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## Public Health Interventions Targeting Maternal Nutrition and Oral Health: A Narrative Review

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### ABSTRACT

Maternal nutrition and oral health are key aspects of public health that significantly impact the well-being of mothers and their children. This review explores the connection between these two areas and how they affect health outcomes. The World Health Organization highlights the importance of good nutrition during pregnancy for the baby's growth and for reducing risks, such as gestational diabetes and preeclampsia.

This review looks at public-health programs that educate mothers about nutrition and provide supplements, like iron and folic acid. While these programs have been beneficial, they often fail to effectively reach low-income groups. Social and cultural factors, such as traditional eating habits, add further challenges, requiring interventions that are sensitive to cultural needs. These efforts have shown improvements, but they often fail to reach the low socio-economic groups effectively. Social and cultural factors, like dietary practices, create additional challenges, which call for culturally tailored interventions. This review stresses the importance of combining maternal care with oral health care to improve the overall health awareness among women. It highlights the successes and limitations of current strategies and suggests that involving communities and implementing strong policies can lead to better health for mothers and their children around the world.

**Keywords:** Maternal nutrition, Oral health, Public health, Pregnancy outcomes, Health literacy, Maternal-child well-being.

### 1. Introduction

Maternal nutrition and oral health are of significance in public health, playing a significant role for mothers and their children. In this context, the World Health Organization recognizes that nutrition is playing a critical role in health and development, meaning that improved maternal nutrition is essential for better infant and child health, stronger immunity, safer pregnancies, and fewer risks for non-communicable diseases (1). Poor nutrition in pregnancy leads to a variety of complications, such as gestational diabetes, preeclampsia, among others, resulting in adverse fetal outcomes (2). Furthermore, oral health is greatly affected by general health; as poor practice of oral

hygiene and unrecognized dental diseases may inflict detrimental effects on systemic health (3).

The nutritional conditions of mother play a critical role, not only for the well-being of mother, but also for that of their infants. Poor nutrient intake, especially at the critical periods of pregnancy and lactation, compromises the growth and development of children, including dental development (3). In general, the interplay of these nutrients and the formation of dental structure emphasize nutritional adequacy to preserve oral health (4). For instance, deficiencies in calcium and magnesium may lead to defective enamel structure, resulting in susceptibility to dental caries (5).

Public health interventions through mother nutrition

represent an important strategy in order to have a holistic approach to these inter-related issues. In low-and middle-income countries, maternal and child health programs were developed to encourage increased consumption of iron, folic acid, and essential micronutrients, which have been proven to improve maternal outcomes and lower the risk of anemia (6). Moreover, education on oral health has been recognized as an important strategy that enhances the overall general health education and enables women to take control over their health (7).

Although these interventions represent a remarkable progress, important difficulties persist in the delivery of nutritional and oral health services, and these difficulties are more notable among rural populations. Systemic impediments to quality oral health care underscore the necessity for targeted interventions aimed at overcoming such hurdles (8). Additionally, socio-cultural behavior shapes the dietary practices and health behavior, especially among women, particularly in rural settings (9). Understanding such influences is important for designing public health interventions for the target population (10).

As can be argued, oral health of pregnant women occupies a very important position. Recent evidence supports the fact that maintaining good oral health among pregnant women is not only very crucial for the mother, but for the baby as well, because maternal periodontal disease has been associated with adverse pregnancy outcomes, like low birth weight and pre-term birth (11,12). This fact demands that oral health care should be incorporated into maternal health programs to ensure the comprehensive care and well-being of the mother and her baby.

Considering these challenges and opportunities, this narrative review provides a global perspective on public health interventions focusing on maternal nutrition and oral health. By utilizing current research and synthesizing best practices, effective strategies for improving maternal nutrition to enhance oral health literacy, and consequently promoting the health of mothers and their children, will be explored. This will contribute to the ever-present dialogue on the importance of integrated approaches to maternal and child health, and will emphasize the need for policies that are specific to diverse needs. Despite maternal health programs, there are still some gaps that persist in the provision of nutrient and oral care services. Most of

them affect vulnerable populations. The objective of this review is to identify the gaps and propose practical solutions for their closure. This will be through informing public health policies towards the maintenance of maternal nutrition and oral health as essential determinants of maternal and child welfare.

