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Dental Caries and Preterm Birth- A Meta Analysis

ABSTRACT

Aims and objectives: Oral health care during pregnancy is said to be an essential but an overlooked factor. During pregnancy, women are more susceptible to dental caries due to various factors. The aim of the present study was to determine the association between dental caries and preterm birth.

Material and methods: The articles were searched from PubMed and PubMed central published between 2001 and 2019 using the keywords. The search keywords included "preterm birth" "dental caries" and "pregnancy". In addition, manual searches of the reference sections of the obtained articles were also conducted. A total of 2064 studies appeared through the search and were filtered according to the inclusion and exclusion criteria. Statistical analysis was done using the software Metaeasy version 1.4 for synthesizing quantitative results of the present meta-analysis that includes association between preterm birth and dental caries and depiction of publication bias. Out of the 2064 references obtained, 8 articles in English language were considered, which fulfilled the inclusion criteria.

Results: The study showed that dental caries during pregnancy had no such effect on the pregnancy term.

Conclusion: No relation was found between dental caries and preterm birth in the present review.

Key-words: Association, Preterm, birth, pregnancy, dental caries

Introduction:

Pregnancy is a state during which a woman may be acquiescent to disease, prevention and health promotion interventions that could enrich her own health or that of her infant.[1] Preterm birth is contemplated as one such governing factor of perinatal morbidity and mortality[2] in developing countries as the preterm infantsare born at less than 37 weeks of gestational age following spontaneous labor with intact membranes, preterm premature rupture of the membranes (PPROM), and labor induction or caesarean delivery for maternal or fetal indications.[3]

Prediction and prevention of preterm birth can be a challenging process in antenatal care due tomanifold etiologies as individual and environmental factors.[4] Pre-eclampsia or eclampsia, and intrauterine growth restriction aresaid to be common reasons for indicated preterm births. A history of preterm birth, low maternal body-mass index, black race or any periodontal disease, are the included risk factors for spontaneous preterm births.[3]

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Changes in oral cavity that includes pregnancy gingivitis, benign oral gingival lesions, tooth mobility, tooth erosion, dental caries, and periodontitis, caused due to the complex physiologic alterations are believed to be related to fluctuations in levels of estrogen and progesterone, leading to an increase in oral vasculature permeability and a decrease in host immune competence, thereby increasing susceptibility to oral infections.[5,6]

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Depending on several etiologic factors, dental caries which is a highly prevalent oral disease, causes the destruction of the dental tissues and produces local and general complications.[7]According to Selwitzet al "The signs of the carious demineralisation are seen on the hard dental tissues, but the disease process is initiated within the bacterial biofilm (dental plaque) that covers a tooth surface."[8]

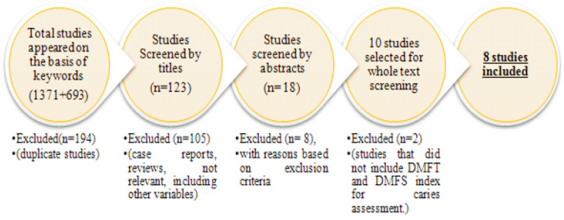
Since Literature provides evidence for the coexistence ofpreterm birth and dental caries, the meta-analysis hence, was undertaken with the objective of probing in the association between dental caries and preterm birth based on the previous studies.

Subjects and Methods:

An extensive literature search of studies published between the year 2001 to 2019 was done during the time period of December 2019 using thesearch enginesPUBMED CENTRAL and PUBMED, EBSCOhost, Cochrane library. The search keywords included "preterm birth" "dental caries" and "pregnancy". In addition, manual searches of the reference sections of the obtained articles were also conducted. A total of 2064 studies appeared through the search and were filtered according to the inclusion and exclusion criteria. The inclusion criteria for the study was observational cohort and case-control studies and the studies that used either DMFT or DMFS index for the assessment of dental caries whereas studies containing duplicated data sets and studies with fewer than 10 patients were excluded.

For the data extraction two reviewers independently screened the title, abstract and keywords of each reference identified by the search and applied the inclusion and exclusion criteria. The same procedure was applied to full text articles and potentially eligible references. Differences in reviewers' opinions were resolved by discussion or by a third reviewer.

