

The cost of dental caries in Saudi Arabia.  
Putting numbers into context

Abdullah A. Marghalani, BDS, MSD,  
Yaser A. Alsabafi, BDS, MSD,  
Ehab N. Alshouibi, BDS, DScD.

Although wellness is not easy to define, the World Health Organization (WHO) in 1948<sup>1</sup> defined health as “a complete state of physical, social, and mental well-being and not merely absence of disease”. This bio-psycho-social model changed the previous concept of health oriented merely by disease. Therefore, promoting oral health, and preventing dental caries is a dimension of being healthy. Tremendous monetary benefits are expected when primary prevention of dental caries especially in children is implemented. The aim of this report was to discuss primarily the monetary cost of treating dental caries for children in Saudi Arabia.

Decayed, Missed, and Filled Teeth (DMFT) is an index classically utilized in epidemiological studies to anticipate dental caries history (treated and un-treated teeth). The WHO, Oral Health Database, has both a global and country specific DMFT estimates for 12-year-old children.<sup>2</sup> Globally, over the past 31 years, DMFT showed a decreasing temporal trend of one unit. In 1980, the DMFT was 2.43. In 2001, it declined to 1.74, and then to 1.67 in 2011; further indication of a declining trend. Country specific DMFT estimates from Sweden, New Zealand, and Japan demonstrated great temporal reduction. In Sweden, the DMFT decreased from 6.3 in 1977, to 0.9 in 2008. The DMFT in New Zealand decreased from 5.1 in 1980, to 1.4 in 2009. Similarly, Japan showed reduction of DMFT from 4.9 in 1987, to 1.7 in 2005. On the contrary to the globally observed decline in DMFT trend, countries like Saudi Arabia, Jordan, Kuwait, Gambia, and Thailand were facing an upward trend in mean DMFT over time. The mean DMFT in Kuwait has increased from 2 in 1982, to 2.6 in 2000. In Saudi Arabia, the mean DMFT has substantially increased from 2 in 1979, to 5.9 in 2002; a 195% increase in approximately 23 years (around 4 additional teeth). Comparing the mean of DMFT in Saudi Arabia to the WHO Eastern Mediterranean

region, which has 22 countries including Saudi Arabia, reveals that Saudi children have more dental caries experience relative to children from the surrounding countries, with a 4.6 DMFT difference. Moreover, within the WHO oral health database that includes more than 180 countries, the highest estimated DMFT was for Saudi Arabian children (DMFT=5.9 in 2002). No other country had such a high DMFT index in the new millennium.

The prevalence of dental caries in Saudi Arabia was measured and presented by the National Campaign to Prevent Dental Caries (NCPDC).<sup>3</sup> In 2008, they found that the minimum prevalence of dental caries among 6 to 7-year-old children was 74% in Hail, while the maximum prevalence was 93% in Asser. The median prevalence of dental caries was 86% in Jizan. A similar measure of DMFT score reported by WHO was also presented by a recent systematic review.<sup>4</sup>

As shown in Table 1, the estimated cost to treat all children aged 14 years or younger in Saudi Arabia is around 3.9 billion Saudi Riyals (SR), assuming each child had around 6 decayed teeth, and the prevalence of dental caries is approximately 84%. It should be noted that the large estimated cost relative to the population size (N=7,758,600) is reflective of the imperative need for immediate attention and comprehensive action. The allocated cost is derived from 3 main sources: salaries, general overhead expenses, and direct expenses. The estimated total cost for treating a decayed tooth by a general dentist in a governmental facility approximates SR100. The cost of the dental work force is SR80. General overhead (depreciation, utilities, rent, and cleaning) was assumed to cost approximately SR15 and direct expenses (materials and supplies) around SR5. These monetary costs may increase when treatment is provided by a specialized dentists or treatment center. The number of children in Saudi Arabia was extracted using the July 2010 population statistics from the Central Department of Statistics and Information, Saudi Arabia.<sup>5</sup> Limitations include that the cost was estimated

**Table 1** - Estimated monetary cost to treat dental caries in 6-year-old children living in Saudi Arabia (N=7,758,600).

| DMFT | Cost per child* | Prevalence (%) | Number of affected children | Cost          |
|------|-----------------|----------------|-----------------------------|---------------|
| 6    | 600             | (74)           | 5,741,364                   | 3,444,818,357 |
| 6    | 600             | (84)           | 6,517,224                   | 3,910,334,352 |
| 6    | 600             | (93)           | 7,215,498                   | 4,329,298,746 |

DMFT - decayed, missing, filled tooth. All costs are in Saudi riyals (SR).  
\*Average cost per tooth is SR100.

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using the number of children who live in Saudi Arabia regardless of their nationality. In this study, we assumed that all children were to be treated under normal dental settings with simple local anesthesia. The cost would increase when treatment requires special clinical setting such as sedation or general anesthesia.

In addition to the monetary costs, the impact of toothache on a child due to dental caries might range from discomfort to almost a paralysis-like state. Reduced functional ability like eating, drinking, memorizing, or playing is anticipated. Some reports showed that children with toothache were around 4 times more likely to have a low GPA.<sup>6</sup> Oral health fitness is a prerequisite for military recruitment within Saudi regulations. A beautiful full set of dentition might be desirable for jobs that require personal interactions, such as in the media. Some other occupations often rely upon proper pronunciation and phonetics, such as teaching and public speaking. Briefly, oral health might contribute to the individual productivity as well as social dynamics within a community.

In epidemiological terms, dental caries in children has reached an epidemic level in Saudi Arabia. In statistical terms, Saudi Arabia is an outlier. Thus, this is a significant public health problem demanding a public health solution. Currently, in Saudi Arabia, most dental preventive strategies are usually secondary and tertiary. Little has been devoted for primary prevention and if practiced, it is carried out in the form of clinical services directed to individuals rather than the whole population. Community water fluoridation is an outstanding example of a primary prevention designated for the whole community. Evidence from the Center for Disease Control and Prevention (CDC) supports cost savings from preventive actions. For instance, for every \$1 spent in prevention, there was an approximately \$38 cost savings in dental treatment costs.<sup>7</sup>

In conclusion, dental caries might be viewed as a "hole in a tooth". Yet, the consequences might extend to "the whole society". Saudi Arabia is experiencing an epidemic level of dental caries that dictates immediate

collaborative, systematic, and multi-level intervention, especially for children. Otherwise, needless higher costs are anticipated.

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*From the Department of Preventive Dentistry (Marghalani), Faculty of Dentistry, Umm Al-Qura University, Makkah, the Preventive Dental Sciences Department (Alshafiqi), College of Dentistry, Taibah University, Madinah, and the Community Dentistry Division (Alshouabi), Faculty of Dentistry, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia. Address correspondence and reprints request to: Dr. Abdullah A. Marghalani, Department of Preventive Dentistry, Faculty of Dentistry, Umm Al-Qura University, PO Box 14405, Makkah 21955, Kingdom of Saudi Arabia. Tel. +966 (12) 5270000. E-mail: Marghalani.a@gmail.com*

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