Genetic Basis of Early Childhood Caries: A Systematic Review

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Abstract

Early childhood caries (ECC) is defined as "the presence of one or more decayed (non–cavitated or cavitated lesions), missing or filled (due to caries) surfaces, in any primary tooth of a child under six years of age" and affects 48% of children worldwide [1]. One of the causes that may be associated with the disease is related to genetic factors [2]. On the latest point, the studies published aimed to evaluate the relationship between ECC and the genetic factors have shown "contradictory results". The aim of this systematic review was to determine the association between ECC and genetic factors.

Materials & Methods

Search of the literature was performed using Scopus and MEDLINE (Pubmed). All publications considered in the study were from Jan 1990 to May 2022. The keywords used and PICO are depicted in table1 and table2 respectively. The selection of the studies were based on analytical observational studies including cross sectional, case control, and cohort studies.

The general characteristics included participants who were younger than 72 months old as well as the responsible/suspected gene and its association with the presence and severity of ECC. The genetic abnormalities included single nucleotide polymorphisms or abnormal genetic loci.

The collection of the data and final papers selection were performed using a format that included: the characteristic of the study, type of study, title, authors, abstract, journal in which the study was published, and date. This information was extracted by two reviewers (AB and AS).

Tables and figure

Table1		
Keyword 1	Keyword 2	Keyword 3
Children	Dental Caries	Polymorphism
Childhood	Dental caries susceptibility [Mesh]	Genetic
Child	Dental caries [Mesh]	Genomics
Child, preschool [Mesh]	Caries	Genetic predisposition
		Gene
Child [Mesh]		Genetic
		Genetics [Mesh]
		Polymorphism, Genetic [Mesh]
		Polymorphism, Single nucleotide [Mesh]

Table2	
Population	Children under 72 months old
Intervention	Genetic
Control	Children without cavity
Outcome	Cavity

Fig1

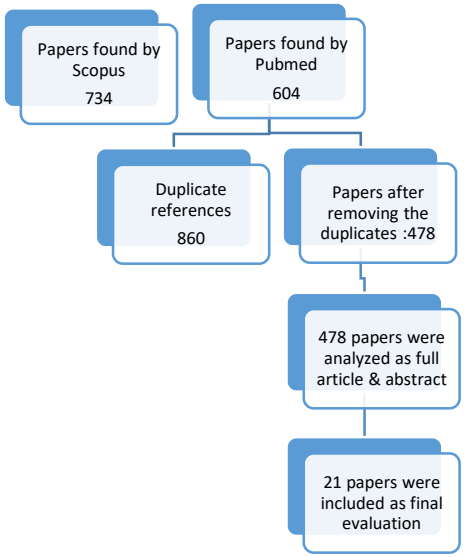

Table3	
Risk of Bias	Method for selecting participants
	Method for selecting exposure and outcome
	Method to control confounding
	Design specific source of bias
	Statistical method
High	0
Moderate	17
Low	4

Results

A total of 1,338 papers were found. After all papers were reviewed and duplicates were eliminated, only 21 publications were considered for the analysis (fig1). The data of the 21 papers were extracted and summarized including: topic of paper, journal, type of study, participants, DNA sample, analysis, and results. Strobe checklist was used to analyze risk of bias. From the 21 papers, 4 were classified as low risk of bias whereas the other 17 showed moderate risk of bias (table3).

The data analyzed were extracted from one Cohort, 10 case control, and 10 cross-sectional studies. From the 21 studies selected, 7 did not find any association between ECC with genetic factors. The other 14 studies showed significant results. These studies also evaluated different types of genes that might be associated with ECC, including (x-chromosome, ALOX15, KLK-4, MTRR, HLA-DRB1, chromosome 1,4,12, 20, AMELX, AMBN, TUFT1, VDR-Bsml, TNF-α. Among the different genes studied, ENAM & MMP were the most commonly reported polymorphisms.

Conclusions

Several types of genetic polymorphisms were found in different studies that may be associated with EEC.

It was also determined that due to the diversity of genes found that might be associated with ECC, a meta analysis of the results was not possible to be performed.

References:

1- Uribe SE, Innes N, Maldupa I. The global prevalence of early childhood caries: A systematic review with meta-analysis using WHO diagnostic criteria. Int J Pediat dent 2021 Nov; 31 (6):817-830.

2- Abbasoğlu Z, Tanboğa I, Küchler EC, Deeley K, Weber M, BS2, Kaspar C, Korachi M, Vieira AR. Early Childhood Caries is Associated with Genetic Variants in Enamel Formation and Immune Response Genes. Caries Res. 2015; 49(1): 70–77.