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The prevalence of dental caries among students of dentistry colleges in holy karbala governorate in Iraq in 2017

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Objectives This study was done to determine the prevalence of dental caries and treatment conducted among undergraduate students (18–24 years) in Holy KarbalaGovernorate in Iraq. Additionally, the selected sample was from two Dentistry Colleges (public and private) students who will be responsible for managing public oral health services in the country.
Methods A total number of 288 Dentistry Colleges (Holy KerbalaPublic Dentistry College and Ibin Hayan Private Dentistry College) students were asked through self-administered questionnaire about dental caries, filling and extracted tooth. Dental caries index was calculated by application of decayed missing filled surfaces/teeth (DMFT)/DMFS index, following the criteria of the World Health Organization. Analysis depended on Statistical Package for the Social Sciences-23 and Amos statistical packages at a significance level of 0.05.
Results The mean age of the students was 21.42 ± 136 years. Females formed about two-thirds of the sample (61.1%). The prevalence of dental caries was 72.9% with a mean DMFT, DMFS values 3.30 ± SE 0.091, 4.94 ± SE 0.161, respectively. The prevalence of dental caries reported by CDC in the USA in 2011/2012 among adolescents aged 16–19 (67%). The mean caries, filling and extracted tooth values were 0.597 ± 0.96 for extracted tooth, 1.180 ± 1.4043 for carried tooth and 1.735 ± 1.9942 filled tooth, while the mean DMF was 3.15 ± 2.85. The proportion of students with caries, filling and extracted tooth were 46.5%, 54.07% and 31.6%, respectively. No statistically significant difference was found for DMF and for each component prevalence rate between the public and private Dentistry College students, or among different genders.
Conclusion A relatively high caries – experience was present among undergraduate students in the Dentistry Colleges (public and private) in Holy KarbalaGovernorate indicating the need for efficient preventive programs early in school age and through university students.
Keywords dental caries, undergraduate students, dentistry colleges, DMFT, iraq

Introduction

Oral health is an integral component of general health and carries a great impact on the quality-of-life.[1,2] Dental caries is the most common preventable oral diseases affecting all age groups all over the world.[3] It was discovered at a prevalence rate of 2–48% in an archaeological populations.[4] The global burden of dental caries I of 187 countries between 1990 and 2010 was estimated in a systematic review which concluded the incidence and prevalence of dental caries remained static during this period. In addition, the most prevalent condition worldwide was untreated caries in permanent teeth affecting 2.4 billion people, while untreated caries in deciduous teeth was the tenth-most prevalent condition, affecting 621 million children, worldwide.[1] However, dental decay is preventable and there has been a steady decline in its prevalence since decades in the developed countries.[5] Experts believe, that this decline was primarily due to the introduction of fluoride therapies after the 1960s that had a huge impact on dental decay rates.[6–9] On the other hand, the prevalence in the developing countries is on rise, because of absence or poor quality of oral public health services. A major part of population in these countries has bad and neglected oral health caused by many different risk factors related to socio-economic and educational levels and difficult or no access to professional dental care.[10] While a small part of population, with higher socio-economic state and good home care and better access for professional services since childhood, shows low caries index.[11]

The main problem in dental caries is that its initial stages are asymptomatic; with symptoms appearing after the carious lesion has progressed into dentine.[12] For this reason, the reported prevalence rates of tooth decay might represent only the tip of the iceberg and the actual size of the problem might be profoundly greater that shown rates.

