clinical feature

The Impact of Maternal Oral Health During Pregnancy on the Mother and Her Baby

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Introduction

The purpose of this project is to create a standardized oral health promotion, intervention and educational protocol specific to underserved pregnant women for public health practice implemented in county health departments.

The literature reflects contradictory findings regarding the association between maternal periodontal disease and adverse pregnancy outcomes, such as preterm or premature low birth weight (PLBW) infants, that have lifelong consequences. Pregnancy is an opportune time to teach mothers about the impact of oral disease, as this is often the time when they are the most interested in educational and behavioral modifications for themselves and the health of their developing baby.[1] The county health department is often the facility to which indigent, uninsured or underinsured expectant mothers go to receive care during pregnancy.

Adverse pregnancy outcomes, including premature or low birth weight infants, are a major problem in the United States and internationally because of their economic burden, long-term disability and mortality. Therefore, there is a need to create and implement a standardized protocol for serving underserved pregnant women in county health departments.

Pregnancy

Mothers should remember that when they are performing oral hygiene procedures, they are affecting not only their own health, but also that of their unborn baby. Most expectant mothers have not thought about the impact of oral health on their own general health and that of their baby. Oral diseases such as dental caries, gingivitis and periodontitis are infectious diseases that can have long-term consequences for the mother and her offspring. These diseases are interrelated and all result from the effects of the dental biofilm matrix on the oral cavity.

Maternal oral flora is transmitted to the newborn, which predisposes the infant to caries later in life.[2] The first-ever Surgeon General's Report on Oral Health in 2000 discussed eliminating oral health barriers and disparities, and David Satcher, MD, PhD, identified treatment of oral disease as very important to improve maternal and infant health during pregnancy. The report also associated adverse pregnancy outcomes with maternal oral health and stated that periodontal treatment can improve maternal and infant general health.[3]

When indigent, uninsured or underinsured expectant mothers go to the county health department to receive pregnancy-related care, they may receive collaborative prenatal care, dental care and nutritional support through the Women, Infants, and Children (WIC) program. One in 10 babies born in the United States is considered preterm and/or low birth weight.[4] In 2007, Schroeder-Drucks stated, "pregnant women with periodontal disease have more than seven times the risk of delivering PLBW infants."[5]

The theory is that bacteria multiply and may go to distant sites, causing a bacteremia, which triggers chemical events when bioactive substances are released from the inflamed gingival pockets into the maternal systemic circulation, initiating the inflammatory cascade.[6] It is thought that periodontal disease also releases pro-inflammatory cytokines and the chemical called prostaglandin, capable of increasing contractility in the uterus, which can induce labor.

Preterm birth (less than 37 weeks gestation) and low birth weight (less than five pounds, eight ounces) infants are immature, which contributes to more and extended admissions in the neonatal intensive care unit along with more morbidity and mortality. These infants have an increased risk of delayed neurodevelopmental disorders with resulting cerebral palsy, blindness and deafness. Respiratory conditions such as asthma and chronic lung disease are more common. In addition, behavioral, cognitive and learning difficulties such as attention deficit hyperactivity disorder are lifelong problems.[7] These complications contribute to a burden on society due to the increase in health care expenditures, with medical costs being 10 times greater for PLBW infants compared to full-term births.[3] Lower socioeconomic status, education, income and access to care have all been associated with poorer pregnancy events.[8]

Many women have the misconception that dental treatment during pregnancy will endanger the fetus. In fact, one study showed that women who receive periodontal debridement therapy may reduce the risk of PLBW infants by 85 percent.[5] Dental insurance is a strong predictor of dental care utilization, with low-income minorities having been shown to have a greater prevalence of dental disease and less access to care than more affluent populations. Medicaid covers approximately one-third of all births in the United States with inconsistent coverage among states. In fact, pregnancy is the only time that most Medicaid programs provide dental coverage for low-income women.[2]

