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# Oral health status and behaviour in Jordanian adolescents aged 12–18 years

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## RESEARCH

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## ABSTRACT

**Background**
This survey was conducted to promote health issues and provide health care for the neediest communities throughout Jordan. It also provides reliable information for researchers and policy makers by collecting and interpreting the dental health status as an important indicator for general health.

**Aims**
The aim of this study was to investigate the oral health status and oral health behaviours of adolescents in the Tafelah governorate in south Jordan.

**Methods**
A cross-sectional survey was conducted on 1194 public school children ages 12–18. All students were examined using a mirror and probe with a dental unit for decay-missing–fillings (DMFT) of permanent teeth, gingival index (GI) and plaque index (PI). Information about oral hygiene habits was also recorded.

**Results**
The prevalence of caries was 71.4 per cent for permanent teeth, with a significant caries index SCI 5.7 and a mean DMFT 2.6. A total of 41.7 per cent had healthy gingiva, 33.3 per cent had mild gingivitis, 24.1 per cent had moderate gingivitis, and 0.8 per cent had severe gingivitis. The average gingival index (GI) and average plaque index (PI) were 0.7 and 0.5, respectively. Some (44.6 per cent) of the examined students never brushed their teeth, and 84 per cent had never received any previous dental treatment.

**Conclusion**
The results indicated that greater than 50 per cent of the examined students in this age group have caries in their teeth and gingivitis of mild to moderate severity. The oral hygiene measures were poor. It is important to enhance dental awareness and allow different preventive measures to be implemented. Furthermore, dental care should be more accessible for underprivileged school students.

**Key Words**
Dental caries, DMFT, gingivitis, gingival index, oral hygiene, plaque index

## What this study adds:

**1. What is known about this subject?**
In Jordan, a few epidemiological studies have been conducted and showed the widespread neglect of oral health and a high rate of unmet treatment needs.

**2. What new information is offered in this study?**
Untreated decayed teeth among children, demonstrating a high rate of unmet treatment needs. Oral hygiene measures were poor, with low rates of dental visit rates.

**3. What are the implications for research, policy, or practice?**
The need to raise the public awareness of oral hygiene and to modify policies for early access to preventive dental services among school children.

## Background

Dental caries and periodontal disease have historically been considered the most important global oral health burdens. Presently, the distribution and severity of oral diseases vary among different parts of the world and within the same

country or region. Extensive number of epidemiological surveys indicates the significant role of socio-behavioural and environmental factors in oral disease and health.[1]

The adequate daily removal of dental plaque prevents periodontal diseases and dental caries.[2] The most common and effective way to promote oral hygiene is tooth brushing; therefore, brushing is recommended as a habit that is repeated every morning and evening. In addition to improved oral hygiene, which prevents periodontal diseases, frequent brushing with fluoride toothpaste increases the resistance of dentition to dental caries.[3]

Periodic epidemiological studies are helpful in planning and implementing oral health and education programmes. This would help in combating these diseases. In Jordan, a few epidemiological studies have been conducted and showed the widespread neglect of oral health and a high rate of unmet treatment needs.[4-8] This survey and previous surveys[9-11] were conducted by the Jordanian National Women's Health Care Center (NWHCC) as part of a national dental health survey to promote health issues and provide health care for the most needy communities throughout Jordan. It also provides reliable information for researchers and policy makers by integrating oral health into strategies for promoting general health and by assessing oral needs in sociodental ways, health planners can greatly enhance both general and oral health.[12]

The objective of this study was to determine the oral health status and oral health behaviours among adolescent school children in the Tafelah governorate in south Jordan. Tafelah is divided into three districts, the Tafelah District (62.3 per cent of population), Bsera District (25.7 per cent) and Alhasa District (12 per cent).

## Methods

A cross sectional survey was conducted from October 2014 through March 2015 (Appendix 1). It included students aged 12–18 years of age in six public schools within the governorate of Tafelah (distributed between three districts).

Ethical approval for the study was granted from the ethical committee of the Jordanian Ministry of Health. Written informed consent forms were distributed and signed by the parents of school children. A proforma sheet was designed and used to collect data, including the following three sections: a demographic data section, oral behavioural data section, and oral and dental examination section. This sheet was pre-validated by a committee of dentists and dental care nurses working for the School Dental Care Service of the Ministry of Health. A mobile dental clinic was used to examine all students at the schools; disposable examination sets (pre-packed mirror and probe) and disposable latex gloves were used during the examination.