The decayed missing filled surfaces/teeth (DMFT) index is well established and most commonly used measure of caries experience in dental epidemiology.[13] It was developed by Klein et al.[14] The World Health Organization recommended its use for oral health surveys,[15] and had introduced some modification on the index calculation to improve its sensitivity and practical use in epidemiological studies.Larmas[16] counted more than 7000DMFT index publications in PubMed, which indicated that it is the most commonly used oral health index. The advantages of DMFT index are too many and include: being simple and clear in addition to its high validity and reliability and acceptable sensitivity and specificity.[17] However, DMFT index fails to provide information on the extent and clinical consequences of untreated dental caries, such as pulpal involvement and dental abscess, which may be more serious than the caries lesions themselves.[13] It also describes both past and present caries experience, which is not the same as caries prevalence. The index carries some limitations such as: being not indicating the number of teeth that are at risk; it might be invalid in older patients because some teeth are lost for the reasons other than caries; it might be misleading in children because teeth may be lost for orthodontic reason and finally being not significant in the root caries.[17]

The targeted population in this study was a sample of individuals with good dental status socio-economical level and access to dental care. The results of this study and similar studieswill provide a data base for oral health among a group with lower caries incidence. Gathered information might

reflect the oral health condition of the whole population and what could be achieved by systemic care and prevention of dental caries in whole population.[10]

The annual report of the Iraqi Ministry of Health in 2017 reported dental caries among the top 10causes of outpatient visits in Iraq, with a percentage of 2.1% of total visitors.[18] Most published studies about the prevalence of dental caries in Iraq were targeting school age children,[19–21] and this is similar to other developing countries,[22] and only few researches involved adult population,[19,23–27] and only few studies investigated dental students.[28–31] A study among 12-year-oldschool children in Baghdad/Iraq in 2009 reported a DMFT value of 1.5. The researcher compared his findings to previous reported data reporting DMFT among school children in Baghdad at 1.23 in 1985 and then was greatly decreased to 1.1 in 1990 and to 0.6 in 1998 and 0.63 in 2003. These years were during the period of economic blockade or sanction imposed on Iraq between 1990 and 2003 where sugar consumption was very low.[21]

Materials and Methods

A cross-sectional descriptive study using self-administered questionnaire about oral health and knowledge and practice about interdental cleaning measures (ICM) was used among a total number of 288 students in two Dentistry Colleges in Holy Karbala in Iraq in April 2017. The University of Kerbala was established since 16 years and include 16 colleges,[32] while Ibin Hayan College was established since 2010. Ethical approval and permission to conduct the survey was obtained before starting the study and the students were informed about the voluntary choice of participation in the study.

The questionnaire consisted of 21 questions designed to evaluate the oral health, knowledge and practice about ICM among the BDS students. The questionnaire was piloted before conducting the definitive study among 10students and minor changes were introduced. The students were invited from Kerbala Dentistry College (KDC) and Dental Section in Ibin Hayan Private Dentistry College (IHC) in Holy Karbala in Iraq, to participate in this survey using a self-administered structured questionnaire. The voluntary participation and anonymous-confidential nature of the questionnaire was made clear to the students. Introductory talk to all the students and explanation regarding the nature and purpose of the study was given by the researcher.

The questionnaire was written in Arabic and organized into four parts: The first part elicited information on the demographic attributes of students including age, gender, college, and study year. The second part assessed students' oral health by asking about possessing carried tooth, extracted tooth or filled tooth due to dental decay and also asked about the number of these teeth. The third and fourth parts assessed the participant's oral health knowledge about ICM and one closed and one open question, while the last part explored the use of these measures. The second part was used to elicit their DMFT index oral while the next two parts were used to determine students' knowledge and practice scores through summation of positive answers. The students were asked to respond to each item according to the response provided in the questionnaire. Responses included multiple-choice (closed end) questions, in which the students were instructed to choose only one appropriate response from a provided list of options. Whilst, open end questions allowed participants to enumerate their answers without any list of correct answer, to eliminate false positive answers.

