Article

# The Impact of the Socioeconomic Status(SES) on the Oral Health Status Among 15 Year-Old School Adolescents In Kerbala City/Iraq

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**Abstract:** Dental caries, plaque, calculus and gingivitis are the most common and widely spread oral health conditions affecting humans at different ages. Socioeconomic status was reported to be one of the factors affecting the severity of oral diseases. The aim of the study included studying the impact of socioeconomic status on oral health variables and investigating the prevalence and severity of dental caries, gingivitis, dental plaque, and dental calculus and an excellent data baseline for planning future preventive programs. The total sample was composed of 500 male students at 15 years old selected randomly from the secondary schools in Karbala city. Assessment of the socioeconomic status using a questionnaire; information about the student's socioeconomic status (SES) was obtained from the student's guardians. Diagnosis and recording of dental caries were according to the criteria described by WHO (2013). gingival index of Loe and Silness (1963) was followed for recording gingival health condition, the Plaque index of Silness and Loe (1964) was used for plaque assessment, and the assessment of calculus was done by applying the Ramfjord index (1959). A high prevalence of dental caries (95.60%) was found, and the caries-free students represented (4.40%); the caries prevalence and severity represented by (DMFT)(DMFS) respectively and the (FS) component of the DMF were significantly affected by the socioeconomic status (SES), Dental plaque and calculus are more in low SES group than other groups, with no significant differences, The mean of gingivitis of the total sample was(1.908), also finding gingivitis is more in low SES group than other groups with a Significant difference(0.011), and regarding the Gingival severity, all subjects have the moderate type of gingivitis (1.1-2). There is a clear and significant increase in the prevalence of dental caries and gingivitis concerning the socioeconomic status of this adolescent group of students. This requires good dental school health programs and improvement in the education level about the importance of oral health and more regular dental visits.

**Keywords**: Dental caries, oral health, gingivitis, socioeconomic

## Introduction

In recent decades, social determinants, as well as medical interventions, have had a significant impact on health. Hunger, malnutrition, poor sanitation, unsatisfactory housing, joblessness, poor working conditions, and cultural and behavioral factors all play a role in poor health[1]. Various studies examined family income, parent's occupations, mom and dad's education, family economic class, poverty status, and household income as SES indices[2].

Oral health, including the caries status, oral hygiene variables and the gingival condition, have been tested in many studies in relation to many factors. Previous epidemiological studies have found a high prevalence and severity of dental decay in various geographic locations and age groups. The high prevalence of dental caries and gingival disease in adolescents highlights the importance of studying the oral health variables in this age group and providing data needed for preparing public preventive health programs [3,4].

There is a clear proportionality difference in educational attainment and oral health regarding life quality. Quality education allows for acquiring and comprehending information about oral health behavior and promotion. [5].

Like other chronic diseases, dental caries have a well-known multifactor dimension, as evidenced by studies identifying demographic, socioeconomic, behavioral, and biological risk factors[6].

SES factors play a significant role in investigating the distribution of dental caries[7]. Many studies have investigated the relationship between socioeconomic status and tooth decay in adolescents, with promising results; however, they depend on one or more components of socioeconomic status [8]. However, another study found no significant differences in dental caries about the SES [9].

Some of the previous studies have found a negative correlation between the oral health variables(caries, plaque and gingivitis)with parent education[10]. Also, there were no significant differences as concerned the factors and the size of the family, but they did have a positive weak correlation [11].

This study was conducted on a group of 15-year-old secondary school students in Karbala, Iraq, to determine the impact of socioeconomic status on oral health.

**Materials and Methods**

This survey study was conducted among secondary school adolescent males (15 years old) living in Karbala City, Iraq. Including 500 students volunteering as the subjects in this study, selected randomly from their schools. First, informed consent was distributed to get permission in order to have their full cooperation. Then, a questionnaire was distributed to get information about their socioeconomic status (SES) according to [9] with modification 9. Including questions about:

1. Mother and father occupation.
2. Mother and father education level.
3. They are crowding index (person number/room number.
4. Level of income.
5. Type of housing.
6. Accommodation.

