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## ORIGINAL ARTICLE

# A systematic review and meta-analysis of primary teeth caries studies in Gulf Cooperation Council States

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## KEYWORDS

Dental caries;  
Children;  
Primary teeth;  
Prevalence;  
*Dmft*;  
GCC countries

**Abstract Objectives:** The aim of the study was to evaluate the prevalence and severity of dental caries in pre-school children in the Gulf Cooperation Council (GCC) area.

**Methods:** A search of literature was conducted to identify articles of dental caries in primary dentitions published during the period from January 1st, 1992 to June 30th, 2016. PubMed, Google Scholar search, and hand searching of journals was conducted to identify relevant articles. The search strategy employed both dental subject headings and free-text terms.

**Results:** Out of a total of 193 studies that fit the initial inclusion criteria, 159 studies were further excluded. Only 34 studies were included in the systematic review and meta-analyses. The overall mean *dmft* in the primary teeth was 5.14 with prevalence of 80.9% in the GCC area. A high level of heterogeneity in the selected studies was found as demonstrated by Q-value of 2538.501 ( $df = 21$ ) and  $I^2$  value of 99.17%. However, the funnel plots showed symmetrical shape at the bottom in both *dmft* and prevalence studies indicating absence of publication bias, which was also confirmed by insignificant result of Egger's regression statistical test (Egger's test  $P = 0.179-0.358$ ).

**Conclusion:** Caries in the primary dentition in the GCC States was high both in terms of mean *dmft* (5.14) and prevalence (80.95%).

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## 1. Introduction

Dental Caries is a progressive irreversible microbial disease affecting the hard tissues of the tooth. It is the most prevalent chronic disease affecting the human race and is painful, expensive to treat and can cause harm to nutrition and overall

health (Al Agili, 2013). Dental caries in infants and young children is known as Early Childhood Caries (ECC). It is defined as the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger” (American Academy of Pediatric Dentistry, 2007-2018). Once it has occurred, its manifestations persist throughout life even after the lesion has been treated. It affects both genders, all races, all ages and all socio-economic groups (Moses et al., 2011). Caries can cause pain, which varies in severity, but has the potential to compromise the quality of life of affected children. Caries may not only result in disfigurement but also have deleterious effects on future dentition (Kowash, 2014). It is a widely established fact that dental caries is an infectious disease induced by diet. The main etiological factors causing this disease are; cariogenic bacteria, fermentable carbohydrates, a susceptible tooth (host) and time (Harris et al., 2004). In children, dental caries is particularly critical because even following repair, the affected tooth structure exhibits increased vulnerability to damage (Al Agili, 2013).

The mechanism of the caries process leads eventually to cavitation of the tooth structure. As a result of the fermentation of carbohydrates, organic acids are produced by oral bacteria, including lactic, formic, acetic and propionic acids. These acids are able to penetrate dental tissues and dissolve the enamel forming the outer layer of the tooth, together with the underlying dentin and the cementum which forms the root of the tooth. The erosion of substance can lead, in time, to cavitation (Featherstone, 2004). Usually the examination for dental caries is performed after teeth have been air-dried, under artificial light and with the aid of a dental mirror and an explorer which is used for the removal of plaque. The number of teeth with caries is recorded for each patient. All erupted teeth are evaluated according to the criteria recommended by the World Health Organization (WHO) using the decayed, missing, filled teeth (*dmft*) index for primary teeth (Pezementi and Fisher, 2005).

There are a limited numbers of studies done in the Gulf Cooperation Council (GCC) States regarding the prevalence of dental caries, therefore more studies are needed to more clearly understand the status of caries in this region. The format of a systematic review is very effective in collecting a large amount of data and analyzing it simultaneously. Examples of GCC States caries status can be seen in studies that have assessed the national prevalence of dental caries and its severity in children in the Kingdom of Saudi Arabia (KSA) and the United Arab Emirates (UAE). In the KSA, caries prevalence was estimated to be approximately 80% for primary dentition (Al Agili, 2013). While in the UAE, the prevalence of dental caries was very high in preschool children, 36% to 47% at two years of age, 71% to 86% at age 4 years and 82% to 94% at five years of age according to Al-Hosani and Rugg-Gunn (1998). According to a UAE survey done in 2006, the proportion of five-year olds who had caries experience in the primary dentition was 83% overall; this varied from 71% in Ajman to 93% in the Western Region (El Nadeef et al., 2010). Therefore, the main objective of this systematic review was to identify the overall prevalence and severity of dental caries in pre-school children in the GCC area.

## 2. Methods

A literature search on the prevalence of dental caries in GCC countries was conducted at the Hamdan Bin Mohammed College of Dental Medicine, Mohammed Bin Rashid University of Medicine and Health Sciences (MBRU). Studies identified by database searches including PubMed, Google Scholar search, and hand searching of journals and an attempt to gather unpublished reports. Conference proceedings were outside the scope of the review. The PubMed database and Google search were conducted using the search by key words as follows: *dental caries, child, prevalence, DMFT, dmft, and GCC countries (Bahrain, Oman, Kuwait, KSA, Qatar, and UAE)*. The search included all literature published in English and Arabic from January 1st, 1992 to June 30th, 2016. The titles, authors, and abstracts from all studies identified were printed and reviewed independently on the basis of keywords, title, and abstract by two reviewers to determine whether these meet the inclusion criteria. The principle investigator (WA) and main supervisor (MK) assessed the retrieved records for inclusion independently. They were not blinded to the identity of the authors, their institution or the results of the research. The principal investigator obtained and assessed the full report of the records considered to meet the inclusion criteria. Disagreements if any were resolved by discussion. The protocol was approved by the Research and Ethics Committee of MBRU.

### 2.1. Data collection

The inclusion criteria were: (1) studies conducted in one of the six GCC countries; (2) studies including prevalence and/or *dmft* data; (3) healthy participants without systemic diseases. Whereas the exclusion criteria were: (1) studies in children with systemic diseases; (2) studies with participants below two years or older than 16 years; (3) studies on prevalence and/or severity of caries in specific teeth; (4) any study published before January 1992; (5) studies with duplicated data. Search results showed 193 articles, which had one or more of search key word/text in the title or abstract. Almost all (191) identified through database search and two through other sources. The aforementioned inclusion and exclusion criteria were applied to the 193 searched articles and subsequently 120 were excluded due to them being non-GCC studies. From the 73 studies that remained and were assessed in full-text 39 were excluded for various reasons (five studies duplicates, five studies reported combined *dmft*/DMFT in mixed dentition, two studies investigated caries in medically compromised children, one study investigated specific teeth and 26 studies reported caries in permanent dentition Fig. 1). Data extracted from the 34 studies included information for primary teeth caries (prevalence and *dmft* data) Table 1).

### 2.2. Statistical analysis

The overall prevalence and severity in different studies were expressed as standardized values (i.e., the standardized mean difference) together with the relevant 95% confidence interval (CI), to enable quantitative synthesis and analysis

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