## **2. Materials and Methods**

### **2.1 Literature Review**

Literature on maternal nutrition and oral health, focusing on public health interventions aimed at improving outcomes for mothers and their children was collected from various databases, including PubMed, Scopus, and Google Scholar, using keywords, such as "maternal nutrition", "oral health", "public health interventions", and "nutritional education". Initially, 200 studies were selected for review. After conducting a thorough cross-review, 25 studies were determined to meet the inclusion criteria and were included in the final analysis, as illustrated in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram (Figure 1).

### **2.2 Inclusion and Exclusion Criteria**

Studies included in this review included peer-reviewed articles published from 1995 till now focusing on maternal nutrition and oral health interventions. Studies that examined the impact of nutrition on maternal- and child-health outcomes were prioritized. Inclusion was based on PICO (Population, Intervention, Comparison, and Outcome) criteria. "Population" of the study included pregnant women and their children with special focus on maternal nutrition and oral health. "Intervention" stands for public health interventions targeting maternal nutrition (e.g., education programs, iron and folic acid supplementation) and oral health (e.g., oral health education, access to dental care). While "Comparison" was the standard care or lack of integrated public health interventions addressing both maternal nutrition and oral health. Lastly, "Outcome" denotes the improved maternal and child health outcomes, including reduced pregnancy complications (e.g., gestational diabetes, preeclampsia), better oral health literacy, reduced prevalence of adverse pregnancy outcomes (e.g., low birth weight, pre-term birth), and improved oral and dental health in children. However, non-peer-reviewed articles, opinion pieces, and studies that did not directly address the connection between maternal nutrition and oral health were excluded.