Figure 1 Literature search flow chart for meta analysis on dental caries and preterm birth
Total studies appeared on the basis of keywords



Statistical Analysis

Statistical analysis was done using the software metaeasyversion 1.4 for synthesizing quantitative results of the present meta-analysis that includes association between preterm birth and dental caries and depiction of publication bias.

Results:

Table 1 mean±SD of DMFT score for dental caries assessment among women having preterm birth and full-term birth

Study	Preterm birth		Full-term birth	
	Mean±SD	Total	Mean±SD	Total
vergnes et al	8.55±4.97	1107	8.23±4.8	1094
Ryalat S et al	12.30±3.70	100	8.3±3.6	100
Corona et al	13.83±3.33	36	13.46±4.5	75
Tinez et al	13.50±7.00	25	11.82±6.4	45
Murman et al	15.70±7.00	18	13.4±6.4	158
Acharya et al	4.76±3.99	57	4.76±3.39	259

Table 2 mean±SD of DMFS score for dental caries assessment among women having preterm birth and full-term birth

Study	Preterm birth		Full term birth	
	Mean±SD	Total	Mean±SD	Total
Vergnes et al	23.06±8.45	1107	21.18±17.2	1094
Durand et al	17.90±2.80	34	20.1±73	73
Heimonen et al	19.20±17.70	72	19.2±14.4	214

Figure 2 forest plot of studies that used DMFT index for dental caries assessment

Preterm births < 37 weeks: a forest plot of 6 studies that used DMFT index for dental caries assessment. Left panel, displays the study. Each study is represented by a circle (denoting its risk ratio estimate) and the horizontal line denotes the corresponding 95% confidence interval. Pooled results from all studies are shown at bottom with the random-effect model.Studies that intersect the vertical line of unity (RR=1), indicate no difference between the case (preterm birth) and the control group(full-term birth) except for one study conducted by Ryalat S et al[9]which showed a negative association between dental caries and preterm birth.

1. vergnes et al
2. Ryalat S et al
3. Corona et al
4. Tinez et al
5. Murman et al
6. Acharya et al
7= OVERALL MEAN

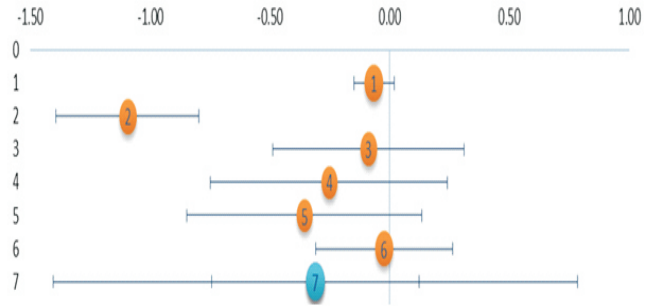


Figure 3: Forest plot of studies that used DMFS index for dental caries assessment

Forest plot of 3 studies that used DMFS index for dental caries assessment, each study is represented by a circle (denoting its risk ratio estimate) and the horizontal line denotes the corresponding 95% confidence interval. Pooled results from all studies are shown at bottom with the random-effect model. Studies that intersect the vertical line of unity (RR=1), indicate no difference between the case (preterm birth) and the control group(full-term birth). The figure showed that dental caries during pregnancy had no significant effect on the overall rate of preterm birth.

