

Association Between Dental Caries and Sociobehavioral Factors Among Female Students in Secondary Schools and College of Dentistry in Babylon Province

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Abstract

Background: Continuous changes in socioeconomic and lifestyle aspects in Iraq have incurred a lot of adverse effects on oral health quality, especially among adolescents. However, minimal studies have been conducted among adolescent females concerning the prevalence of dental caries (DC). **Objectives:** This cross-sectional study aimed to investigate the prevalence of DC and its severity concerning different aspects of sociobehavioral (SB) factors among female students in secondary schools and dental colleges in Babylon Province, Iraq. **Materials and Methods:** About 500 students from both Al-Tali'a secondary school (16–18 years) and Babylon Dental College (19–20 years) were recruited in this study from March to May 2023. DC was assessed based on the decayed, missing, and filled teeth index (DMFT) scores, and SB and socioeconomic factors were obtained from a structured questionnaire. **Results:** The prevalence of DC was high (98.6%), and its association with measured SB factors was not significant. However, the severity of DC was positively ($P < 0.05$) associated with sugar intake and previous dental visits, but negatively ($P < 0.05$) associated with the frequency of brushing and household wealth index. **Conclusion:** The results here highlight the considerable effects of SB factors on the severity of DC, which in turn reflect a poor education of oral health among adolescent females in Babylon City, and it also recommends the desperate need for creating preventive programs for reducing the occurrence of DC among the students.

Keywords: Babylon, dental caries, female students, sociobehavioral factors

INTRODUCTION

Oral health status is mainly integrated with systematic body health, and it plays a considerable role in an individual's quality of life.^[1] Among oral health problems, dental caries (DC) is one of the most dominant diseases worldwide, and it is defined as deteriorated effects targeting the enamel layer of the tooth by the acidity generated by oral bacteria.^[2] It is a biofilm-mediated, multifactorial disease resulting from different factors working together. These factors could involve how the host is susceptible, oral microbial flora, and environmental factors such as type of diet, fluoriated water, and oral hygiene.^[3,4] Previous research indicated that more than three and a half million people were annually affected by different types of oral diseases

worldwide.^[5] Among these, about two-thirds are affected by DC.^[6] In addition, the prevalence and severity of DC have been shown to be significantly associated with socioeconomic status (SES), as the latter could be fundamental for DC development.^[7] Individuals who come from families with high levels of education and SES tend to have more dental care compared to those with low levels of both SES and education, which in turn could be associated with lower DC occurrence and

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severity.^[8] Adolescents are prone to be attacked with a high incidence of DC. This prevalence among them could have negative impacts on their daily activities with others.^[9] Epidemiological studies conducted in different cities of Iraq are equivocal with some studies have found that the prevalence of DC is significantly associated with different SES,^[8,10] while others found no significant effects of SES on the prevalence and severity of DC among the studied groups.^[1,11,12] A study done on students from different high schools (mixed male and female) in Erbil city indicated that the prevalence was high among the studied population and negatively correlated with the levels of parents' education, monthly income, and number of individuals brushing per day.^[8] DC was also significantly highly prevalent among pupils of primary schools in Babylon City and positively associated with students' body mass index.^[10] On the other hand, the prevalence of DC observed among students of high schools (mixed male and female) in Karbala and Duhok cities was not significantly influenced by SES measured in these studies.^[1,11,12] To our knowledge, we are not aware of any study addressing the prevalence of DC and its severity concerning the associated sociobehavioral (SB) factors among female students of secondary school and dental college in Babylon Province, Iraq. Therefore, this study could provide us with observed data enabling us to plan for better oral health programs in both schools and universities and hence minimizing the occurrence of DC in this age group.

MATERIALS AND METHODS

Sites and participants of the study

This epidemiological study was a cross-sectional design conducted in Babylon Province, Iraq for a period from March to May 2023 at two random institutions, Al-Tali'a secondary school for girls and College of Dentistry/University of Babylon. These institutions are located in the urban area of the Hillah district. Hillah is a city in central Iraq located 100 kilometers to the south of Baghdad. It is the capital city of Babylon and the most populated urban center. A total of 300 female students with ages ranging from 16 to 18 years ($N = 100$ /each age) from Al-Tali'a secondary, and another 200 female dental students with ages ranging from 19 to 20 years who are in the first and second year of dental college ($N = 100$ /each age) were randomly selected. All participants recruited in the current study were first given a consent form, and only those who signed the consent form were enrolled in the study.

