other problems related to caries, such as infections, restlessness, and broken sleep patterns, can hurt a baby's quality of life and cause them to lose weight.

Conclusions

1. The study revealed the high percentage of dental caries among school children.
2. The study reveals that most schoolchildren have neutral eating habits while a very low number of them have healthy eating habits.
3. The results of this study indicated that there is a highly significant association between dental caries and BMI.

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