1=Vergnes et al
2=Durand et al
3=Heimonen et al
4= OVERALL MEAN

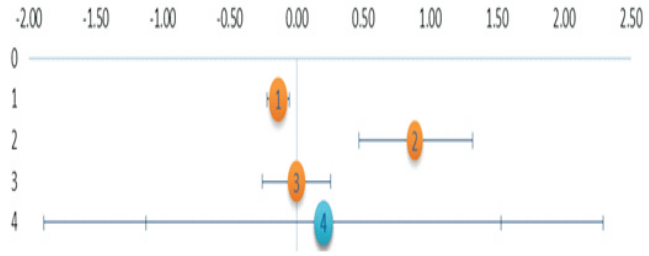
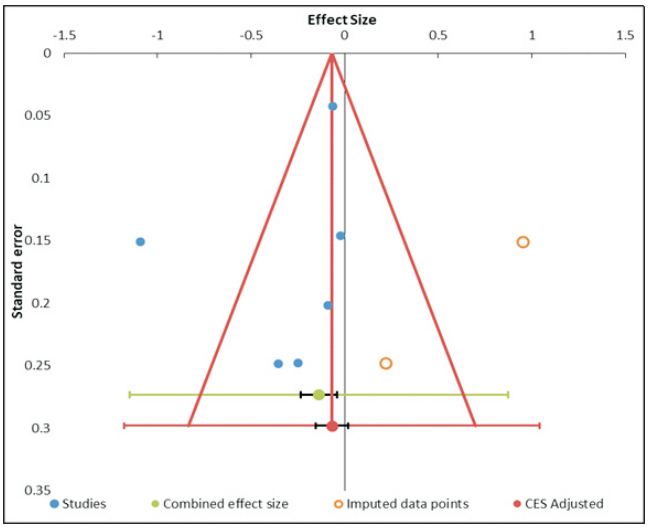


FIGURE 4:Funnel plot for publication bias

An analyses that indicate publication bias in a meta- analysis is a funnel plot. Examination of the funnel plot for our data suggests strong evidence of publication bias for dental caries and pregnancy outcomes in the meta-analysis.



Discussion:

Substantial evidence exist in literature suggesting that infections in pregnant women may alter normal cytokine and hormone-regulated gestation, which could result in preterm labour, premature rupture of membranes and preterm birth.[10]It has been demonstrated that women are more susceptible to dental caries during pregnancy due to the particular conditions they suffer, such as increased acidity in the oral cavity, sugary dietary cravings, inadequate attention to oral health and delayed treatment[11]

The present review tried to analyze the relationship between preterm birth and dental caries based on articles published from the period between 2001 and 2019. Out of the 18 abstracts read, 10 were excluded, leading to a total of 8final selected articles.

According to Minozzi et al."major etiologic factors in caries development during pregnancy include modified saliva composition (elevated acidity and mucin levels) that favors the formation of bacterial plaque; changes in dietary habits (smaller but more frequent meals to prevent nausea, vomiting, and hypoglycaemia);inadequate dietary intake of minerals, vitamins and other protective compounds;erosive effects of gastric acid (frequent vomiting and regurgitation); poor oral hygiene, and inadequate dental surveillance and monitoring".[12]

Visual examination of the exposed teeth or surfaces were included for the diagnosis of dental caries in included studies. The decayed, missing, filled teeth (DMFT) and decayed, missing, filled surface (DMFS) index were used to record dental caries in permanent dentition. No unanimity has been

reached between the studies included in the present Meta-analysis Exception were the study conducted by Ryalat S et al [9] and Vergnes et al[2] which stated that higher DMFT score was associated with preterm deliveries in contrast to other studies, which did not find this association.

Apart from the scarcity of the studies in literature, there are some other limitations of the present study such as the inclusion of only studies published in English language, fitting an element of selection bias. Not conceding the various confounding variables,such as socioeconomic factors etc. that might have affected the establishment of a relationship in some of the studies included.On the other hand, considering index like DMFT and DMFS for examination of dental caries only may lead to underreporting of the disease, though interproximal radiographs can be an option which is more sensitive to but it cannot be used in an epidemiological survey approximating the studies included.

Although the present study failed to depict any association between dental caries and preterm birth still according to Gaffield et al and Barak et al, various physiological changes occur in the during pregnancy. Fluctuations in the pregnancy hormones progesterone and oestrogen can increase the permeability of the oral blood vessels and decrease the immune response, thereby increasing the susceptibility of pregnant women to oral infections.[13,14]
Russell & Mayberry 2008 and Silk et al. in the year 2008 stated that the pregnant women are at a increased risk of suffering from various dental problems, the most common being dental caries, gingivitis and periodontitis due to hormonal variations in combination with changes in the oral fiora.[15,16,17]

Hence Pregnant patients must be educated about the importance of maintaining good oral hygiene, expected changes in the oral cavity and routine dental visits. Dental health professionals must be aware of upgradation of pregnancy related conditions and their proper management without harming the patient and foetus.

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