The socioeconomic status (SES) score was divided into three groups, each representing low, average, medium, or high socioeconomic status. The following was the cut-off value for the composite index used for this study(10-25):

a) Low socioeconomic status (10-15).
b) average socioeconomic status (16-24).
c) high socioeconomic status (25+).

Examinations were conducted in the school and were carried out in the classrooms under standardized conditions, following the basic methods of the oral health survey recommended by [12]. Oral hygiene was recorded at first by application of plaque index [13]. Dental calculus extent was assessed according to the criteria of the calculus component of periodontal disease index (PDI) by [14].

The gingival condition was recorded using gingival index [15]. Diagnosis and registration of dental caries were conducted following the criteria of [12]. Data description, analysis and presentation were performed using Statistical Package for Social Science (SPSS version -22, Chicago, Illinois, USA).

## Results

The sample consisted of 500 students divided into three Socioeconomic (SES) status levels: Low, Medium and High. The highest percentage of subjects was found in the medium SES level(43.6%), followed by the high SES (21.8%)and the lowest percentage in the low SES level(34.6%), as seen in Figure 1.
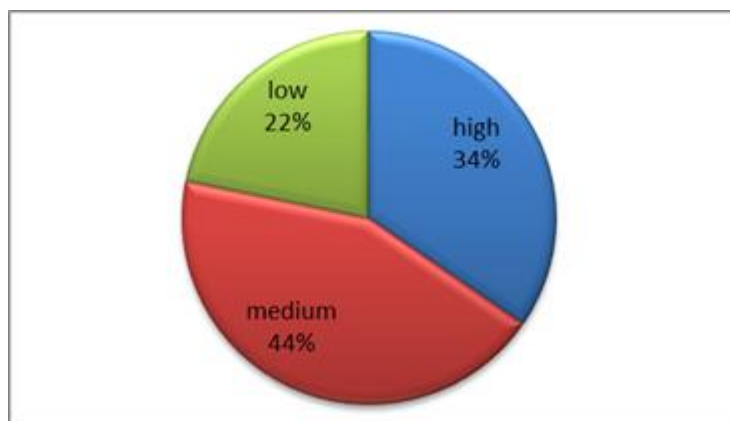


**Figure 1. Socioeconomic status distribution in the sample.**

*Dental caries and Socioeconomic status (SES)*

The decay was more in the medium SES group (8.055)than in other groups, although it is not significant; the missing was also more in the low SES group(0.734) than in other groups and also not significant; the filling was more in the high SES group (1.098)than other groups, and there was a significant difference (0.001). The DMFS and DMFT were more in the high SES group(9.723) and (6.902), respectively, than in other groups, and there was a significant difference (0.027) and ( 0.004) respectively; additionally, decayed tooth (DS) fraction was found to be the most significant fraction of DMFT value compared to other components for the total sample as shown in table 1.

| Var-iables. | Low | | Medium | | High | | F | P value | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | ±SE | Mean | ±SE | Mean | ±SE | | | Mean | ±SE |
| **DS** | 6.771 | 0.512 | 8.055 | 0.367 | 8.017 | 0.412 | 2.351 | 0.096^ | 7.762 | 0.242 |
| **MS** | 0.734 | 0.184 | 0.607 | 0.158 | 0.505 | 0.165 | 0.427 | 0.652^ | 0.640 | 0.098 |
| **FS** | 0.358 | 0.120 | 0.495 | 0.089 | 1.098 | 0.185 | 7.810 | **0.001\*** | 0.674 | 0.080 |
| **DMFS** | 7.633 | 0.599 | 9.284 | 0.429 | 9.723 | 0.520 | 3.655 | **0.027\*** | 9.076 | 0.292 |
| **DMFT** | 5.495 | 0.347 | 6.445 | 0.221 | 6.902 | 0.277 | 5.504 | **0.004\*** | 6.396 | 0.157 |

Df=2, ^=not significant at p>0.05, *=Significant at p<0.05.