About 288 completely filled questionnaires from dental students were collected and analyzed. The obtained data were analyzed using the Statistical Package for the Social Sciences (SPSS) software for windows version 23.0 (IBM SPSS, SPSS Inc., Chicago, IL, USA). Excel data base was used to calculate DMFT and caries prevalence rates and these dependent variables were assessed in terms of different independent variables in the study. The process of analysis used Chi-square test of indifference; *t*-test;correlation and regression analysis for demographic, oral health indices, and knowledge and practices scores among dental students. A *P*-value of <0.05 was used as a cut-off level for statistical significance. Correlation between knowledge and practice were examined by Karl Pearson's correlation coefficient method. In addition simultaneous predictors effects was explored through Structural Equation Model analysis using the mean percentage scores.

Results

The students in the public college (KDC) formed three quarters (213 students, 74%) of the sample and the remaining were from the private college (IHC, 75 students, 26%). Females formed about two-thirds of the sample (176 students, 61.1%). The main bulk (44%) of the students was from the third study year (Table 1).

Females formed a significantly higher proportion in KDC compared with IHC (Fig. 1).

Table 1. **The demographic characteristics of the undergraduate Dentistry College students in Holy Karbala Governorate in Iraq in 2017 (*n* = 288)**

Variable	Category	Frequency	Percentage (%)
College	Holy Kerbala Dentistry College	213	73.96
	Ibin Hayan Dentistry College	75	26.04
Study year	Second	14	4.86
	Third	127	44.10
	Fourth	81	28.13
	Fifth	66	22.92
Gender	Male	112	38.89
	Female	176	61.11
Total		288	100.00

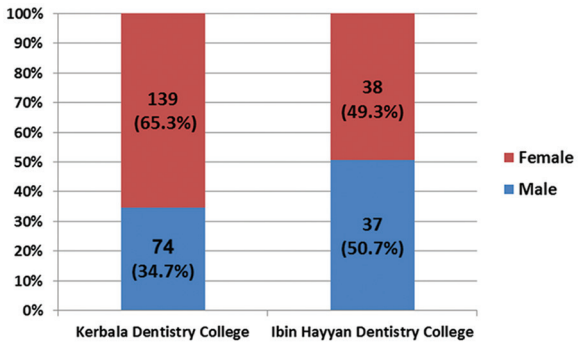

Fig. 1 **The gender distribution of undergraduate Dentistry College students in Holy Karbala in Iraq in 2017 (*n* = 288).**

The mean age of the students was 21.42 ± 1.36 years and males had a significantly (P = 0.008) higher mean age than females (21.68 ± 1.48 years and 21.26 ± 1.25 years, respectively). Similarly, the mean age of students in the private college (IHC) was significantly higher than the mean age of students at the public college (22.24 ± 1.39 years, 21.14 ± 1.22 years, respectively, P < 0.001).The proportion of students with caries, filling and extracted tooth among the total sample were 48.0%, 54.1% and 31.7%, respectively (Table 2). The prevalence of dental caries among the total sample was 69.9%, while the proportion of the students free from lifetime caries was 30.1%. Gender differences in these proportions were not significant.

No significant gender difference was discovered in the prevalence of tooth caries, filling or extraction (Table 3).

Comparison of the prevalence of tooth caries, filling or extraction between the two colleges showed no significant differences between the students in the two colleges (Table 4).

The mean numbers of teeth with caries, filling and extracted tooth among the total sample were 1.19 ± 1.41, 1.74 ± 1.99 and 0.4860 ± 0.96 teeth, respectively. Comparison of the detailed numbers of these pathological findings among males and females showed no significant differences (Table 2). On the other hand, comparison of these indices between the two colleges showed highly significant differences (Table 5).

