



Dietary and Geographic and Cultural Factors as Predictors of Dental Caries Risk among Children in Saudi Arabia – A Systematic Review

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Abstract

The widespread prevalence of dental caries in Saudi Arabia has been a cause for concern. As the largest country in the Middle East region and with a population of over 20 million, geographic and socio demographic challenges play a role in understanding caries risk in the country. The aim of this systematic review was to use the PRISMA guidelines to conduct a systematic review of the dietary, geographic and socio demographic factors that could influence the prevalence of dental caries in Saudi Arabia. A review of the MEDLINE, Pubmed Central, Google Scholar and EBSCO databases revealed 47 relevant articles. This review discusses the through the findings of the above mentioned articles the dietary, geographic and socio demographic factors that could influence the prevalence of dental caries in children in Saudi Arabia.

Keywords: Diet; Dental caries; Children; Early childhood caries; Geographic factors; Socio-demographic factors

Introduction

Dental caries has been recognized by the World Health Organization as an infectious disease that could impact the physical, social and emotional well-being of children. The widespread prevalence of caries in Saudi Arabia has been attributed to a variety of factors including diet, lack of education, and a lack of parental awareness [1-3].

A recent systematic review suggests that dental caries in Saudi children could be higher than 80% in the primary teeth of children fewer than 12 years of age [4]. Such a high prevalence of dental caries often negates the effectiveness of caries risk tools used in the West as they classify almost all children as “High Risk” leaving little room for differentiation or sensitivity.

Caries risk assessment requires a detailed understanding of the dietary and cultural factors that contribute to the occurrence of caries [5-8].

Saudi Arabia is a “young country” with over 50% of the population being under 12 years of age [9]. Since the first studies on prevalence of dental caries in the Kingdom of Saudi Arabia were carried out in the 1990’s, the severity of the disease and the impact it has had on children has been documented in detail [10-13]. Although the prevalence of dental caries in Saudi Arabia has been reviewed and even meta-analyze [4,14], few have attempted to review the cultural, regional and dietary variations in dental caries in Saudi Arabia.

The aim of this systematic review is to analyze the data currently available in literature with regards to the impact of diet, geography and cultural factors that could influence the prevalence of dental caries among children in Saudi Arabia.

Methodology

This systematic review was performed using the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines for systematic reviews and meta-analyses. The following sets of keywords were used to identify articles of interest from the MEDLINE, Pubmed Central, Google Scholar and EBSCO databases,

- 1) Diet, dietary factors, Saudi Arabia, dental caries
- 2) Region, Saudi Arabia, dental caries
- 3) Cultural Factors, Saudi Arabia, dental caries

Keywords	Total number of responses		
	Pubmed	Google-Scholar	Relavant Articles
Diet, dietary factors, Saudi Arabia, dental caries	7	4790	39
Cultural Factors, social factors, Saudi Arabia, dental caries	1	3100	34
Region, Saudi Arabia, dental caries	109	8940	43

Table 1: Summary of the findings of the keyword searches.

The articles that appeared on the search were then filtered for relevance (Table 1) and then subjected to the PRISMA flow-chart (Figure 1).

A total of 47 studies matched the aim of this systematic review. The studies were then analyzed to identify geographic, cultural and dietary factors that could influence the prevalence and severity of dental caries among children in Saudi Arabia.

Results

Dietary Habits

The role of dietary habits and the relationship of these habits to socio-economic status, order of birth and the education of the mother have been documented in literature [15]. Attempts have been made to document the dietary behavior of Saudi children and how this is impacted by factors such as the availability of fermentable carbohydrates in schools or the socio-cultural traits of parents [1-10].