**Table 1: Descriptive and statistical of caries experience among SES.**

Table 2 shows the concern with the fillings. The difference was significant between the low and high SES (0.003) and medium and high SES (0.010). Regarding the DMFS and DMFT, the difference between the low and high SES was Significant(0.026). At the same time, the other differences were not significant.

| Dependent Variable | | SES | | Mean Difference (I-J) | P value |
|---|---|---|---|---|---|
| FS | Games-Howell | Low | Medium | -0.138 | 0.627 |
| | | | High | -0.740 | **0.003** |
| | | Medium | High | -0.603 | **0.010** |
| DMFS | Hochberg | Low | Medium | -1.651 | 0.089 |
| | | | High | -2.090 | **0.026** |
| | | Medium | High | -0.438 | 0.881 |
| DMFT | Hochberg | Low | Medium | -0.950 | 0.060 |
| | | | High | -1.406 | **0.003** |
| | | Medium | High | -0.457 | 0.483 |

Df=2, ^=not significant at p>0.05, *=Significant at p<0.05.

**Table 2: Multiple pair-wise comparisons of caries experience among SES.**

As found in Table 3, the prevalence of dental caries in this study was (95.60%), and caries-free students represent (4.40%). The highest distribution of students were those belonging to the medium SES group, for both Caries(208) and Caries free(10) students. Also, the caries-free percentage was higher in the low SES(7.34%) than in other SES groups.

| | | Caries Status | | | |
|---|---|---|---|---|---|
| | | Caries | | Caries Free | |
| | | N. | % | N. | % |
| SES level | LOW | 101 | 92.66 | 8 | 7.34 |
| | Medium | 208 | 95.41 | 10 | 4.59 |
| | High | 169 | 97.69 | 4 | 2.31 |
| Total | | 478 | 95.60 | 22 | 4.40 |

**Table 3: Distribution of caries by BMI and SES levels.**

*Oral health cleanliness and SES:*

Dental plaque and calculus were more in the low SES group(1.806)( 0.349), respectively than in other groups, as shown in Table 4, although there were no significant differences. The mean value of the plaque index of the total sample was(1.761±0.010), While the mean value of the calculus index of the total sample was(0.142±0.050).

| Variables. | Low | | Medium | | High | | F | P value | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | ±SE | Mean | ±SE | Mean | ±SE | | | Mean | ±SE |
| PlI | 1.806 | 0.022 | 1.752 | 0.015 | 1.744 | 0.017 | 2.977 | 0.052 | 1.761 | 0.010 |

| CalI | 0.349 | 0.229 | 0.088 | 0.007 | 0.080 | 0.007 | 2.391 | 0.093 | 0.142 | 0.050 |

Df=2,^=not significant at p>0.05

**Table 4: Descriptive and statistical of Oral health cleanliness among SES.**

*The gingival health condition and SES:*

The prevalence of gingivitis among the students was 100%, and regarding the Gingival severity, all subjects have moderate types of gingivitis (1.1-2).

Table 5 shows that the mean of gingivitis of the total sample was(1.908), also finding that gingivitis was higher in low SES(1.947) than in other groups with a Significant difference(0.011). Regarding gingivitis, the difference between the low and medium SES was Significant(0.004). Also, the difference between the low and high SES was Significant(0.006). At the same time, the other differences were not significant.

| SES | Mean | ±SE | F | P value | Multiple Pair-wise comparisons (Games-Howell posthoc test | | |
|---|---|---|---|---|---|---|---|
| **Low** | 1.947 | 0.011 | 4.561 | **0.011*** | Low | Medium | **0.004*** |
| **Medium** | 1.898 | 0.011 | | | Low | High | **0.006*** |
| **High** | 1.896 | 0.013 | | | Medium | High | 0.989^ |
| **Total** | 1.908 | 0.007 | | | | | |

*=Significant at p<0.05, ^=not significant at p>0.05,df=2.

**Table 5: Descriptive and statistical of GI among SES.**

### Discussion

In the current study, the highest percentage of the students belonged to the medium SES level (43.6%). The Same finding was reported by [16] in the same city 9 years ago as she found the majority of the subjects belonged to the medium SES level (53.62%), Which was in contrast to [10] studies in Baghdad in 2019, which found that the low SES group is the largest group and the medium SES is the smallest group of students [16,10].

The prevalence of dental caries was (95.60%), which is considered high compared to another result of different Iraqi studies among adolescents in different age groups and both sexes [17,18, 16,19,3,4]. Differences in dental caries experience among this study and the other Iraqi studies were affected by the type of survey instrument used(either CPI probe or sharp probe), sample size, including different geographic areas, socioeconomic factors, differences in sex and age and the differences due to the difference in period among the studies in the same city over a of 9 years period.

