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Periodontal and Gingival Diseases among Pregnant and Non-pregnant Women in Some Selected Tertiary Care Hospitals in Dhaka, Bangladesh

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Abstract

Background: Periodontal health is vital for overall well-being, and pregnancy significantly impacts oral health due to hormonal changes. Prior research shows that pregnant women have higher levels of plaque, gingival bleeding, and periodontal diseases, which can lead to adverse pregnancy outcomes like preterm birth and low birth weight. This study aims to explore the prevalence, risk factors, and implications of periodontal and gingival diseases among pregnant and non-pregnant women in Dhaka, Bangladesh, to identify how pregnancy influences oral health and the need for targeted dental care.

Methods: The study utilized a cross-sectional design, encompassing both pregnant and non-pregnant women at the outpatient departments of selected tertiary care hospitals in Dhaka. Data were collected through face-to-face questionnaire covering socio-demographic information, health status, oral hygiene practices, and dietary habits. Clinical examinations were conducted to assess periodontal health, including probing for gingival bleeding and measuring periodontal pocket depth.

Result: The study examined 229 women of reproductive age, primarily aged 25-34 years. Most had secondary education (32.8%), were Muslims (78.6%), and married (71.6%). Nearly half were pregnant (46.7%). Pregnant women showed higher plaque accumulation, with 78.5% having moderate to severe inflammation versus 39.3% of non-pregnant women. Pregnant women also had more gingival bleeding (53.3%) and recession (59.8%) and deeper periodontal pockets (26.2% with 3 mm pockets). Hypertension and diabetes were slightly higher in non-pregnant women (11.5% vs. 5.6%). Pregnant women brushed less regularly (80.4% vs. 99.2%) and lacked thorough tongue and teeth cleaning (72% vs. 53.3%). Both groups had low flossing rates (86% of pregnant and 85.2% of non-pregnant women). Most preferred home-cooked food, and only 5.6% of pregnant women had a dental check-up during pregnancy.

Discussion: Pregnancy increases the risk of periodontal and gingival diseases due to hormonal changes and socio-demographic factors. This aligns with global findings,

highlighting the need for tailored oral health interventions and education during pregnancy. Addressing disparities and promoting oral hygiene can improve outcomes. Enhanced public health policies and targeted programs are essential for supporting vulnerable groups.

Conclusion: This research highlights the need to include dental care in prenatal healthcare. Improving oral health awareness and practices among pregnant women can significantly enhance maternal and fetal outcomes.

Keywords: Periodontal health; Periodontal disease; Gingival disease; Gingivitis; Gingival bleeding; Periodontal pockets; Periodontal inflammation; Plaque accumulation; Oral health; Oral hygiene

Introduction

The significance of periodontal health for overall well-being is undeniable, with various factors, including pregnancy, exerting a significant influence. Hormonal fluctuations and other pregnancy-related elements can bring about alterations in oral health for expectant mothers. Recognizing the distinctions in periodontal health between pregnant and non-pregnant women is essential for providing appropriate dental care and enhancing the health of both the mother and the fetus.

Numerous studies have delved into the periodontal status of pregnant women, comparing it with that of their non-pregnant counterparts. A study carried out in Brazil from February 2004 to August 2005 aimed to evaluate the factors associated with the prevalence of periodontal disease in low-risk pregnant women. The results indicated elevated levels of plaque and gingival bleeding in pregnant women compared to their non-pregnant counterparts (1), suggesting a heightened susceptibility to gingivitis and other periodontal issues during pregnancy. Another investigation by Boggess et al. explored the correlation between vitamin D levels and periodontal disease in pregnant women, revealing an association between vitamin D deficiency and an increased risk of periodontal disease during pregnancy (2). Vitamin D deficiency during pregnancy is also implicated in infantile rickets, poor fetal growth, and neonatal development issues

(3), potentially predisposing women to gestational diabetes mellitus and pre-eclampsia (4).

Gupta & Acharya conducted a population-based cross-sectional study in India, reporting a high prevalence of periodontal disease among pregnant women, aligning with similar findings in various countries (5). This underscores that periodontal disease is a prevalent global oral health concern among pregnant women.