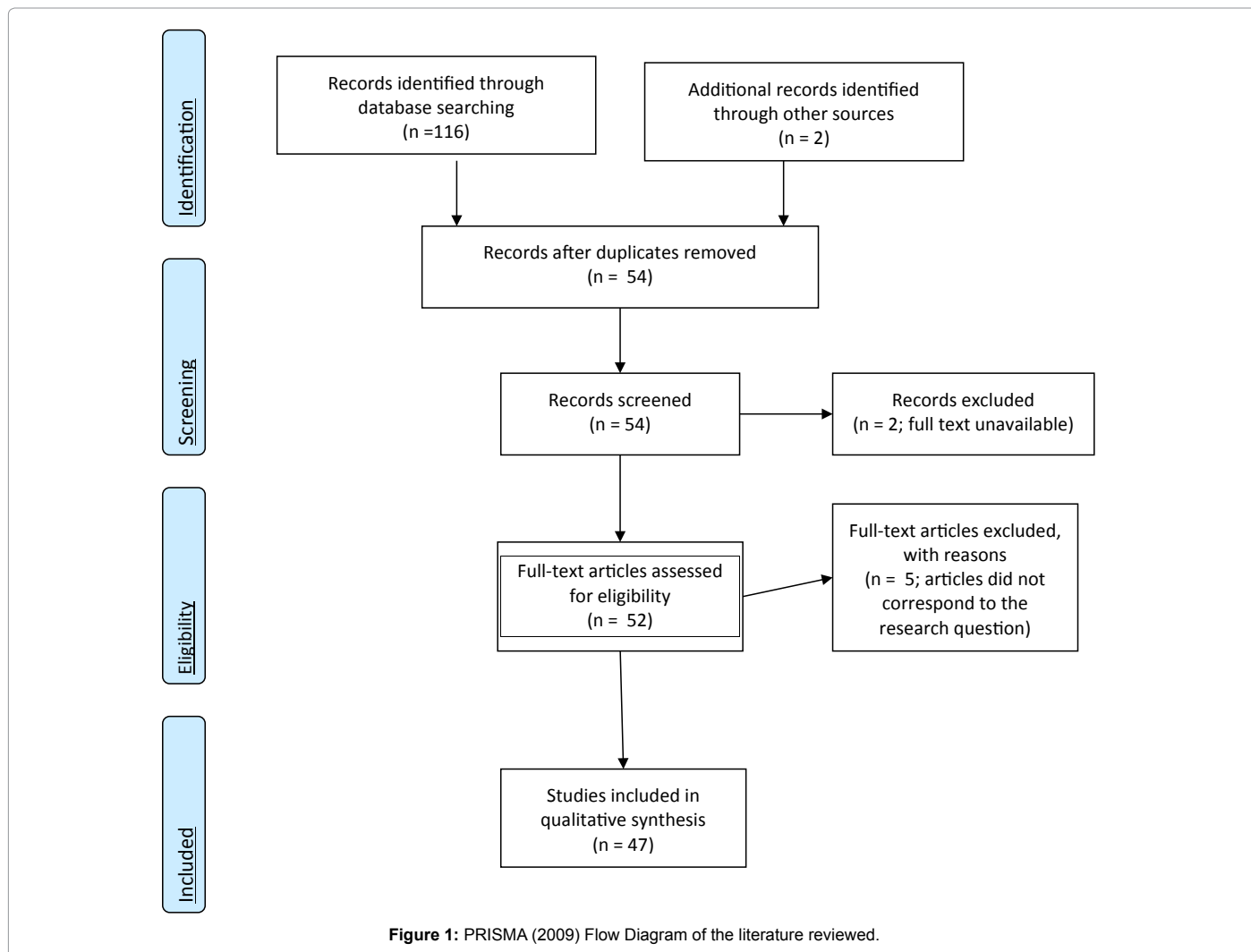
Al Dossary et al studied the feeding patterns of children in Saudi Arabia and found that the use of milk is rare and breast feeding is common but higher number of children are breast fed g before sleep [16]. There has also been documentation of an increase in the use of

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bottled milk and carbonated drinks in bottles [14,17-19]. Wyne et al reported that carbonated drinking items are popular and give these contents in feeding bottles to the children [15]. Several studies have corroborated these findings, with some suggesting that as many as seventy five percentages of the Saudi children took soft drinks and fruit juices in feeding bottle [17-19]. The consumption of sugar containing drinks has also been reported in older children. ALSadhan and Salwa showed that the use of sugar containing drinks increased to three times a day in Intermediate school children (13-18 years of age) as compared to once daily in primary school children (aged 6-12 years) [20].