The World Health Organization 4th edition recommendations for clinical examination were used to assess oral health status.[13] Three general practitioner dentists performed clinical examinations of all students, and the dentists attended pre-survey training to minimize differences in their clinical judgements as well as homogenize and standardize the examination procedures and references. A pre-survey assessment of agreement was performed between examiners, with Kappa inter examiner =0.93 and intra examiner =0.98.

Tooth decay was defined in this survey (similar to a previous study conducted by the same authors on a different population)[9] as the occurrence of a cavity extending into the dentine. This is in accordance with the recommendation of the WHO for defining tooth decay as 'cavities with a softened dentine floor'. DT (decayed teeth) was defined as the number of teeth with untreated decay (cavity). FT (filled teeth) referred to the number of teeth with decay in the past that had been repaired by operative procedures. If the teeth were removed or extracted as a result of decay, they were defined as MT (missing teeth). The sum of DT, MT and FT is referred to as the DMFT value, which represents the total number of teeth affected by tooth decay, third molars were excluded for older aged children The DMFT value indicates the total number of teeth affected in the past and present, which reflects a cohort that is more indicative of the oral health status than the DT/dt value, which only reflects the number of teeth with untreated decay requiring attention; therefore, DMFT was selected for evaluation in this study. The DMFT index has been criticized for not counting enamel caries, caries activity, teeth or surfaces at special risk, and difficulties confirming the reason for decay extraction at the point of examination, particularly for deciduous teeth.[14] However, it can provide important descriptive information for monitoring trends and increasing the awareness of policy makers regarding dental health. In this study, the significant caries index (SiC) was also calculated because the DMFT presents limitations in its distribution. The SiC refers to the one-third of the population that is more severely affected by dental caries to bring attention to those individuals with the highest caries scores in the studied population.[15] A new global oral health goal of a SiC score of less than 3 in 12-year-olds in a given population was established, and this goal was to be achieved by the year 2015.[15]

Oral plaque was evaluated by running the side of a ball-tip probe along the inner and outer aspects of the six index teeth, using the criteria of the plaque index of Silness and Löe (Table 1).[16] The six indexed teeth are the upper right first molar, upper right lateral incisor, upper left first premolar, lower right first premolar, lower left lateral incisor and first molar. Missing teeth are not substituted. The gingival condition was determined for the same teeth using the criteria of the gingival index of Löe and Silness (Table 2).[17]

Objective research was performed to evaluate the state of oral hygiene during the examination as follows: good (plaque index 0.0 i.e., absence of plaque), fair (plaque index 0.1-1.9 i.e., presence of plaque) and bad (plaque index 2.0-3.0 i.e., plaque seen by the naked eye). The gingival index of Löe and Silness[16] was used to record the severity of gingivitis. The gingival index by Löe and Silness[17] measures the severity of gingivitis on a scale ranging from 0.1–3.0 (0.1-1.0: mild gingivitis, 1.1-2.0: moderate gingivitis, and 2.1-3.0: severe gingivitis).[10]

Statistical analysis was performed using SPSS 20.0 for Windows (SPSS Inc., Chicago, IL, USA). The Chi-squared statistic was used for statistical evaluation. A P-value <0.05 was considered statistically significant.

## Results

### Demographic data

Of the 1194 school children examined, 53 per cent were females and 47 per cent were males. Figure 1 shows the distribution according to the district, and Figure 2 shows the distribution according to age group.

### Behavioural data

Most (84 per cent) school students had not received previous dental treatment. Approximately half (44.6 per cent) never brushed their teeth (Figure 3), of which 30 per cent of female students never brushed their teeth and 61 per cent of male students never brushed their teeth. A total of 88.3 per cent of school students in the Alhasa district brushed one or twice daily, whereas 56.2 per cent and 64.2 per cent of school students never brushed their teeth in the Alhasa district and Bsera district, respectively.

### Clinical examination data

Only 29.4 per cent of students were caries free, with a DMFT 2.6 and significant caries index of 5.7 (Table 1). D constitutes the major component of the DMFT score (Table 2). The average PI was 0.52±0.6, with no statistically significant difference according to gender ($p$>0.05). The average GI was 0.66±0.7, with no gender difference ($p$>0.05). According to the plaque index PI, approximately half (49.5 per cent) have good oral hygiene, 45.5 per cent have fair oral hygiene, and 5 per cent having bad oral hygiene (Figure 4). According to the gingival index, only 41.7 per cent were healthy, whereas 57.4 per cent have mild to moderate gingivitis (Figure 5).