Onigbinde's study in Nigeria assessed the periodontal status of pregnant women, attributing observed gingival changes during pregnancy to increased estrogen metabolism and prostaglandin synthesis by the gingiva, contributing to heightened susceptibility to periodontal disease in pregnant women (6).

Compelling evidence suggests that pregnant women may be more prone to periodontal conditions, including gingivitis and periodontitis, compared to non-pregnant women. Factors such as hormonal shifts, vitamin D deficiency, and increased estrogen metabolism may contribute to this heightened susceptibility during pregnancy. Understanding social disparities in periodontal health between pregnant and non-pregnant women is crucial for developing appropriate dental care strategies and interventions to enhance maternal and fetal outcomes (7).

Research on gingival and periodontal disease in pregnant women has uncovered significant associations between maternal oral health and adverse pregnancy outcomes. Maternal periodontitis is linked to an increased risk of pre-eclampsia (7). Additionally, periodontal disease can impact fetal development due to an imbalance between the patient's immunity and pathogenic periodontal microorganisms (8). Evidence suggests associations between periodontal disease and various adverse pregnancy and birth outcomes, such as preterm birth, low birth weight, early pregnancy loss, gestational diabetes, and pre-eclampsia (9). The study also emphasized a lack of awareness and knowledge among pregnant women regarding the potential impact of poor maternal oral health on pregnancy and infant outcomes (10). This underscores the need for targeted education and interventions to improve oral health practices and knowledge among pregnant women.

Most obstetricians are aware of the adverse effects of periodontal disease on pregnancy outcomes and the potential benefits of treating it (11). This highlights the importance of collaboration between dental and prenatal care practitioners to ensure comprehensive care for pregnant women. Furthermore, the study demonstrated that P. gingival infection can induce more severe periodontal diseases during pregnancy, potentially attributed to down-regulated anti-inflammatory mechanisms (12). This suggests the necessity for further research and interventions targeting specific pathogens to enhance maternal oral health during pregnancy.

In conclusion, the study on gingival and periodontal disease in pregnant women is anticipated to significantly raise awareness about the association between maternal oral health and adverse pregnancy outcomes. It underscores the importance of addressing periodontal disease in pregnant women through targeted interventions, education, and collaborative care between dental and prenatal care practitioners

Periodontal and gingival diseases present substantial oral health challenges for both pregnant and non-pregnant women, yet there is limited research on their occurrence and contributing factors in Bangladesh. This study seeks to address this knowledge gap by comparing the periodontal health of pregnant and non-pregnant women in selected tertiary care hospitals in Dhaka. The goal is to provide essential insights into the oral health status of women in Bangladesh, guiding the creation of targeted interventions to improve their oral health outcomes.

This research is expected to a more comprehensive understanding of the proportion and factors influencing periodontal diseases among pregnant women in Bangladesh in comparison to their non-pregnant counterpart. Such insights are crucial for developing effective interventions that promote oral health and mitigate adverse pregnancy outcomes linked to periodontal disease. By examining the periodontal health of pregnant and non-pregnant women, the study aims to identify potential differences in oral health status between these groups. This knowledge is essential for recognizing the unique oral health challenges faced by pregnant women and enables the design of tailored interventions.

Analyzing the impact of demographic factors like age, socioeconomic status, and education on periodontal health in both pregnant and non-pregnant women will help pinpoint vulnerable populations requiring additional support to enhance their oral health. Assessing oral hygiene practices and dental care utilization among both groups will reveal factors contributing to variations in periodontal health, guiding the development of oral health education and promotion programs.

The study's findings will contribute to the expanding body of evidence on oral health issues among women in Bangladesh. This evidence can inform evidence-based oral health policies and interventions, fostering improved oral health outcomes for these populations. In conclusion, this study expected to furnish, valuable information on the periodontal health of pregnant and non-pregnant women in Bangladesh, steering the development of targeted interventions and ultimately contributing to the overall enhancement of oral health in the country.