Currently, there is no standardization of programs for pregnant women available in the state or county health departments. The protocols may vary widely from county to county and state to state. There is a need to support educational and therapeutic programs for all pregnant females, regardless of their socioeconomic status or ability to access health services, due to the substantial health benefits and economic burdens that will otherwise result. In 2006, Boggess and Edelstein extrapolated from their findings the suggestion that "[18 percent] of the PLBW infants born annually might be attributable to periodontal disease, and thus account for a significant proportion of the $5.5 billion annual costs associated with the care of PLBW infants."[2]

Background

Case-control and cohort studies from 2006 showed a relationship between both acute gingival infections (gingivitis) and chronic periodontal infections (periodontitis) with abnormal pregnancy outcomes.[8] Potential confounding risk factors include the mother's age, height, weight, socioeconomic status, ethnicity, smoking, alcohol use, cervical competency, diet, hypertension, history of previous PLBW infant and presence of infection.[9] Periodontal disease, characterized by episodes of exacerbation and quiescence or remission, usually worsens during pregnancy.[8]

Review of the Literature

Lopez, Smith and Gutierrez found that periodontal disease was an independent risk factor for PLBW infants.[10] The authors state that infectious diseases like periodontal disease can and should be treated prior to and during pregnancy. While many recent studies report that maternal oral disease may be an independent risk factor for abnormal pregnancy outcomes, including PLBW infants, preeclampsia and mortality, causality has not yet been established, and there is disagreement in the literature about an assocaition.[3] As an example, the most recent study concluded that there were no significant differences between pregnant women in the periodontal treatment group and the control group and that periodontal therapy did not reduce the incidence of preterm delivery.[11]

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Although there are conflicting results, most of the clinical studies from the 2000s show a positive correlation between periodontal disease and PLBW infants, and more research will be needed to refute them definitively.[7] Pregnancy gingivitis commonly occurs at interproximal sites in the anterior area of the mouth. The current edition of *Carranza's Clinical Periodontology* includes the opinion that periodontal disease in mothers results in abnormally high levels of inflammatory mediators, and that the translocation of bacterial endotoxins from the inflammation may foster premature labor and PLBW infants.[12] To address the potential for poor birth outcomes in dentally underserved populations, Healthy People 2010 aims to increase access for improved oral health by decreasing barriers such as lack of dental insurance and public programs because oral health tends to vary on the basis of sociodemographic factors. Oral health initiatives, collaborations and partnerships need to occur to increase oral health literacy to explore new ways to improve access for all Americans.[13] The World Oral Health Report 2003 (WHO) found that oral diseases qualify as a major public health problem due to their high prevalence and incidence, with the greatest burden falling on disadvantaged populations.[14]

Oral Health in America also states that oral health is essential to general health and well-being and should be achieved by all Americans. Oral disease disproportionately affects our most vulnerable populations: children, the elderly, and racial and ethnic minorities.[15] *The National Call to Action to Promote Oral Health* is a follow-up by the successor surgeon general, Richard Carmona, MD. This report, issued in 2003, recommends expanding programs for a partnership of public and private organizations to reduce health disparities for vulnerable and special needs populations. The movement is for enhanced oral health, which leads to better general health and awareness of the integral relationship of certain adverse pregnancy outcomes.[16]

The Standardized Protocol for Treatment of Pregnant Women at a County Health Department

Collecting and Analyzing Data

The science supporting dental treatment before, during and after pregnancy to reduce dental caries and periodontal disease transmission is strong. Pregnancy is an opportune time to teach mothers about the impact of oral disease, as this is the time that they are the most interested in educational and behavioral modifications for themselves and the health of their developing baby. Dental diseases are highly preventable and manageable with early and regular dental care; however, the second trimester is considered the best time for restorative intervention.[2]

The treatment plan should be individualized to each patient's needs and may include non-surgical periodontal scaling and root planing with local anesthesia when necessary, and the use of ultrasonic and hand instrumentation.[17] In addition, education about avoidance of high sugar intake, smoking cessation, oral hygiene procedures, sealants, fluoride supplementation, caries prevention and parafunctional habits such as thumb sucking are important measures to maintain oral health in both mothers and their offspring.[1] More emphasis should be placed on vulnerable, high-risk populations in need of dental care.[18]