There have been reported incidences of success through enforced diet control. For example a group of children living in a social welfare institute in Jeddah city where a strict dietary control and regular application of oral hygiene measures showed lower prevalence of dental caries [21]. However this systematic review was unable to find evidence of such programs being implemented in non-institutionalized children in Saudi Arabia.

Geographic Factors

Saudi Arabia is a large country with a population of around 28.2 million individuals, over half this population is under the age of 12 years [9]. The Kingdom of Saudi Arabia also has a land area of 2,149,690

km² making it the largest country in the Arab world. Although the Kingdom is spread over 13 main administrative regions the bulk of the population is concentrated in the three major urban regions of Riyadh, Jeddah and Dammam [9], it is therefore natural that a majority of the studies have been reported from these areas (Figure 2).

Many studies show that caries distribution in the Kingdom varies from 90-95%, with some studies suggesting that only 4% of Saudi children aged between 6-7 years of age were free of dental caries [8,12,21,22]. Nainar and Wyne, in a study conducted in Riyadh suggested that preschool children had anterior and posterior teeth problems in about 90% and almost all the pre-school children had posterior caries [23]. Aldosari et.al. found that dental caries in AlQaseem area was 90.5% and 91.1% in Riyadh city is 91.1%. The mean DMFT score in Qaseem was 7.05 and 7.35 in Riyadh [16].

A recent Meta-analysis of caries in the different regions of Saudi Arabia put the prevalence of dental caries at 85%. The paper also pointed out that while publication bias observed in the analyses might overestimate the level of dental caries in the permanent dentition, there was no overestimation of dental caries in the primary dentition [14].

The difference between the caries rates between urban and rural populations is a factor that has received little attention. Results derived