Data collection

Personal data from all participants were formally obtained through a structured questionnaire delivered by five trained dental students (the last stage of the college). The data included socioeconomic (age, mother's education, and index of household wealth) and behavioral (frequency of

cleaning teeth, consumption of sugar, and previous dental visits) factors. The structured questionnaire was built based on the updated recommendations issued by WHO with minor amendments.^[10]

Oral examination

DC in the participants was examined according to the WHO guidelines.^[13] The examination was achieved by five trained dental students (the last stage of the college) under the supervision of a dental specialist in conservative dentistry. Each of the two students worked in pairs, with one as an examiner and the other as a recorder. Participants were examined in a comfortable chair by using an examination kit including a disposable mouth mirror, masks, probes, and gloves after making sure that there was no food debris on the examined teeth. The severity of DC was classified based on the scores of decayed (D), missing (M), and filled permanent teeth (F), separately. The summation of D, M, and F scores then calculated the individual's DMFT. Any case of caries that was not surly diagnosed was withdrawn from the current study. All procedures used in the current study were performed according to the regulations issued by the Helsinki Declaration,^[14] and followed by approval from the ethical committee of the College of Dentistry, University of Babylon.

Statistical analysis

Data were processed and analyzed using the Statistical Package of the Minitab (Version 17; Minitab Inc., State College, USA). Frequencies and percentages of participants according to demographic characteristics and oral health behavior were presented using descriptive analysis. A chi-square test was applied to measure the significant association between the presence and absence of caries concerning other associated factors among participants. A chi-square test was also used to measure the significant association between degrees of caries severity (based on DMFT) and other associated factors among participants. P values were less or equal to 0.05 and considered significant.

RESULTS

Demographic characteristics and sociobehavioral factors

The total number of samples recruited in the current study was 500 female students. Three hundred female students, whose ages ranged from 16 to 18 years were selected from Al-Tali'a secondary school, and another 200 whose ages ranged from 19 to 20 years from the College of Dentistry/University of Babylon (first and second year). The age groups were ranked into five categories with 100 students for each group [See Table 1]. Based on the level of mother's education, participants were classified into three levels of SES (primary, secondary, and university). The highest percentage of participants belonged to the secondary

level of mother's education (41.2%), followed by the participants of the university level of mother's education (38.6%), and the lowest percentage was seen in the primary level of mother's education (20.2%). According to the levels of SES, participants were classified into three levels

Table 1: Frequency distributions of participants according to demographic characteristics and oral sociobehavioral factors (N = 500)

Variable	Category	N	%
Age	16	100	20
	17	100	20
	18	100	20
	19	100	20
	20	100	20
Mother's education	Primary	101	20.2
	Secondary	206	41.2
	University	193	38.6
Household wealth index	Poor	69	13.8
	Medium	389	77.8
	Rich	42	8.4
Frequency of cleaning teeth	Never	20	4
	One a day	206	41.2
	Twice or more a day	264	54.8
Frequent consumption of sugar	Seldom	233	46.6
	Frequent	267	53.4
Previous dental visit	Never	189	37.8
	Yes	311	62.2

of household wealth index (poor, medium, and rich). The highest percentage of participants came from the medium level of wealth index (77.8%) compared to the lowest percentage, which belonged to those who came from the rich level (8.4%). In comparison, the percentage of those who came from the poor level was (13.8%) [see Table 1].

Regarding the behavioral aspects, more than half of the participants (54.8%) brushed their teeth twice or more a day compared to 4% of participants who never brushed their teeth, but less than half of the total participants (41.2) brushed their teeth once a day. More than half (53.4%) of the participants consumed more frequent daily sugar intake compared to 46.6% of participants who had rare daily sugar intake. Most of the participants (62.2) in this study had been to dental clinics compared to the 37.8% who had never visited dental clinics [See Table 1].

Prevalence of dental caries and its relation with sociobehavioral factors

The total prevalence of DC in the current study was high (98.6%) with most of the cases belonging to the students who came from Al-Tali'a secondary school. However, the effects of age groups on the prevalence of DC did not reach a significant level [See Table 2]. Despite that, there were no significant associations between DC and socioeconomic factors (household wealth index and mother's education). DC was more dominant among students who came from a medium level of household wealth index, followed by the students who came from a poor level of wealth index.