Research conducted in the mid-2000s demonstrates a bidirectional relationship between periodontal disease and adverse pregnancy outcomes. Oral health may be indicative of what is going on in the rest of the body. Improvement in the periodontal status may also ameliorate other systemic diseases. Education should be offered when the mother is receptive to learning about what to expect after the baby is born.[19]

Implementation

The maternal oral health program is implemented with a workshop for physicians and nurses from the maternity clinic, dentists and dental hygienists from the dental clinic, and the manager from the Women, Infants, and Children (WIC) clinic. Afterward, a review of the literature, with key articles from journals from each discipline, (e.g., *Obstetrics & Gynecology*, *Journal of the American Dental Association*, *Journal of Dental Hygiene* and *Maternal and Child Health Journal*) is presented and discussed. Lastly, 60 days later, there is a follow-up two-hour workshop for program analysis with feedback and problem solving.

The methodology for pregnant women who visit the maternity clinic at the county health department is referral to the dental clinic after signed medical clearance.[20] The conceptual framework includes the proposed standardized protocol for treatment in the dental clinic at all county health departments that begins at the first appointment with an assessment by the dental hygienist, followed by an examination by the dentist. This initial visit includes blood pressure and pulse measurement, oral cancer screening, nutritional counseling and full-mouth periodontal

charting for tissue assessment and treatment classification. Routine radiographs would be delayed until after pregnancy to prevent unnecessary radiation exposure to the developing baby. If the dentist decides that a radiograph is necessary, a double lead apron would be used to decrease the exposure as much as possible.[19]

The mother's diet must contain the essential nutrients for her and also to support the baby's developing teeth and avoid cariogenic foods that might satisfy unusual cravings. It is important to dispel any myths about the mother losing calcium from her teeth while pregnant.[19] Tobacco cessation, avoidance of drugs and alcohol, and domestic violence programs are also important to initiate at the first visit.[20] Domestic violence assessment and intervention for the affected patient is an important concept to include in the dental visit, especially since pregnant women tend to be more vulnerable to such abuse. An individualized dental treatment plan and plaque control program with proper brushing and flossing techniques are explained. A series of short appointments should be planned with frequency dependent on the needs of the patient to maintain a healthy oral environment. Oral care supplies such as a toothbrush, toothpaste and dental floss should be dispensed at this visit with oral care instruction. These appointments should involve the obstetrician, nurse, dentist, dental hygienist, dietitian and expecting parents to focus on optimizing the health of the mother and her developing baby.[19]

Depending on the findings, the second visit is scheduled with the dentist to relieve any conditions causing pain, which might require extractions or immediate restorative procedures. Routine dental treatment is delayed until the second trimester or after the pregnancy. The county health departments do not have the necessary funds for all the needed dentistry. Therefore, they concentrate on relieving pain, which is accomplished by means of extractions or referral to a lower-cost dental clinic for treatment if the patient qualifies financially.[20] If the patient is not in pain, the second visit should be scheduled with the dental hygienist to begin scalings.

The last visit for the mother is reserved for polishing and more education. This is a good time to talk about the importance of breastfeeding, care of the baby's first teeth, importance of fluoride and how to avoid baby bottle decay. A child's toothbrush and supplies should be dispensed at this visit. After the birth, the baby should receive follow-up appointments. These should take place at six-month intervals to assess for early childhood caries, fluoride varnish applications, nutritional counseling, oral hygiene instructions and prophylaxis when the deciduous teeth are present in the oral cavity. Sealants should be applied when the permanent teeth first erupt.[20] All educational materials should be available in English, Spanish and other languages.