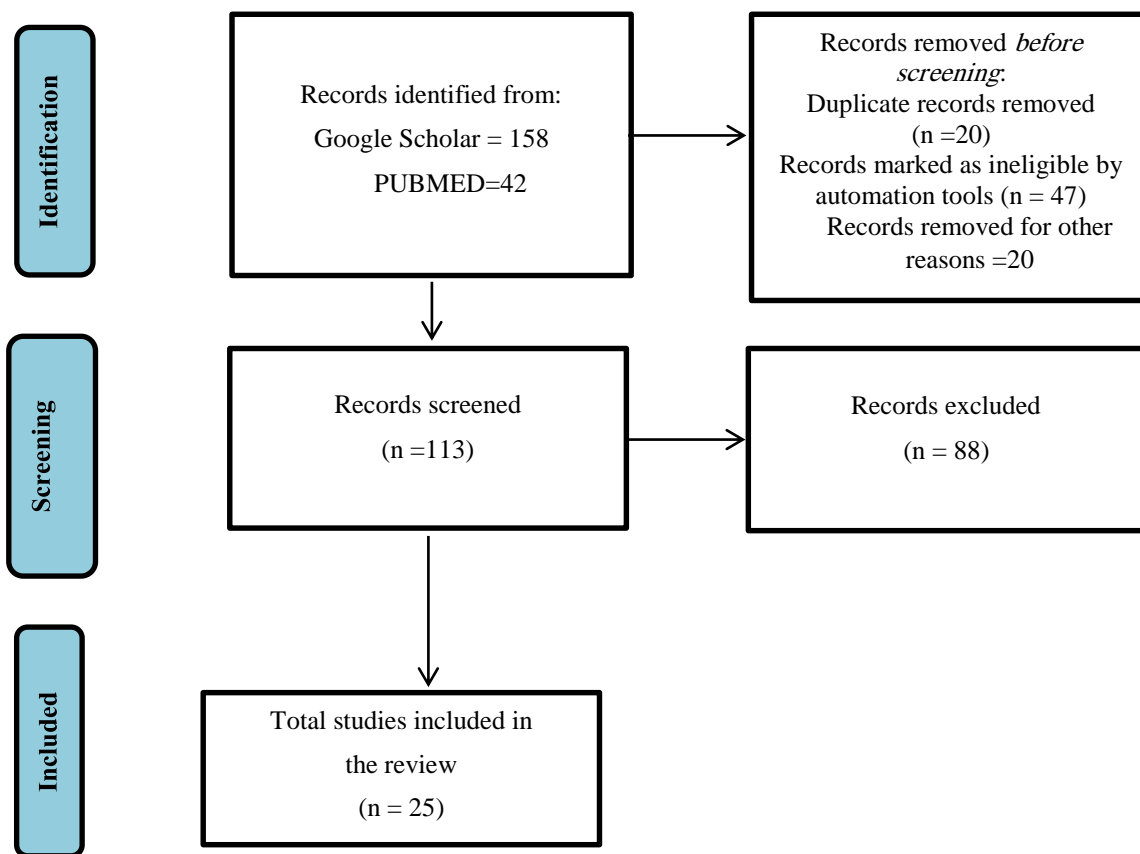


Figure 1: PRISMA flow diagram

**3. Results**

Maternal nutrition plays an extremely critical role in determining the oral health of a child. It affects, particularly, the development of teeth and, in the long run, the oral status of the child. Nutrient adequacy during pregnancy will ensure that proper minerals and vitamins are available for the mother as well as for the developing fetus. This is especially crucial for the formation of dental tissues which could impact a child's future oral health status to a large extent (11,12).

Research has revealed that administering calcium supplements to the mother during pregnancy reduces chances of dental caries in their children (13). A controlled randomized study found that children whose mothers had received calcium supplementation during pregnancy showed fewer dental carious lesions at the age of 12 years compared to those whose mothers had not (14). This finding illustrates the role of calcium, not only in ensuring the health of the mother's bones, but also in the development of stronger teeth in children. The connection between maternal nutrition and dental health is further emphasized by the fact that nutrition determines the growth and development of the oral

tissues. Proper vitamins and minerals' supplementation during pregnancy will result in proper enamel and dentin formation and prevent future dental problems (15). Malnutrition at this developing stage might result in hypoplasia of enamel, thereby increasing vulnerability to caries and other oral diseases after birth, like non-caries wear of dental tissues.

Dietary practices during pregnancy also provide a set precursor for the future eating habits of a child. It has been previously determined that diets high in calcium with significant amounts of dairy consumption prevented dental caries in children (14). Dietary lifestyles have long-term implications, as children are known to adopt the nutrient-intake habits of their mothers.

Identifying these relationships, there is an emerging consensus on the necessity of integrated policies concerning maternal and child oral health. This is a step forward from barriers in the access of nutritional resources as well as dental care. Proper education and support of the mothers ensuring their health and that of their children would be guaranteed (16). Great collaborations between healthcare providers and

families enhance nutrition for maternity and later oral health achievements in the future generations.

Maternal nutrition would affect not only the health of mothers, but also that of their children. Nutrition during pregnancy has long-lasting effects on dental health; hence, there is a need for a comprehensive approach to healthcare through strategic and integrated maternal-and child-health programs.

## 4. Discussion

### 4.1 Nutritional Education Programs

Nutritional education interventions represent an important tool in public health practice, contributing to the improvement of maternal-and child-health outcomes through the promotion of healthy diet. These programs offer education regarding appropriate nutrition during pregnancy and lactation, fundamental to fetal development and maternal welfare. Studies have demonstrated that well-planned nutritional education results in a better understanding of the diet to be chosen, effective preparation of food, and high level of awareness about nutrition during pregnancy (2,6).

One promising approach has been the integration of nutritional education as an extension of services in maternal health care. Programs that seek the incorporation of healthcare providers to offer individualized nutritional counseling have been effective in supplementing the consumption of many nutrients, such as iron and folic acid, for pregnant women (7). Community-based interventions that make use of local leaders and relevant resources have also been more appealing and, consequently, more successful programs (9).

The World Health Organization placed great emphasis on comprehensive educational strategies that address what to eat, as well as how to make healthier food choices in the context of local food environments (1). Equipping women with knowledge and skills that enable them to make informed diet choices can empower them to improve their health and the health of their children.