Table 2. **The prevalence of tooth caries, filling or extraction among undergraduate students in Holy Karbala Governorate in Iraq in 2017 (n = 288)**

Variable	Frequency	Percentage (%)
Have carried tooth	135	48.0
Have filled tooth	146	54.1
Have extracted tooth	91	31.7

Table 3. **The gender distribution of the prevalence of tooth extraction, caries and filling of undergraduate Dentistry College students in Holy Karbala in Iraq in 2017 (n = 288 frequency and percentage -in brackets-)**

Gender	Have extracted tooth	Have carried tooth	Have filled tooth	
Male	34 (30.4)	55 (51.4)	59 (54.6)	285
Female	57 (32.6)	80 (46.0)	86 (53.8)	86
Total	91 (31.7)	135 (48.0)	145 (54.1)	371
Significance	0.694	0.377	0.887	

Table 4. **The prevalence of tooth extraction, caries and filling of undergraduate Dentistry College students in Holy Karbala in Iraq in 2017 (n = 28, frequency and percentage -in brackets-)**

College	Have extracted tooth	Have carried tooth	Have filled tooth	Total
Holy Kerbala Dentistry College	68 (31.9)	105 (51.0)	112 (57.1)	285
Ibin Hayan Dentistry College	23 (31.5)	30 (40.5)	33 (45.8)	86
Total	91 (31.7)	135 (48.0)	145 (54.1)	371
Significance	0.974	0.142	0.199	

Index	College	Mean	Std. deviation	Significance
Number of extracted teeth	Holy Kerbala Dentistry College	0.46	0.84	<0.001
	Ibin Hayan Dentistry College	1.86	1.17	
Number of tooth with caries	Holy Kerbala Dentistry College	1.03	1.28	<0.001
	Ibin Hayan Dentistry College	2.21	1.77	
Number of tooth with filling	Holy Kerbala Dentistry College	1.52	1.97	<0.001
	Ibin Hayan Dentistry College	2.91	1.74	

The mean DMFT value for the total sample was 2.65 ± 2.70 and there was a highly significant difference between KDC and IHC (2.74 vs. 2.27, P < 0.001). However, no statistically significant gender difference was discovered (2.71 vs. 2.93 for males and females, respectively, P = 0.587). While a significant difference was discovered between the study years through ANOVA test (P = 0.004). The mean DMFT value for the second, third, fourth and fifth study years were 0.50, 1.48, 2.36 and 2.40, respectively.

Further analysis tried to assess the situation of the mostly affected proportion of the students using the Significant Caries (SiC) index which is concerned with the worst third of the total population. The mean SiC was 4.69 ± 2.41 tooth and there was no significant difference between KDC and IHC (4.4056 vs. 6.00, P = 0.072). Additionally, no significant gender difference was found (4.56 vs. 4.84, P = 0.413); nor there was any significant difference between the study years (P = 0.104).

This study included a section exploring student knowledge and use of interdental cleaning measures (IDM) which showed significant differences across the genders, colleges and study years. The mean knowledge score for KDC students was significantly higher than IHC students (0.47 ± 0.89 point vs. 0.91 ± 1.12 point, P = 0.003). The gender difference was also significant toward female students vs. male students (0.92 ± 1.11 point vs. 0.60 ± 1.00 point, P = 0.013). However, the correlation between the knowledge score and DMFT was very weak and not significant (r = 0.046, P = 0.437).

On the other hand, other indicators were included to determine the use of IDM where the mean use score was 0.41 ± 0.65. On comparing the use score between the colleges and genders, no significant differences were discovered. The mean use score for KDC students was significantly higher than IHC students (0.42 ± 0.63 point vs. 0.36 ± 0.71 point, P = 0.513), while mean male use score was 0.35 ± 0.60 point vs. 0.45 ± 0.68 for females, P = 0.217. Similarly very weak correlation was found between the use score and DMFT and was not significant (r = 0.065, P = 0.271).

A further step was undertaken in the analysis to determine the instantaneous impact of knowledge and use of IDM on DMFT through the use of Structural Equation Model (SEM) by Amos software. The model showed that the highest impact as shown by the highest regression coefficient, was for the use of IDM (0.94), while knowledge imposed a minor effect of less than one half of use effect (0.41). The impact of gender and age were almost similar top knowledge, while the colleges impact was very small (Fig. 2).