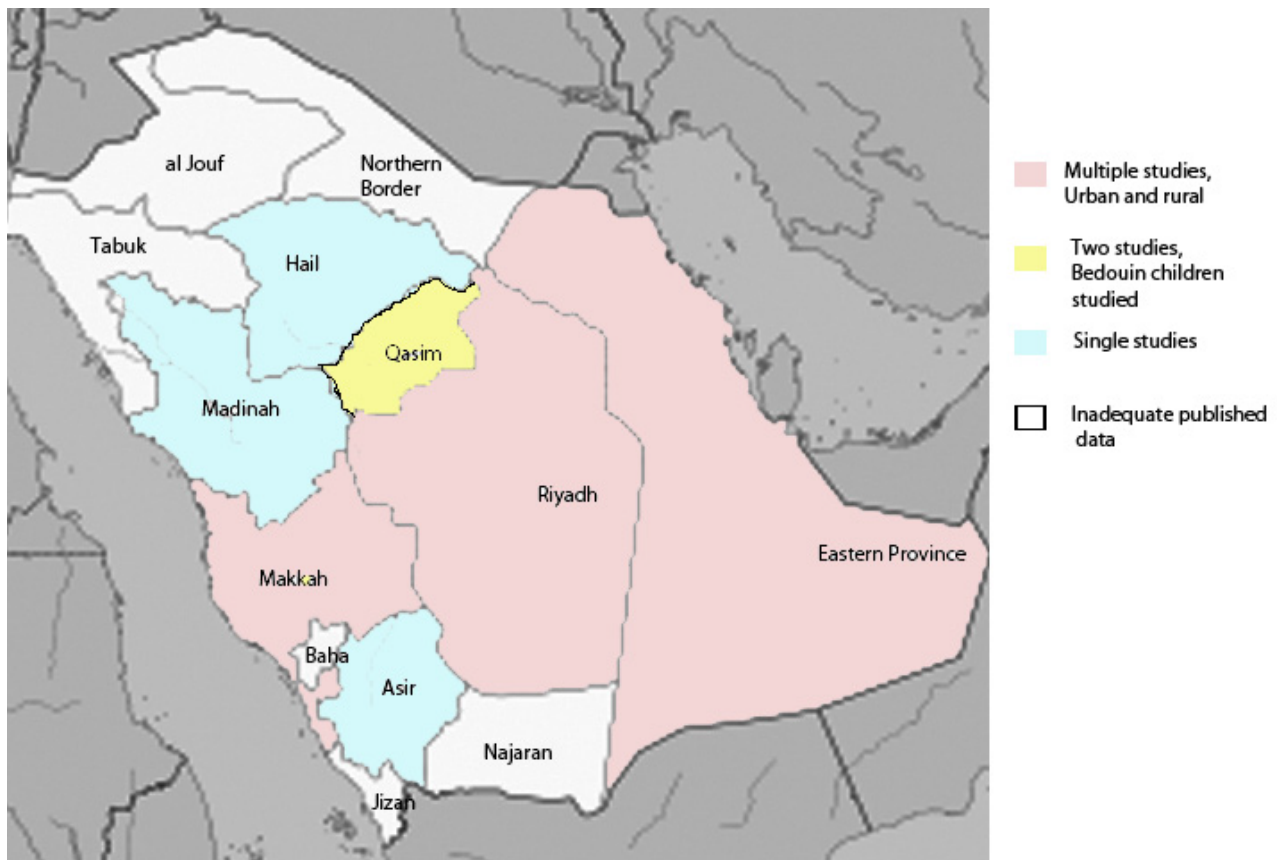


Figure 2: Map showing the reporting of caries data in the major administrative regions of Saudi Arabia.

from the first national oral health survey suggested that children in rural parts of Saudi Arabia had higher caries rates when compared to their urban counterparts [13]. Despite this higher prevalence of dental caries in rural children a study showed that only one fifth of Bedouin children had poor oral hygiene and these children have lower caries prevalence than both their urban and rural counterparts [2]. The nature of population distribution has meant that most studies have been done in the densely populated Riyadh, Makkah and Eastern Provinces, with little detailed data available from other regions, it is also seen that some regions do not have adequate published data (Figure 2).

Geographic Considerations to Fluoride Exposure

Since there is no centralized water fluoridation program in the Kingdom of Saudi Arabia, the fluoride intake of children through water remains determined by geographic considerations. There have been attempts made to estimate the fluoride levels in the water from different parts of the Kingdom of Saudi Arabia [24]. Al Dossary et al, in their extensive study of the relationship between fluoride levels and dental caries in the Kingdom found that children from areas with high levels of fluoride in the water did not show significantly lower caries rates than their counterparts in areas with low levels of fluoride [16,24,25].

The lowest (DMFT) was found in children from lowest water fluoride level and higher DMFT from areas with more optimum water fluoride level [16]. There have been several explanations postulated for this lack of linear relationship between fluorides and dental caries. It has

been suggested that extremely poor dietary habits combined with an apparent lack of awareness, water down the probable effects of Fluoride [26]. Another explanation that has been preferred is that the absence of accurate data on the source of potable water, and an inadequate data on the number of children consuming bottled water makes it difficult to evaluate the relationship between fluoride and dental caries [25]. However, a more recent study, based on the relationship between dental fluorosis and dental caries showed that at levels above 0.6ppm, there was evidence of mild dental fluorosis in a significant number of children [24].

In majority of regions in Saudi Arabia the fluoride level was lower than recommendations and the highest fluoride level in water was in Hail region and it was 1.27 PPM while the lowest mean in fluoride levels found in As per region [24]. However it must be remembered that Saudi Arabia is an arid desert country with average temperatures approaching 36° C (96°F). The water consumption would therefore need to be adjusted for this higher temperature and relative lack of humidity. Given these factors there is a need to critically analyze the optimum fluoride levels in the Kingdom of Saudi Arabia.