## Discussion

The caries prevalence among 12–18 years old school children in Tafelah is very high (70.6 per cent). One-third of the examined students (SiC index) had a very high DMFT of 5.7 compared to 3.9 in a previous study describing the oral health among school children on national level,[7] indicating widespread neglect of oral health in these children. Untreated decayed teeth dominated the DMFT scoring among the children, demonstrating a high rate of unmet treatment needs.

Although the present study is not based on a representative sample of public school children in Tafelah because it uses convenience sampling, it does provide insight into the prevalence and severity of caries and gingivitis and lack of oral hygiene practice and dental care among public school children.

The prevalence of caries among adolescents aged 12–18 years was greater the recommended target of the WHO and Federation of Dentistry International of less than 50 per cent caries-free children by 2000.[18] It was similar to that recorded in our previous survey of Tafelah school children in a younger age group (6–12 years old) (70.6 per cent for deciduous teeth).[8] The mean DMFT in this study was 2.6, and it was lowest in the Alhasa district (1.2) and highest in the Qasaba district (3.3). The same trend was observed in the significant caries index, for which the lowest was in Alhasa (4.1) compared to (5.9) for both Qasaba and Bsera districts. The mean DMFT score was similar to the mean dmft score (3.2) recorded in a previous survey in Tafelah in a younger age group,[9] with Alhasa showing the lowest score of 1.2. These similarities support correlations in the caries experience between primary and permanent teeth as evidenced by several studies[19] and indicate the need to increase dental awareness among students and their parents at a young age to allow for the implementation of preventive dental measures. Our results are similar to previous reports from Jordan[5,6] and countries that have similar socioeconomic and cultural features.[1] By contrast, developed countries such as Spain had much lower scores of 1.33 DMFT in 12-year-old children, and there was a goal to reduce this to below 1.0 by 2015.[20] The SiC score of (5.7)

in our study was much higher than the recommended global health goal for 2015.[15]

Untreated decay comprised the major component of the caries index. A similar finding of a high prevalence of untreated dental caries was reported in previous studies.[4,5,9,11] Low dental visit rates (93.3 per cent of school students had never received previous dental treatment) and a large proportion of untreated caries could be due to a lack of dental awareness, lack of access to affordable health care services, or limited access to dental care.

The information gathered from the questionnaire indicated that approximately half of school students never brushed their teeth, limiting the applicability of the WHO recommendation for public health efforts to make fluoridated toothpaste affordable in developing countries.[3]

An unexpected finding of this study was that the reported rates of tooth brushing did not reflect an impact on caries prevention. It seems that either the response did not reflect the true practice in this group or that the tooth brushing was an inadequate independent factor for preventing caries. The relationship may also have been confounded other factors, such as the age at which brushing was started, dietary intake of sugar and refined food, genetic predisposition, crowding of teeth and lack of public fluoridation, consistent with the hypothesis that the cause of caries is multifactorial.[21]

The results of this surveys shows that 58.3 per cent of school children aged 12–18 years old had gingivitis of mild to moderate severity. These results are similar to results from other parts of the world with a similar cultural and socioeconomic status.[22,23]

This study revealed that the mean plaque index and gingival index for the total subjects was 0.6 and 0.7, respectively. These results suggest that school children of this age group have fair oral hygiene with mild gingivitis. For gender variations, the difference was not significant between genders. These findings were inconsistent with of studies in 13–14 years old Northern Jordanian school children that reported PI scores of 1.82 and 1.63 for 1993 and 1999, respectively,[24] whereas GI scores[24] were 1.89 in 1993 and 1.67 in 1999, which were also higher than those in this study. A more recent study occurred in 2006 for 14–15-year-old schoolchildren in the Jerash district that reported a plaque index score of 1.46 and a gingival index score of 1.56.[6] Our findings show that 61 per cent of boys never brushed their teeth, whereas 70 per cent of girls brush their teeth once to three times daily, which did not reflected positively in the prevalence and severity of gingivitis among them. this can be explained by the effect of female sex hormones mainly oestrogen and progesterone associated with puberty which will increase gingival inflammation without an accompanying increase in plaque levels.[26] Although girls scored more favourably on behavioural measures, and showed more interest in oral health, and perceived their own oral health to be good to a higher degree than did boys.[25]

Oral health affects people physically and psychologically and influences how they grow, enjoy life, look, speak, chew, taste food and socialize, as well as their feelings of social well-being[27] The results of this survey indicate the need to start a local campaign to raise the public awareness of oral hygiene and the need to modify policies for early access to preventive dental services among school children (Tables 3 and 4).

