

## Prevalence and severity of dental caries in school students aged 6-12 years in Mafraq governorate: Northeast of Jordan

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### Original Article

#### Abstract

**BACKGROUND AND AIM:** Dental caries is a chronic disease with a high prevalence despite its preventability. Untreated dental caries can cause substantial pain and suffering, and imposes a significant public health and economic burden. Our aim was to determine how prevalent and severe dental caries are among school children between 6 to 12 years of age from a mixed population (Jordanians and Syrian refugees) at Mafraq Governorate, Northeast of Jordan, as well as to evaluate their habits with regards to oral hygiene.

**METHODS:** The survey was a cross-sectional study conducted on 1286 public school children. All students were examined using a mirror and lit probe with a dental unit for decay-missing-fillings for deciduous teeth (dmft) and decay-missing-fillings for permanent teeth (DMFT); oral hygiene habits were also recorded.

**RESULTS:** Among 1286 school children, 21.1% were Syrian refugees. The caries prevalence was 78.7% with dmft ranges from 2.3-4.4 and DMFT ranges from 0.4-1.8. There were significant caries indices (SiC) of 7.0 and 2.7 for deciduous teeth and permanent teeth, respectively. About 29.2 % of the students never brushed their teeth, and 93.3% did not have any previous dental treatment. All tested indicators of oral health status were worse among Syrian refugee students compared to Jordanian students, although this difference was not statistically significant.

**CONCLUSION:** The caries prevalence in this age group in Mafraq was very high. One-third of the examined students had very high dmft and DMFT scores, which reflected negligence of children oral health. Untreated dental caries was the main component of DMFT scores among the examined population, indicating lack of dental care services for those children, especially for refugees.

**KEYWORDS:** Deciduous Teeth; Dental Caries; Decay-Missing-Fillings

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Oral health problems in children including dental caries development will not affect only the health status of a nation, but will also affect the overall health care expenditure with its effect on the economy.<sup>1</sup> The resulting infection and oral pain associated with dental caries will have a tremendous effect on children with

impacts on sleeping and growth, causing behavioral problems, affecting their ability to adapt and respond to different social burdens of such effects.<sup>2</sup>

Dental caries is a preventable disease. Despite this fact, it is still the most common chronic disease affecting children. This put a huge burden on oral health providers and

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public health sectors to adapt policies to promote healthier eating habits, water fluoridation, and teeth brushing.<sup>3,4</sup>

According to the World Health Organization (WHO), 60%-90% of schoolchildren in the world have or had caries, and Asia and South America are the most affected regions.<sup>5</sup> In a public survey, prevalence of dental caries was 41.6% among 6-years-old Jordanian children, and more than 67.0% of the total DMFT were D.<sup>6</sup> The prevalence of dental caries was even higher in another survey, with prevalence of 72.9% for 12- to 13-years-old children in north of Jordan and a D component of 92.0% of the total DMFT.<sup>7</sup>

Jordanian National Women's Health Care Center (NWHCC) conducted series of surveys in different parts of the country in collaboration with different governmental ministries in Jordan including health, education, and military. Previous results were published earlier.<sup>8</sup> The NWHCC is a Jordanian governmental-independent body aiming to promote health issues as well as providing health care for the least privileged communities throughout Jordan and to gather information and data for researchers and policy makers by health indicators surveys.<sup>9</sup>

The Mafraq governorate, located in the Northeast of Amman, the capital of Jordan, is one such community. Mafraq covers the second largest area in the kingdom and has 4 districts that are largely spread across the governorate: Mafraq capital (Mafraq Casabah) district, Ruwaished district, North Badiya (Badiyah Shamaliyah) district, and West Badiya (Badiyah Gharbiyah) district.<sup>10</sup> In 2011, the civil war in Syria resulted in the immigration of more than 1.5 million Syrian refugees to Jordan, and their main border crossing points were located at the Mafraq governorate, which covers close to 300 kilometers of the border with Syria. Additionally, many people were settled in the governorate. The largest refugee camp for Syrian refugees, Zaatari, is located 10 km east of Mafraq. According to the United Nations Higher Commission for Refugees (UNHCR), the presence of Syrian refugees in Mafraq

caused a strain on natural resources and increased rental prices, youth unemployment, waste, and demands for water, health, and education.<sup>11</sup> This was reflected as a direct impact on the quality of medical services in the hosting governorate, and there was significant pressure on medical centers and hospitals.<sup>12</sup>