Table 2: Prevalence of dental caries concerning other associated factors among participants (N = 500)

Variable	N (%)		X ²	P value
	With caries	Without caries		
Age groups				
16-18	295 (98.3)	5 (1.6)	0.021	0.884
19-20	198 (99)	2 (1)		
Household wealth index				
Poor	67 (100)	0 (0)	2.868	0.82
Medium	384 (98.7)	5 (1.3)		
Rich	40 (95.2)	2 (4.8)		
Mother's education				
Primary	99 (98.02)	2 (1.98)	0.554	0.758
Secondary	204 (99.03)	2 (0.97)		
University	190 (98.45)	3 (1.55)		
Frequency of cleaning teeth				
Never	20 (100)	0 (0)	0.001	0.997
Once a day	203 (98.54)	3 (1.46)		
Twice or more a day	270 (98.54)	4 (1.46)		
Frequency consumption of sugar				
Seldom	228 (97.85)	5 (2.15)	1.759	0.185
Frequent	265 (99.25)	2 (0.75)		
Previous dental visit				
Yes	309 (99.36)	2 (0.64)	3.415	0.06
No	184 (97.35)	5 (2.65)		

In the same direction, students with a medium level of mother's education had more DC compared to the other categories [See Table 2].

In terms of behavioral factors, the prevalence of DC was not significantly associated with all behavioral factors measured in the current study ($P > 0.05$). However, DC was more common among students who brushed their teeth twice or more a day compared to those who never brushed their teeth a day. More than half of the students who consumed more frequent daily sugar intake had DC. Most of the DC was observed among students who had previously visited dental clinics [see Table 2].

Prevalence of caries severity and its relation with sociobehavioral factors

According to the scores of the DMFT index, the severity of DC was presented here and the participants were ranked into two categories. The first rank covered the students whose DMFT scores were from 1 to 3, and the second rank included those whose DMFT scores from 5 and above. The severity of DC was not significantly influenced by age groups ($P > 0.05$). Regarding the socioeconomic factors, students who came from high-income families had significantly less severity of DC compared to other groups. However, the mother's education for the participants in this study was not significantly associated with the degree of DC severity [see Table 3]. All behavioral factors measured in the study had significant impacts on the severity of DC. Students who consumed more sugar

had significantly more severity of DC compared to those who had less daily sugar intake. The same picture was also found in terms of those who had previously visited dental clinics, who significantly experienced more DC severity compared to those who had never visited dental clinics. The results also indicated that the severity of DC was negatively associated with the frequency of teeth brushing [see Table 3].

DISCUSSION

The current epidemiological study is considered the first for addressing the prevalence of DC and its severity in relation to the associated risk factors among female students from secondary schools and Babylon Dental College (first and second years) in Babylon Province, Iraq. Adolescence and youth are crucial for oral health, as in these periods, individuals become responsible for choosing their diet habits, highlighting their importance for being a good candidate in studying promotional programs for oral health.^[15]

The current study indicated that the prevalence of DC was higher (98.6%) than the studied sample ($N = 400$). Even though this prevalence is the highest compared to the previous studies performed in Iraq, many other studies reported higher percentages. A recent epidemiological study done in Karbala City, Iraq found that the prevalence was 95.6% among students of secondary schools ($N = 500$).^[12] Similar results were also found among students of secondary schools in Maysan, Duhok, and

Table 3: Prevalence of caries severity (DMFT) concerning other associated factors among participants ($N = 500$)

Variable	N (%)		χ^2	P value
	DMFT =1-3	DMFT ≥ 4		
Age groups				
16-18	46 (15.59)	249 (84.41)	0.029	0.865
19-20	32 (16.16)	166 (83.84)		
Household wealth index				
Poor	6 (8.94)	61 (91.04)	13.521	0.001
Medium	58 (15.1)	326 (84.9)		
Rich	14 (35)	26 (65)		
Mother's education				
Primary	12 (12.12)	87 (87.88)	5.2	0.074
Secondary	27 (13.24)	177 (86.76)		
University	39 (20.53)	151 (79.47)		
Frequency of cleaning teeth				
Never	0 (0)	20 (100)	9.754	0.002
Once a day	21 (10.34)	182 (89.66)		
Twice or more a day	57 (21.11)	213 (78.89)		
Frequency consumption of sugar				
Seldom	63 (27.64)	165 (72.38)	44.421	<0.0001
Frequent	15 (5.66)	250 (94.34)		
Previous dental visit				
Yes	25 (8.09)	284 (91.91)	37.153	<0.0001
No	53 (28.8)	131 (71.2)		