Nutritional education programs form an essential public health intervention focused on the health of both mothers and children. Approaching diet deficiencies and healthy eating with tailored, community-driven, and targeted approaches, these programs can best encourage a healthier diet for mothers, which would in turn determine better health outcomes for their families.

### 4.2 Supplementation Initiatives

Maintaining good oral health also requires folic acid supplementation, especially in pregnant women. Folate intake is sufficient to prevent neural tube defects (16) and is generally important for both the mother and fetus for good oral health outcomes as well. Evidence indicates that folate intake plays an important role in cellular growth and repair for oral tissues. It maintains healthy gingiva and prevents periodontal diseases among the population (17).

Pregnant women are more susceptible to oral disorders than other people. For example, gingivitis and periodontitis occur because of some hormonal changes that affect gum tissues. Folic acid has also been found to improve periodontal health, and several studies showed that it can result in diminished inflammatory effects and enhance healing or promote healthy gum tissues (18). Neglecting proper oral health care during pregnancy can lead to adverse outcomes, including pre-term birth and low birth weight. Studies suggest that periodontal disease is a significant risk marker for such complications (19). Poor oral hygiene may also contribute to developmental defects in primary teeth, affecting the child's long-term oral health (20). Despite its importance, oral health care during pregnancy is often overlooked, as many antenatal care providers lack awareness or proper training (21,22). Comprehensive perinatal guidelines stress integrating oral health into prenatal care to improve maternal and infant outcomes (23,24,25).

The international guidelines underscore the necessity of supplementation with folic acid and multi-vitamins during pregnancy. Guidelines further elaborate that nutritional deficiencies may compromise oral health. Helping pregnant women achieve adequate folate intake may reduce risks for periodontal disease and other potential oral health complications (26).

Global policies to improve folate status in women of childbearing age include mandatory fortification of staple foods with folic acid. This has been successful in decreasing the number of cases of neural tube defects (NTDs) and will likely promote better oral health (27). However, inequalities persist with regard to folate intake, largely in regions where fortification is not practiced. Education programs and awareness activities should be extended to continuous campaigns that could inform people of the benefits that can be derived from consumption of folic acid to the oral and general health (28).

Supplementation of folic acid is a crucial component of public health interventions in maternity care. It can play a role in the reduction of oral health problems during pregnancy. Thus, addressing all intended benefits of folic acid fortification would give increased nutritional status, decrease the prevalence of oral health problems during pregnancy, and contribute to healthier pregnancies. Further research is required toward more understanding of all benefits of supplementary consumption of folic acid, including potential effects on oral health.

#### **4.3 Integrated Health Services**

Integrated health services are crucial for enhancing maternal-and child-health outcomes, particularly in the context of oral health. A comprehensive approach that combines oral healthcare with maternal-and child-health services can address significant difficulties and improve overall health (28).

The integration of oral health into maternal healthcare is essential for achieving oral health equity. Studies indicated that pregnant women often receive inadequate oral health education and care, leading to adverse outcomes, not only for themselves, but also for their children (29). Effective integration strategies can mitigate risks associated with poor oral health, such as periodontal disease, which is linked to pre-term and low-birth-weight deliveries.

Healthcare providers play a pivotal role in promoting oral health for pregnant women. It is important for both oral and prenatal healthcare providers to collaborate closely to ensure that pregnant women receive comprehensive care (30). This includes regular oral health screenings and referrals to dental professionals, which are critical for preventing oral diseases that can affect maternal and child health.

Integrating maternal and child oral health promotion into nursing and midwifery practice is supported by systematic reviews that highlighted the effectiveness of such approaches (31). By equipping healthcare professionals with the necessary tools and knowledge, they can better address the oral health needs of pregnant women and their children. Integrating health services not only enhances access to care, but also fosters a holistic approach to health that considers the interplay between oral health and overall well-being. This collaborative model is essential for addressing the complex health needs of mothers and their children.