Our aim was to determine how prevalent and sever dental caries are among school children between 6- to 12-year-old from a mixed population (Jordanians and Syrian refugees) at Mafraq governorate, Northeast of Jordan, as well as to evaluate their habits with regards to oral hygiene.

## Methods

Over 6 month's period, the NWHCC trained teams conducted an oral health survey for students aged 6-12 years of age from six public schools within the governorate of Mafraq (distributed between three districts). The Ruwaished district was not included because of its small population (4.6%), which is distributed over a large area, having the lowest population density in the entire Kingdom.<sup>10</sup> Two schools per district were selected for the survey based on the number of students: grades 1 to 4 were mixed gender schools, all examined students after grade 4 were girls as regulations prevent mixed schools after that (10-12 years).

Ethical approval for the study was granted from the ethical committee of the Jordanian Ministry of Health (Code: MOH REC 160019). All students were examined after approval from their parents by signing an informed consent. Demographic and oral behavioral data were collected, and all students had a full oral and dental examination. The data sheet was pre-validated by experts committee of dentists and dental care nurses. A mobile dental clinic was used to examine all students at the schools; disposable examination sets (pre-packed mirror and explorer) and disposable latex gloves were used during the examination.

Oral health clinical examination followed WHO recommendations in its 4<sup>th</sup> edition.<sup>13</sup> to

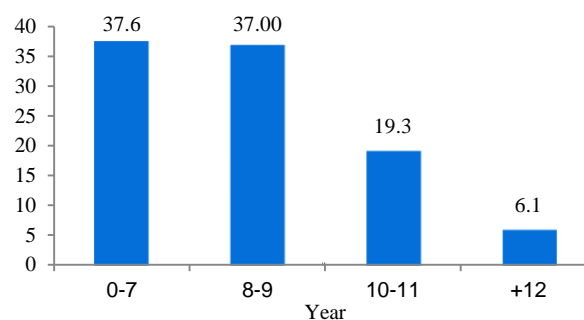
standardized the examination procedures and to decrease differences in examination outcome, all general practitioner dentists who conducted the clinical examination attended a training course before starting the survey. Pre-survey assessment of agreement was performed between examiners, with Kappa inter-examiner of 0.93 and intra-examiner of 0.98.

Tooth decay was defined according to WHO criteria as 'cavities with a softened dentine floor', we had previously used this definition in a study.<sup>8</sup> Number of teeth with untreated decay (cavity) was defined as DT/dt (decayed teeth). The number of teeth with decay in the past that had been repaired by operative procedures were defined as FT/ft (filled teeth). MT/mt (missing teeth) was used to describe teeth removed or extracted because of decay. The sum of DT/dt, MT/mt and FT/ft, which represented the total number of teeth affected by tooth decay was referred to as the DMFT/dmft. Permanent tooth decay was represented by DMFT, and dmft indicated decay in primary teeth. The level of tooth decay in a population can be represented by the mean values of DT/dt, MT/mt, FT/ft and DMFT/dmft as well as by the proportion of the population affected by each type of decay.<sup>14</sup> The DMFT/dmft ratio represents the total number of teeth affected in the past and present, this value is a cohort that is more representative of the oral health status than the DT/dt value, which indicates those teeth requiring attention because of untreated decay; therefore we chose DMFT/dmft for evaluation and reporting in this study, although this index can be criticized for not counting either enamel caries, or caries activity, or even teeth or surfaces at special risk, in addition to not confirming the reason for decay extraction during examination, especially for deciduous teeth.<sup>15</sup> However, it is good in providing descriptive information for trends monitoring and policy makers' awareness of dental health. Significant caries index (SiC) was used in this survey to overcome the limitation in the distribution of

DMFT. The SiC refers to the one-third of the population that are more severely affected by dental caries.<sup>16</sup> A new global oral health goal of a SiC score less than 3 in 12-year-olds was set by WHO as one of the new global health goals to be accomplished by 2015.<sup>16</sup> Statistical analysis was performed using SPSS for Windows (version 20, IBM Corporation, Armonk, NY). The chi-squared test was used for statistical evaluation. A P-value < 0.05 was considered statistically significant.