Zakho cities, Iraq (92.53%; $N = 750$), (90.2%; $N = 809$), and (92.5%; $N = 400$), respectively.^[1,16,17] Inconsistent with our results, the prevalence of DC was lower compared to our findings which were about 72.31% ($N = 650$) among students from secondary schools in Erbil city, Iraq^[8] and 82.8% ($N = 750$) among female students of secondary schools in Kirkuk City, Iraq.^[18] The prevalence of DC found here was also far higher compared to the findings of similar age groups in most African and Eastern countries (India, 61.4%; Nigeria, 9.7%; Saudi Arabia, 78.9%; Uganda, 66%).^[19-22]

According to the paucity of epidemiological studies conducted on females in Iraq, female students were selected in our study in order to provide us with an observational database regarding the prevalence of DC in relation to the SB factors among them. The potential reason for the high prevalence of DC observed among female students in the current study could be traced back to the idea that the teeth of females are earlier erupted than males and hence it has longer exposure to the environmental factors. In addition, females could have more access to food due to their roles in the preparation of daily meals.^[17] Moreover, high levels of caries among females may also be attributed to the hormonal fluctuations that occur in their puberty.^[21] Although the exact reason for underpinning the differences in the prevalence of DC between our study and others is not clear, several factors could be associated with these disparities. Changes in the levels of fluoride supplied among different cities across the country or even internationally could be one factor associated with this disparity. It was found that the levels of supplied fluoride used in Iraq are between 0.12 and 0.22 ppm which is considerably below the required level (1.2 ppm).^[17] Variations in the time spent conducting these studies may also be correlated with this disparity as it has been shown that carbohydrate consumption has been increasing in recent years across developing countries.^[23] Moreover, dissimilarity in the measures of oral hygiene being used, patterns of diet regimes, size of the studied sample, and quality and numbers of the specialized dental centers between Iraq cities or different countries could also have collectively participated in such observed differences.^[1]

With regard to the relationship between associated risk factors and the prevalence and severity of DC, the current study indicated that there were no significant associations between the factors and DC prevalence. These results were comparable with the previous findings in Iraq and in other countries.^[1,11,13,17,18,22,24-26] In contrast to the findings observed here, it was shown in other studies that the prevalence of DC was significantly associated with the risk factors.^[12,16] Nevertheless, the severity of DC measured by DMFT in the current study was significantly associated with household wealth index, frequency of cleaning teeth, frequency of consumption of sugar, and previous dental visits. Individuals who came

from low-income families had more severe DC compared to those raised in high-income families, suggesting the importance of having adequate care for dental health. Even though the prevalence of DC in our findings was not significantly influenced by the number of brushing teeth, its severity was significantly minimized by more frequent brushing times. In agreement with this finding, many studies have reported similar outcomes,^[22,27] indicating that frequent use of brushing (twice or more a day) could be one of the effective approaches for reducing the severity of DC.^[20,22,27] On the other hand, individuals with more frequent sugar intake experienced more severity of DC. These findings were supported by previous studies.^[17,28,29] Previous research indicated that the high daily consumption of natural or added sugar is strongly associated with the progression of caries,^[28-31] highlighting the importance of having a prevention program for reducing sugar intake in both secondary and university levels of education. The severity of DC measured by DMFT was also significantly greater among those who had previous dental visits. In line with our findings, many previous studies had generated the same outcomes,^[17,20,22] indicating that the female students in our study had less care toward preventive dentistry.

The current study has some limitations in that the outcomes of this study may not be enough to be generalized to all female adolescents and young adults in Babylon City as the school and dental college selected were in urban places, and it could not be the case for the schools in a rural place. In addition, the design of the current study was cross-sectional, which is not adequate for establishing the causality among the studied variables. Moreover, the study did not include male participants, which could have provided us with a more comprehensive picture of the role of the association between gender and the occurrence and severity of DC.

CONCLUSIONS

The female students in both secondary schools and dental colleges in Babylon Province, Iraq had a higher prevalence of DC. Its severity was negatively associated with the household wealth index and frequency of cleaning teeth. In addition, high consumption of sugar was positively associated with greater severity of DC.

In fact, these outcomes could reflect poor dental knowledge among female adolescents and young adults in Babylon City and it also highlights the desperate need for creating preventive programs for reducing the occurrence of DC among the students.

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Conflicts of interest

There are no conflicts of interest.

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