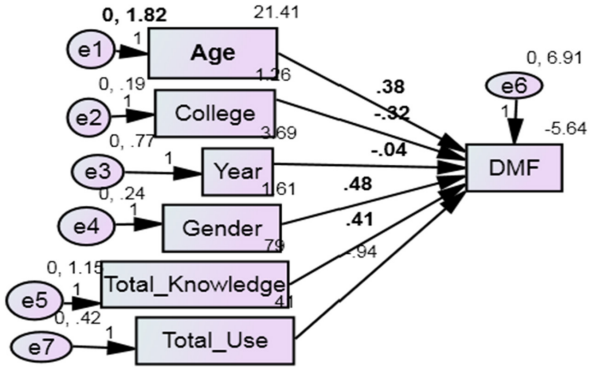

Fig. 2 **The results of Structural Equation Model of the impact of gender, age, study year knowledge and use of interdental cleaning measures and college on DMFT index among undergraduate Dentistry College students in Holy Karbala in Iraq in 2017. DMFT, decayed missing filled surfaces/teeth.**

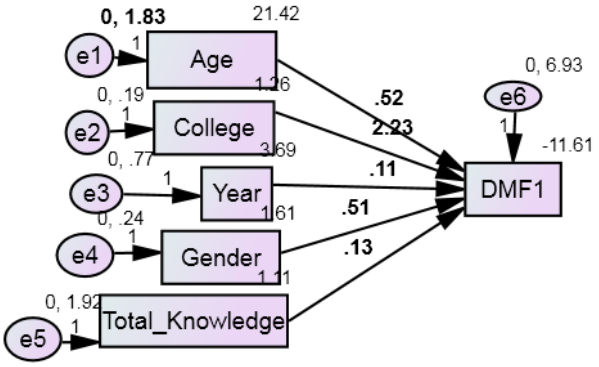

Fig. 3 **The results of Structural Equation Model of the impact of gender, age, study year knowledge about interdental cleaning measures and college on DMFT index among undergraduate Dentistry College students in Holy Karbala in Iraq in 2017.DMFT, decayed missing filled surfaces/teeth.**

However, when the use score was removed, the SEM model showed a greater impact (2.23) inthe difference between college students in the sample (Fig. 3).

Discussion

The problem of tooth decay is not a local oral health problem but is a systemic disease with impact on physical built self-esteem and mental health.[2] It carries a heavy burden on human being health and a great economic and sociocultural impact.

Dental health professionals have an important role in the improvement of the public's health education level. For this reason, the acquisition of knowledge and attitudes relating to dental health and the prevention, control, and treatment of dental problems during the future dentists' training period is very important.[3] At present, it is assumed that the decrease in the prevalence of dental caries in many population groups is also related to a reduction in the activity and the speed of progression of the carious lesions.[4] This has led to a change in the dentists' approach to dental care, which is more oriented toward prevention rather than restoration to avoid or postpone invasive treatment.

This study has indicated a serious finding regarding the high lifetime prevalence of caries (69%) among dental students in Holy Karbala Governorate. The important issue is that these students represent a group characterized by good dental status and knowledge of etiology and prevention of dental caries. However, knowledge alone is not enough unless it is adopted as a behavior. The process of adopting any change in dental care attitudes about personal dental care must be learned and practiced throughout study years in the dentists' learning process, especially during their undergraduate training in the dental college.[6] For this reason, a study of how dental students adopt this knowledge and convert it to their own oral health care during their study could, in fact, be of a great importance since the students are the ones who will apply these same behavior patterns to their patients in their practices in the future.

On the other hand, the findings in this study might indicate that the problem is much worse among students in other colleges and this might need to explore in further studies in the future.

Another noteworthy finding was the difference between the private and public college, in the benefit of the later. The students in the private colleges in Iraq are usually from families of higher socioeconomic level as they could offer payment of around 10000 US$/year to these colleges. From these results, one can conclude that the worthy people might be worse than lower social class population in protecting their children's oral health.