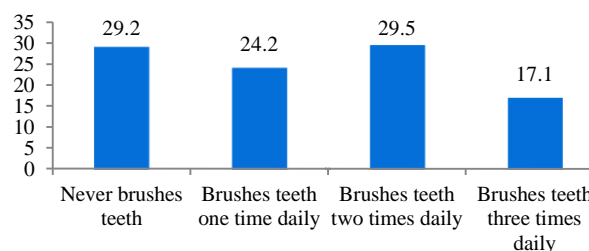
## Results

Among 1286 school children examined, 78.9% were Jordanian and 21.1% were Syrian refugees, 63.0% were females and 37.0% were males; 45.6% were in Casabah district, 30.9% in Badiyah Shamaliyah and 23.5% in Badiyah Gharbiyah. The distribution of students per age group is shown in figure 1.



**Figure 1.** Distribution of students according to age group

Most of the school students (93.3%) never had dental treatment. Only 6.7% had previous dental treatment, and of those, 4.5% were males. Figure 2 show that 29.2% of school students never brushed their teeth.



**Figure 2.** Distribution of school students according to the frequency of tooth brushing

**Table 1.** DMFT, dmft, SiC/dmft and, SiC/DMFT scores by gender, district, age group, frequency of tooth brushing and nationality

Score	dmft	SiC/dmft	DMFT	SiC/DMFT
<b>Gender</b>				
Male	3.5	7.3	0.6	2.2
Female	2.7	6.8	1.1	2.8
<b>District</b>				
Casaba	2.3	6.7	0.4	2.0
Badiyah Gharbiyah	2.5	7.4	0.5	2.2
Badiyah Shamaliyah	4.4	7.1	1.8	3.2
<b>Age group (year)</b>				
6-7	4.0	7.5	0.4	2.1
8-9	3.1	6.7	0.7	2.3
10-11	1.5	5.9	1.5	2.7
+12	0.8	5.1	3.1	4.1
<b>Frequency of tooth brushing</b>				
0	4.0	7.4	1.2	3.0
1	3.0	6.7	0.5	2.5
2	1.9	6.5	0.9	2.6
3	3.1	6.9	0.8	2.4
<b>Nationality</b>				
Jordanian	2.9	6.8	0.6	2.5
Syrian	3.4	7.6	1.1	2.8
<b>Total</b>	<b>3.0</b>	<b>7.0</b>	<b>0.9</b>	<b>2.7</b>

DMFT: Decay-missing-fillings for permanent teeth; dmft: Decay-missing-fillings for deciduous teeth; SiC: Significant caries index

The caries prevalence was 78.7% (67.9% for deciduous teeth alone and 32.7% for permanent teeth alone). Table 1 shows the dmft, DMFT and SiC per gender, district, age group, frequency of tooth brushing and nationality. The dmft index was 3.0 and was highest in Badiyah Shamaliyah (4.4) and in the 6- to 7-year-old age group (4.0). There was no statistically significant difference in gender or frequency of tooth brushing ( $P > 0.05$ ). The SiC were 7.0 and 2.7 for deciduous and permanent teeth, respectively. A SiC for permanent teeth was highest in North Badiya (Badiyah Shamaliyah) district (3.2). Gender and frequency of tooth brushing did not

significantly affect the SiC. There was no significant difference between Syrian refugee students and Jordanian students in dmft, DMFT, SiC/dmft and SiC/DMFT scores, although there was a trend toward worse indices among Syrian refugee students ( $P < 0.05$ ).