Cultural and Socioeconomic Factors and their Impact on Dental Caries

The literature reviewed suggests that cultural and socioeconomic factors have an influence on the prevalence and severity of dental caries. This is visible in terms of the impact of these factors on the type of oral hygiene practices used in children as well as the parents attitude towards dental visits

Oral Hygiene Practices

Recent reviews and Meta analyses show that poor oral hygiene rates exist among the children of the different Saudi regions [14,16]. There are cultural factors related to oral hygiene practices and dietary habits which produce a comparatively higher rate of dental caries among Saudi people [27].

A study from Riyadh showed that more than ten percent of children had poor and about fifty percent had reasonable oral hygiene [28]. Tooth cleaning with the brush is at the age of two years are rare among children and the age of brushing their teeth is beginning after three years of maturation [29-31]. Oral hygiene care practices in the Saudi population seem to start later than the suggested time for the teeth cleaning. It has been reported that about forty percent of preschoolers in Riyadh city did not brush their teeth [32]. Similar findings were observed in Alkharj city [33]. While in Tabuk city which located in the north west region the studies showed that the mother educational level play an important factor in oral hygiene practices [34,35].

The birth-order of the child or number of children in the family does not seem to affect the brushing practices or first dental visit pattern [36]. Wyne et.al. In their survey showed that although a majority of the children were aware that oral health is an essential factor towards the general health of a person about one fifth reported that they have no idea about effective brushing for their teeth [36]. In another study one fourth had not been taught how to brush their teeth [37]. This general lack of willingness of children to brush their teeth, and a lack of the will to educate them seems to suggest that traditional methods may offer some hope.

The use of miswak which is a tooth cleaning twig is a socially recognized dental cleaning method prevailing in Saudi Arabia and has been reported to result in significant reductions in plaque [38,39]. A study conducted in 10 regions of Saudi Arabia based on 3117 persons fifteen years and older revealed that half the population studied used miswak for their dental cleaning [40].

This habit has religious support as well as social acceptance. Generally a large part of the society follows the use of miswak. The use of miswak among young Saudis seems to cut across social, economic and regional lines with multiple studies confirming acceptance of this habit [29,38-41]. Children are often influenced by their teachers and studies have shown that between two third and a fifth of all school teachers surveyed used only miswak (Figure 3) to maintain oral hygiene [42].



Figure 3: Miswak intact and chewed.

Education also seems to play a role in the prevention of dental caries. Mothers with a college education have been shown to give more care to their children's dental cleaning, including the use of adjuncts such as dental floss [20]. It has also been demonstrated that maternal education plays a much more significant role than the education of the father when it comes to parental awareness towards the oral health of Saudi children [43].

Dental Visits

It has been shown that parents in Saudi Arabia have a lack of knowledge about the benefits of regular dental check-ups for their children [19]. 12.5% completed their initial appointment at age 12 months and the average number of children is 4.36 per family that is high rate contrast with western countries [19].

While the usual reason for not visiting a dentist is the unavailability of dental care, data from Saudi Arabia seems to contradict this. About one fourth of the students sampled in Jeddah city; a large city with the highest number of registered dentists in Saudi Arabia (MOH 2012); had never visited a dentist [44]. In Riyadh city, only below fifteen percentages of children are ready to visit the dentist for a regular check-up [45]. It has been repeatedly documented that children go to a dentist in Saudi Arabia only under the condition of pain in their teeth [1,4,22,36,46]. Moreover, 40.0% of children thought that one must visit the dentist only in case of pain in the teeth [3]. While in AlJubail city which located in the east region about two third visited the dentist only in case of dental problems [47].

Conclusion

This systematic review reveals that the Dietary factors (including fluoride exposure), Cultural factors such as feeding practices in infants and the use of miswak, and the diverse geographic distribution of population in Saudi Arabia, each in their own way influence the prevalence of dental caries among children.

However the review also shows that there is little attempt to study these factors on a large scale. How these issues are addressed in future oral health surveys will be important if a tool is to be developed to assess caries risk in children in Saudi Arabia.

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