Similar four previous studies among dental students were published previously. In the first and most recent, the oral health indices were compared between fifth and first study year students in the dental college in Mustansiria University. The sample included 50 students in the first and 60 students in the sixth study year (55 males and 55 females). The DMFT means were significantly higher among females than males (6.48 for males and 7.08 for females) in first year. While in the fifth year students the means were 8.73 for males and 9.16 for females. The prevalence of tooth brushing, mouthwash, dental floss, and tooth picks using for the fifth year students were higher than first year students.[30] Whilst a previous similar study in the same college examined 30 students from each of the five study year students (75 males and 75 males) and reported almost similar findings. Dental caries prevalence was 100% (none of the examined students were caries free). However, DMFS value was decreasing with advancing study year and was attributed by the researcher for better knowledge and awareness about dental health among senior students in comparison with freshmen. There was no significant difference between all the study years, and increased in filling score values with a significant difference between females in all study years.[33] The gender difference found in this study was not significant and is consistent with most reviewed findings; however, the above two mentioned results reported two contradictory findings.

The third study year showed reversed gender prevalence among 250 dental students (150 females and 100 males) in the College of Dentistry in Baghdad University in 2011. The students answered a self-administered questionnaire; where 75 students (30%) reported having dental caries and 70 students (25%) reported having tooth filling. The study found that females had better oral hygiene practices, significantly less

self-reported oral bad breath (40%vs.70%). It was found that smoking and presence of dental caries had statistically highly significant correlation with halitosis.[31] The fourth study year surveyed 450 students from nine colleges in Mosul University (50 students from each college) in 2004. The study concluded that the students have acceptable dental health knowledge. However, more than half of the students (54.6%) had gingival bleeding but they did not know the cause of bleeding (75.1%) and how to avoid it (75.5%). A large percent of them had no ideas about the causes of dental caries (75.5%), and how to avoid it (76%). Their knowledge was poor regarding the age at which the primary and permanent teeth erupted (23.8%, 22.8%) and completed (18.6%, 27.3%).[34]

Few other studies reported adult dental caries indices from outpatient clinics in Iraq. A study at Mustansiriyah University outpatient clinic showed that dental caries was the main cause behind teeth loss among 584 adult patients visiting the outpatient clinic in the dental college in Al-Mustansiriyah University in Baghdad in 2013. Teeth loss was more prevalent among males, however, no significant gender difference was found but significant association with age was discovered.[27] A survey among 300 dental outpatient clinic visitors in Najaf city (central part of Iraq) showed that two thirds of them have acceptable dental health knowledge, and a great majority (91%) have good dental behavior as teeth brushing of at least once a week.[26] A study in Tikrit city found that the mean DMFT scores were 7.5 (8.3 for female and 6.7 for male). Mean DMFT for both sex increases with age. The percentage of decayed teeth DMFT percentage was the highest among younger age group (60.7% for female and 63.1% for male). There was statistically a highly significant difference between age, sex, dental visit type and brushing behavior and DMFT.[19]

For similar studies in other parts of the world, a meta-analysis study in Saudi Arabia estimated DMFT in Saudi Arabia at 3.34 and the prevalence of dental caries was reported to be rising with age (91% for age group 12–19 years; and DMFT of 7.35 while, it was 98% for age group 30–45 years; and DMFT of 14.5).[35] While, a study among 320 medical and dental students in Serbia in 2007 reported a mean DMFT value of 12.8 ± 4.7 with only one student with a value of zero.[36] A second study in northern Brazil city said to be not served by restorative dental services, among 889 students aged 15–19 years showed that the DMFT index was 4.65 ± 0.12, and the prevalence of dental caries was 87.4%.[22]

Conclusion

This study revealed high dental caries prevalence among dental students in Karbala Governorate with no gender difference. However, the private college students showed higher prevalence rates and indices. As these students represent important dental health care providers in the near future; at most attention need to be given to improve future dentist knowledge and practice in Iraq.

Conflict of Interest

None.

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