Dental decay component d or D was the major component of d+m+f, D+M+F (84.5%-95.1%) with only less than 10% of filled teeth. The same was true when %d, %m, %f & %D, %M, and %F were calculated for Syrian refugee students; no significant difference could be demonstrated between the two groups ( $P > 0.05$ , table 2).

**Table 2.** %D, %M, %F and %d, %m and %f by gender, district, age and nationality

%	Gender		District			Age group (year)				Nationality		Total
	Male	Female	Casaba	Badiyah Gharbiyah	Badiyah Shamaliyah	6-7	8-9	10-11	12+	Jordanian	Syrian	
d	90.9	91.6	92.0	86.4	92.9	93.3	90.4	84.5	95.1	91.4	91.1	91.3
m	7.3	5.2	4.1	13.3	4.4	3.9	6.9	13.9	3.3	5.8	6.6	6.1
f	1.8	3.3	3.9	0.3	2.7	2.8	2.7	1.6	1.6	2.8	2.2	2.6
D	94.4	92.3	85.2	96.2	94.9	89.5	94.8	94.2	90.5	92.5	93.6	92.8
M	2.6	1.8	7.6	0.6	0.3	6.8	0.9	1.6	0.4	1.9	2.3	2.0
F	3.0	5.8	7.2	3.2	4.9	3.7	4.3	4.2	9.1	5.4	4.9	5.2

## Discussion

The caries prevalence among 6- to 12-year-old school children in Mafraq was very high. One-third of the examined students (SiC index) had a very high dmft and DMFT (7.0 and 2.7, respectively), which reflected negligence of children oral health. Untreated dental caries was the main component of DMFT scores among the examined population, indicating lack of dental care services for those children, especially for refugees.

Even though this study used convenience sampling with its limitation as a non-representative sample, it does give insight into the prevalence and severity of caries, as well as the oral hygiene and dental care practice among school children in this part of Jordan.

Among school children aged 6-12 years (mixed dentition stage), the prevalence of caries exceeded the recommended target of the WHO and Federation of Dentistry International aiming less than 50% caries-free children by 2000.<sup>17</sup> The prevalence was close to that in our previous survey of Tafelah school children in the same age group (70.6% and 28.0% for deciduous and permanent teeth, respectively).<sup>8</sup> Our results were in line with previous similar surveys in Jordan<sup>6,7</sup> and countries with similar social, economic, and cultural characteristics.<sup>5</sup> On the other hand, more developed countries like the United Kingdom,<sup>18</sup> Italy,<sup>19</sup> and Germany<sup>20</sup> reported better results with a 50.0% caries-free schoolchildren.

The deft index was 3.0 and was the highest in Al Badia Shamaliyah (4.4) and in the 6- to 7-year-old age group (4.0). The SiC for deciduous teeth (7.0) was much higher than the recommended goal for 2015;<sup>15</sup> it was highest in the 6- to 7-year-old age group (7.5). European studies conducted in the nineties reported different mean dmft in primary dentition in children aged 5-7 years with a range between 0.9 and 8.5. Spain and Denmark reported lowest values (1.0 dmft and 1.3 dmft respectively). A higher value was mean dmft values below 2.0 and was also reported in Finland, the Netherlands,

and Norway (mean deft less than 2).<sup>21</sup> Our results of mean dmft was higher than those reported by these studies.

Mixed dentition gives the opportunity to study the association between the number of dental caries and the primary and permanent teeth. Many studies have suggested a clear relationship between presence of dental caries in the primary and permanent teeth,<sup>22</sup> indicating a predictive potential for presence and severity of dental caries in primary teeth on the prevalence and severity of dental caries in permanent teeth.