Outcomes

The anticipated outcome from this standardized oral health promotion, intervention and educational product for underserved pregnant women implemented in county health departments would be better maternal-infant health. A review article by Bobetsis et al. found that some of the published intervention studies show a significant reduction in PLBW infants after periodontal therapy; however, the results were not always statistically significant, possibly due to the small sample size and noncompliance.[7] The suggestion, which ongoing research will need to verify or refute, is that the risk of PLBW infants may increase with the severity of periodontal disease.[21]

Medicaid and Medicare services should expand dental coverage for pregnant women, as pregnancy provides a teachable moment for both self-care and child-care to limit intergenerational oral disease. Oral health promotion should begin preconception and continue through birth to include prevention services with education and referral for additional evidence-based interventions when dental disease is present.[2] An ideal strategy would be for the dental community to partner with the medical community and expand public services so that infants are safeguarded. The transdisciplinary collaboration framework consisting of physicians, dentists, nurses and dental hygienists is important for optimal communication, and because every pregnant female should be assessed for periodontal disease.[22]

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Discussion, Conclusions and Recommendations

Periodontal disease is characterized by cycles of exacerbation and remission. Researchers have hypothesized that the chronic burden of endotoxins and inflammatory cytokines damages gingival tissue and may also affect placental inflammation, which ultimately produces placental damage. However, disparities in oral health care accessibility and utilization may also confound the understanding of the relationship between maternal oral health and adverse pregnancy outcomes. The data is encouraging, because periodontal disease is preventable, treatable and reversible in its early stages.

The dental hygienist should serve in public health facilities such as maternal and child health clinics within community health programs, stressing professional dental care and preventive education during pregnancy. When the periodontal tissues are healthy and the patient uses good plaque control procedures at home, exaggerated adverse responses to gingival inflammatory changes during pregnancy can be abated. Prenatal care helps the mother to enjoy optimum health both during and after pregnancy, which also gives the child the best chance to be born healthy.[19]

Despite medical advances in diagnosing and treating preterm labor, complications are rising. Adverse pregnancy outcomes, such as neurological sequelae, have an impact beyond the immediate family, as an economic burden to society, in increased health care costs.[23] The hypothesized improvement in maternal oral hygiene could lead to improved general health for the mother and her developing baby, since dental health extends way beyond the oral cavity. According to *Oral Health in America*, new educational initiatives need to be incorporated to spread the word about this concept. Many medical professionals do not know about the research linking periodontal disease and adverse pregnancy outcomes. Formal education strategies regarding mouth and body connections need to be implemented in medical and dental school curriculums for the practitioners to understand the health consequences of poor oral hygiene and the growing body of related research.[24]

Counseling prior to conception should be the cornerstone of contemporary maternal care. Inflammation should be controlled with periodontal debridement therapy and oral hygiene instruc-

tions as needed until delivery. Cross-referral is another way to implement transdisciplinary protocols for decreasing the maternal effects of poor oral hygiene for optimum patient care.[23] There needs to be a paradigm shift to shared responsibility for oral health promotion by direct referral systems, improved screenings, expanded guidelines for health promotion and prevention, standardized assessment instruments, implementation of evidenced-based intervention protocols and interdisciplinary continuing education venues.[22] A standardized protocol should be implemented at all county health departments.

Additional research is needed to determine whether periodontal interventions completed before conception or early in pregnancy might improve pregnancy and birth outcomes. The association between maternal periodontal disease and premature, low birth weight infants should be explored to establish if there is a causal or merely associative relationship. More randomized, placebo-controlled, double-blind trials need to be performed to test the strengths of these associations. In the meantime, we know that scalings can be safely performed during the second trimester to help reduce the inflammation. Therefore, since periodontal disease is both preventable and treatable, it is the interdisciplinary team's duty to intervene with pregnant females to help decrease the occurrence of periodontal disease, and possibly PLBW infants, with their public health consequences.

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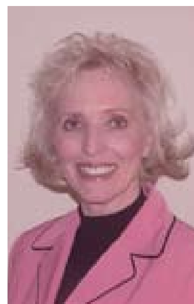

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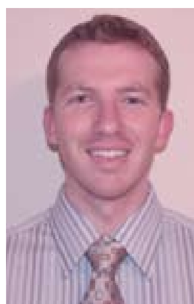

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