## Conclusion

The caries prevalence among 12–18-year-old adolescents in Tafelah is very high (70.6 per cent). The significant caries index (SiC index) which represents adolescents with the highest caries scores in the studied population scored a very high DMFT of 5.7, indicating the widespread neglect of oral health in children ages 12–18 years. Untreated decayed teeth dominated the DMFT scoring among children, demonstrating a high rate of unmet treatment needs. The prevalence of gingivitis of mild to moderate severity was also high (58.3 per cent). Oral hygiene measures were poor, with low rates of dental visit rates.

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## PEER REVIEW

Not commissioned. Externally peer reviewed.

## CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

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## ETHICS COMMITTEE APPROVAL

Ethical approval for the study was granted from the ethical committee of the Jordanian Ministry of Health, 201/2015

**Table 1: Criteria used for plaque index (PI)**

| Score | Criteria |
|---|---|
| 0 | No plaque. |
| 1 | A film of plaque adhering to the free gingival margin and adjacent area of the tooth. The plaque may be seen in situ only after application of disclosing solution or using the probe on the tooth surface. |
| 2 | Moderate accumulation of soft deposits within the gingival pocket or at the tooth and gingival margin that can be seen with the naked eye. |
| 3 | Abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin. |

**Table 2: Criteria used for gingival index (GI)**

| Score | Criteria |
|---|---|
| 0 | No inflammation. |
| 1 | Mild inflammation, slight change in colour, slight edema, and no bleeding on probing. |
| 2 | Moderate inflammation, moderate glazing, redness, bleeding on probing. |
| 3 | Severe inflammation, marked redness and hypertrophy, ulceration, and tendency towards spontaneous bleeding. |

**Table 3: DMFT, SiC/ DMFT scores by gender, district, age group and frequency of tooth brushing**

| Score | Gender | | District | | | Age group | | | | Frequency of tooth brushing | | | | Overall Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | Qasaba | Alhasa | Bsera | 12-13 | 14-15 | 16-17 | 18+ | 0 | 1 | 2 | 3 | |
| **DMFT** | 2.9 | 2.3 | 3.3 | 1.2 | 3.1 | 1.9 | 2.7 | 2.8 | 1.8 | 3.7 | 2.2 | 1.1 | 2.4 | 2.6 |
| **SiC/DMFT** | 6.1 | 5.3 | 5.9 | 4.1 | 5.9 | 5.1 | 5.7 | 5.9 | 5.4 | 6.1 | 4.8 | 4.9 | 5.6 | 5.7 |

**Table 4: %D, %M, and %F by gender, district and age**

| % | Gender | | District | | | Age group | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | Qasaba | Alhasa | Bsera | 12-13 | 14-15 | 16-17 | 18+ | |
| **D** | 83.7 | 83.3 | 82.9 | 92.6 | 80.7 | 84.5 | 82.4 | 84.4 | 80.3 | 83.5 |
| **M** | 8.0 | 5.1 | 3.7 | 3.1 | 12.1 | 8.3 | 7.5 | 4.9 | 9.1 | 6.6 |
| **F** | 8.3 | 11.6 | 13.5 | 4.3 | 7.2 | 6.6 | 9.4 | 10.1 | 10.6 | 9.9 |