#### **4.4 Community-based Interventions**

Community-based interventions play a crucial role in improving maternal and child nutrition, resulting in better oral health. These initiatives focus on educating families about the importance of nutrition during pregnancy and early childhood, promoting healthy dietary practices, and addressing nutritional deficiencies. Programs that provide supplementary food and vitamins, particularly iron and folic acid, have been found to enhance maternal health outcomes (2,6). Furthermore, integrating oral health education into community health services can lead to better awareness and prevention of dental issues among pregnant women as well as among children (12,14). Collaborative efforts involving healthcare providers, local organizations, and families are essential for the success of these interventions, ultimately leading to improved health outcomes and reduced difficulties in access to care (16,17).

#### **4.5 Policy and Advocacy**

Effective policy and advocacy are vital for promoting maternal and child health, particularly in addressing nutritional and oral health needs. Policymakers should prioritize the integration of nutrition and oral health initiatives within maternal healthcare frameworks, ensuring that all pregnant women have access to essential supplements and education (27,28). Developing guidelines that emphasize the importance of maternal oral health can lead to better health decisions and practices among healthcare providers (19). Additionally, advocacy efforts focused on reducing inequities in healthcare access can significantly impact health outcomes for vulnerable populations (8, 23, 28). Engaging stakeholders, including public-health organizations and community leaders, is crucial for creating supportive environments that foster healthy behaviors and enhance health literacy among families (6,18).

#### **4.6 Challenges and Gaps**

Maternal nutrition and oral health are critical components of overall maternal and child health. However, various challenges and gaps hinder optimal outcomes in these areas. This article explores the key challenges and gaps, drawing on recent research and evidence.

#### 4.6.1 Challenges

Many women face significant nutritional deficiencies during pregnancy, which can adversely affect both maternal-and child-health outcomes. Studies have highlighted low consumption of essential nutrients, particularly iron and folic acid, which are crucial for fetal development and maternal health (2, 21,32).

Also, difficulties in access to oral health care pose a significant challenge, especially among rural populations. Factors such as socio-economic status, lack of awareness, and transportation challenges contribute to these barriers (8).

Additionally, there is often a lack of integration between maternal health services and oral health care. This fragmentation leads to missed opportunities for providing holistic care to mothers, highlighting the need for collaborative approaches (8,29). Furthermore, socio-cultural factors significantly shape dietary practices and health behaviors among pregnant women. Understanding these influences is considered essential for developing effective interventions to improve nutrition during pregnancy and in the postpartum period (23).

#### 4.6.2 Gaps

While in terms of awareness of the importance of oral health in mothers, outcomes are increasing, more research is needed to explore the specific impacts of oral health on pregnancy and child health (5,30). Moreover, as many regions lack comprehensive policies that integrate maternal and child oral health services, developing such policies is crucial for enhancing service delivery and improving health outcomes (17).

Increased public health campaigns are deemed necessary to educate mothers about the importance of nutrition and oral health. Emphasizing nutrients, such as calcium and folic acid, can significantly benefit maternal and child health (15,18).

It is also very important to conduct more longitudinal studies to assess the long-term impacts of maternal

nutrition and oral health on child development. Such research can help inform better practices and policies.

#### 5. Conclusions

Public-health interventions focused on maternal nutrition and oral health are crucial for improving outcomes for mothers and their children. A comprehensive approach that incorporates nutritional education, supplementation, integrated health services, community engagement, and policy and advocacy can significantly enhance maternal and child health globally.

Addressing challenges, such as inadequate nutrient intake, particularly of iron, folic acid, and calcium, and difficulties in access to care is vital, especially for rural populations.

Integrating maternal-and oral-health services ensures holistic support during pregnancy, while recognizing socio-cultural influences on dietary practices strengthens health interventions.

There is an urgent need for more research on the impacts of oral health on maternal and child outcomes and for effective policies that foster integrated care. Collaborative efforts among healthcare providers, policymakers, families and communities are essential to create an environment that supports maternal and child health.

To address these critical issues, stakeholders are encouraged to enhance access to tailored nutrition education, integrate oral health services within maternal health programs, advocate for policies that mandate food fortification, address difficulties in access, and invest in research on maternal nutrition and oral health impacts

#### Conflict of Interests

The authors have no conflict of interests to declare regarding this manuscript.

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