The mean DMFT in this study was 0.9, which was highest in North Badiya (Badiya Shamaliyah) (1.8) and 12-year-old school children at a value of 3.1. Our DMFT score may represent lower numbers than the actual caries severity in the community secondary to discrepancy in the age group distribution for this selected sample; with more deciduous teeth and fewer permanent teeth in the studied group (6- to 9-year-old age). Despite this discrepancy in age group, the caries index score of permanent teeth (2.7) was relatively high; it was highest in North Badiya (Badiya Shamaliyah) (3.2) and 12-year-old school children (5.1). Our reported score was like the reports from two studies including 12-year-old Sicilian and Sardinian children (2.88 and 2.4 respectively),<sup>23,24</sup> while a study from Greece reported a score ranging between 2.77 to 6.74 for the children with the same age group.<sup>25</sup> Two studies from Spain reported lower scores of 1.33 DMFT in the same age group, with a set up goal to reduce it below 1.0 by 2015.<sup>26,27</sup> For German and Hungarian 8- to 9-years-old children, the mean DMFT was 0.7 and 0.4 respectively.<sup>28</sup> Higher scores of dmft and DMFT in North Badiya (Badiya Shamaliyah) may be attributed to socioeconomic differences<sup>23</sup> and may indicate that more attention should be paid to this specific population.

Untreated decay represents a major component of the caries index. The high prevalence of untreated dental caries was like

other previous studies.<sup>6-8</sup> Low dental visit rates (93.3% of school students had never visited a dentist) which was reflected by many untreated caries could be explained by the absence of dental awareness, lack of affordable health care services or limited access to dental care.

Poor oral health habits indicated the fact that approximately one-third of school students never brushed their teeth, and was not compatible with the WHO recommendation for public health efforts to make fluoridated toothpaste affordable in developing countries.<sup>29</sup>

The effect of tooth brushing on development of dental caries was not apparent in this study, which was an unexpected finding. Our results revealed that tooth brushing did not positively influence the severity of dental caries as dmft or DMFT or SiC. This can be explained by either that the response did not reflect the true practice in this group or the tooth brushing technique was less effective in preventing caries. This relationship may be affected by confounders like the age at which brushing was started, dietary habits including ingestion of sugar and refined food, genetic predisposition, and lack of public fluoridation techniques, supporting that the cause of caries is multifactorial.<sup>30</sup>

The small trend toward better dental and oral health among Jordanians compared to Syrian refugees can be explained by the lack of care for Syrian refugees during their stay in Syria before they move to Jordan.<sup>31</sup> Prior to their arrival, refugees lack access to appropriate health care in addition to many social and psychological trauma's including family member's loss, income loss, separation from their communities or threats.<sup>32</sup> Stress encountered by Syrian refugees and their parents can negatively affect the oral health of students.<sup>33</sup> These results were like other study that showed refugees complained from high debris, more calculus, higher gingivitis, decayed, missing, or filled teeth scores.<sup>34</sup> These results suggested that refugees suffer from more unmet oral health need and

inability to access proper dental services in their communities which put more pressure and burden on those who provide health care for refugees (governmental and non-governmental) to put more efforts to provide them with a more complex and a higher state of health care than the needs of the general local population.<sup>35</sup>

Despite the above-mentioned limitations of sampling and indexing, our results demonstrated that dental caries is still a major dental health problem among schoolchildren in Jordan. Like other developing countries, lack of oral health experts and poor health infrastructure, is affecting the dental services provided for school children, the unlimited availability of refined sugar products with no awareness policies and protocol to decrease their consumption by children is another possible cause for this high prevalence of dental caries. Oral health and dental care information should be part of prenatal counseling to provide the expectant mothers with such instructions as early as possible. Access to dental care should be available for all communities aiming to provide such communities with a preventive care as well as a curative care.

## Conclusion

This study documented a high prevalence of dental caries among schoolchildren aged 6–12 years in Mafraq, Jordan, and there were SiC of 7.0 and 2.7 for deciduous and permanent teeth, respectively, which reflected negligence of children oral health. Untreated dental caries was the main component of DMFT scores among the examined population, indicating lack of dental care services for those children, especially for refugees. Oral hygiene measures were poor in the study population.

## Conflict of Interests

Authors have no conflict of interest.

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