For the total sample, this study's mean DMFT and DMFS were (6.396± 0.157) (9.076 ± 0.292). This result was higher than that reported by [16] studies in 2013 on adolescents in the same city 9 years ago. Dental caries (DS) was higher in the medium SES group than in other groups, While filling (FS) was higher in high SES; this outcome was consistent with other Iraqi studies [16,9].

In the present study, the caries experience was significantly affected by socioeconomic status; those higher socioeconomic levels had a significantly higher DMFT than those of those lower socioeconomic levels. In contrast, [10] was

found that those higher socioeconomic level had a significantly lower caries experience than the lower socioeconomic level in preschool children [10], and the difference could be explained by the present difference in the age group between the two studies.

MS was more in the low SES, and this result agrees with [9] study [9]. The (FS) component of the DMF was concerned with the significant difference between the different SES groups, which indicates the importance of education and income level on the improvement of oral health as the number of missing teeth due to caries decreases and replacement with increases the number of teeth that filled. Income families can visit the dentist and pay the fillings cost. It also increases parents' education level and makes them more aware of the importance of oral health for their children.

Also, in the present study, the caries-free students were at the highest percentage in the low SES group, and the association between SES and caries-free could not reach statistical significance. This resulted in agreement with other studies [16,9] and disagreement with another Iraqi study in 2007. [20]

In the present study, it was found that the mean value of plaque index was higher than other Iraqi studies[3,4,21,10] and less than that reported by [9]. [3,4,21,10,9] This variation may be due to sample size differences, as well as differences in the resident status attitude and knowledge, age of subjects, gender and brushing method and time prior to the examination or the usual brushing.

The present study found that the prevalence of dental plaque was 100% divided into two groups(a moderate amount of dental plaque constituted the highest percentage in the total sample(88.4%), followed by an abundance of plaque amount (11.6%), so the majority of the subjects were with a moderate plaque, and this outcome was in agreement with other result reported [21,22,23], . [21,22,23] Also found in this study that dental plaque was more in low SES group than other groups with no significant differences, and that is probably because of lack of knowledge and awareness about oral hygiene. They have low incomes to visit the dental clinic. This result was in agreement with [10] studies, and in contrast to [16] in the same city, she reported that the average SES adolescent had the highest plaque index mean value, while the highest SES scorers had the lowest, and the difference was significant. [16,10]

The mean value of the calculus index for the total sample was higher than that reported by [16] 12-year-old adolescents in the same city (0.02). [16] This difference may be due to age differences, dietary habits, and lifestyle changes in the past decade. The finding of this study was that dental calculus was more in the low SES group than in other groups, and that is probably because of poor oral hygiene and an increased plaque level in this group; the same result was genuinely revealed by [16] and [10]; it was reported by [16] that there was a high correlation between plaque index and calculus index. [16,10]

In the present study, it was found that the mean value of the gingival index was higher than found in other Iraqi studies. [3,4] The present study found that the prevalence of gingivitis was 100% ( and regarding the gingival severity, all subjects have moderate type of gingivitis (1.1-2). Nearly the same result was found by [3] in Al-Khalis city in the same age group males found that the moderate type of gingivitis was the most prevalent). [3] The cause behind this high prevalence of gingivitis in this study may be related to the dental plaque found in this survey; as dental plaque prevalence and severity increased, gingivitis prevalence and severity increased. The exact positive correlation was found between dental plaque and gingivitis in other Iraqi studies by [3,16].

There was a significant difference concerning gingivitis and the SES in this study; the highest mean of gingivitis was found in the low SES group, and the

same was found by other Iraqi studies [24,16,9,10]. A higher SES is associated with better education, better oral health practices, and better chances to visit the dentist more regularly. This might explain the better oral health status indices among students with high SES. [24,16,9,10]

### Conclusion

Most of the subjects in this study belonged to the medium Socioeconomic status(SES); SES could be considered a significant factor affecting oral health in developing countries like Iraq. It is essential to improve the education level of families to improve their children's oral health.

### Acknowledgements

Many thanks to everyone who participated in the study and to Dr. M. Galib for his assistance with the statistical work and data analysis.

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