**Figure 1: Distribution of school students according to district**

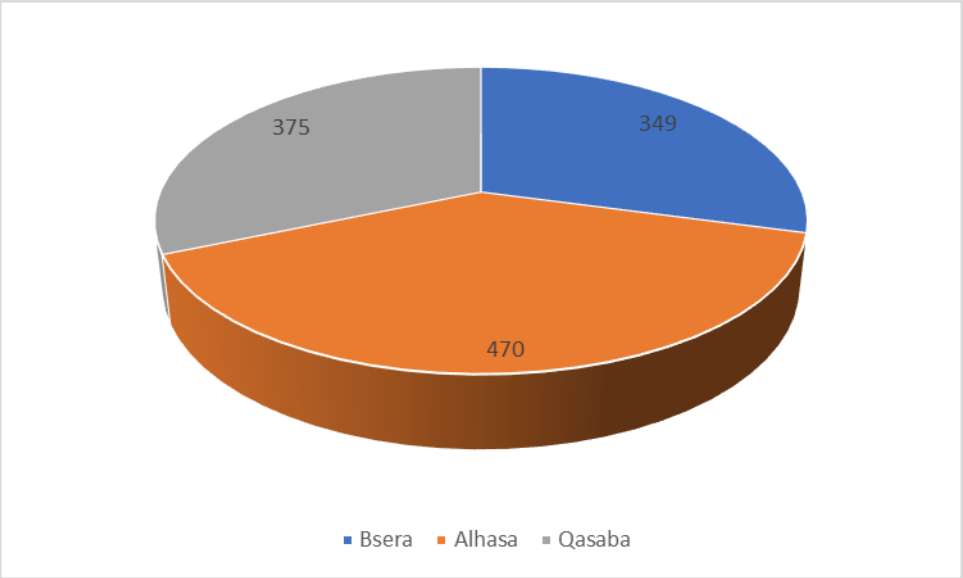


**Figure 2: Distribution of school students according to age (%)**

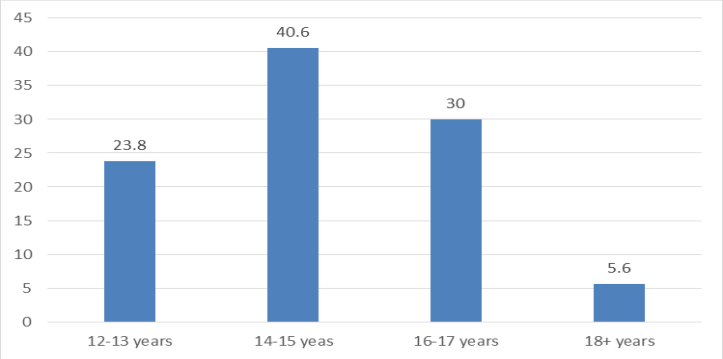


**Figure 3: Distribution of school students according to the frequency of tooth brushing (%)**

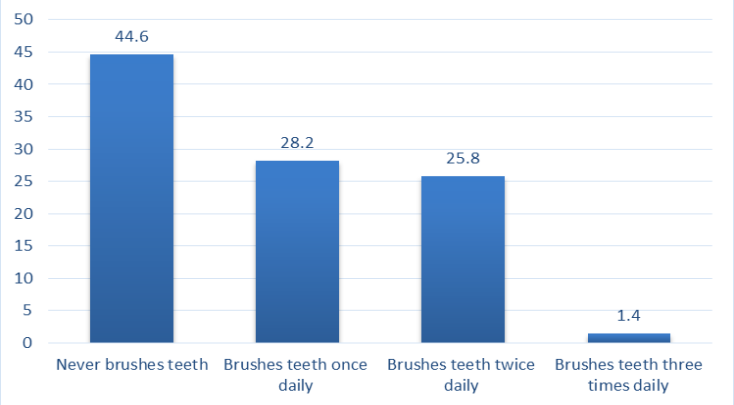

**Figure 4: Oral hygiene status according to PI (%)**

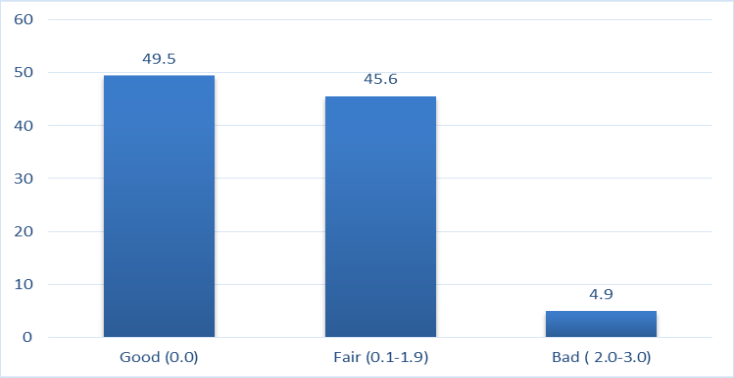


**Figure 5: Oral health status according to GI (%)**