Operational Definitions

Here are the detailed about both conditions:

Gingival Disease: It involves initially inflammation of the gum tissues without loss of supporting periodontal structures(13) (14). Key aspects include:

Clinical Signs of Inflammation

- Redness (erythema)
- Swelling (edema)
- Bleeding on probing (BOP)
- Tenderness (14)(15)

Types:

i) **Plaque-Induced Gingivitis:**

- Caused by dental plaque accumulation,and characterized by reversible inflammation.(15)

ii)**Non-Plaque-Induced Gingivitis:**

- Caused by factors other than plaque (e.g., viral, fungal, or bacterial infections, systemic conditions, allergic reactions, or trauma). (15)

Criteria for Diagnosis:

- Presence of inflammation (redness, swelling).

- Bleeding on probing at one or more sites.

- Absence of clinical attachment loss (CAL) or bone loss. (14)(18)

Periodontal Disease: It involves more extensive destruction, affecting the supporting structures of the teeth, including the periodontal ligament and alveolar bone. It is characterized by irreversible damage (17). Key aspects include:

Clinical Signs of Disease

- Clinical attachment loss (CAL)

- Pocket formation (periodontal pockets)

- Radiographic evidence of alveolar bone loss

- Possible tooth mobility(20)(21)

Types:

i)**Chronic Periodontitis:**

- Slow progression and common in adults, associated with plaque and calculus accumulation.(22)

ii)**Aggressive Periodontitis:**

- Rapid attachment loss and bone destruction, can affect younger individuals.

Iii)Periodontitis as a Manifestation of Systemic Diseases:

- Associated with systemic conditions like diabetes or heart disease.(22)

iv)**Necrotizing Periodontal Diseases:**

- Characterized by necrosis of gingival tissues, periodontal ligament, and alveolar bone.

- Includes necrotizing ulcerative gingivitis (NUG) and necrotizing ulcerative periodontitis (NUP). (22)

Criteria for Diagnosis:

- Clinical attachment loss of ≥ 1 mm at two or more non-adjacent teeth.

- Radiographic evidence of bone loss.

- Presence of periodontal pockets (depth >3 mm).

- Gingival inflammation and bleeding on probing may also be present.(19)

Research question

What is the proportion of periodontal and gingival diseases among women of child-bearing age, both pregnant and non-pregnant, attending selected tertiary care hospitals in Dhaka, Bangladesh?

Study Objectives

General Objective:

To estimate the proportion of periodontal and gingival diseases among pregnant and non-pregnant women of child-bearing age attending selected tertiary care hospitals in Dhaka, Bangladesh.

Specific Objectives:

- To determine the proportion of periodontal and gingival diseases among pregnant women attending selected tertiary care hospitals in Dhaka.
- To determine the proportion of periodontal and gingival diseases among non-pregnant women of child-bearing age attending selected tertiary care hospitals in Dhaka.
- To examine factors associated with periodontal and gingival diseases among pregnant and non-pregnant women of childbearing age.
- To assess oral hygiene practices and dental care utilization among both pregnant and non-pregnant women.

Study Variables

Socio-demographic Variables:

Age

Socioeconomic status

Education level

Marital status

Parity (number of previous pregnancies)

Pregnancy-Related Variables:

Gestational age

Pregnancy complications (e.g., gestational diabetes, hypertension)

Nausea and vomiting during pregnancy

Use of prenatal supplements (e.g., vitamin D)

Oral Health Parameters:

Plaque index

Gingival bleeding on probing

Probing pocket depth

Clinical attachment level

Gingival recession

Oral Hygiene and Dental Care Practices:

Frequency of tooth brushing

Flossing habits

Dental visits during pregnancy

Utilization of dental services

Nutritional Factors:

Dietary habits

Vitamin D intake

Calcium intake

Behavioral and Lifestyle Factors:

Smoking status

Alcohol consumption

Dietary Patterns:

Consumption of sugary or acidic foods and beverages

Nutrient-rich dietary choices

Family History:

Family history of periodontal disease

Literature Review

This study was designed to determine the proportion of gingival disease and periodontal disease in pregnant and non pregnant women in Bangladesh Sheikh Mujib Medical College And University (BSMMU) and Shaheed Suhrawardy Medical College and Hospital, (Ssmch) Dhaka. For the in-depth conceptualization of the study problem, acquiring the background information and for selecting appropriate methods, a considerable number of research articles published in various different national and international journals, reports, symposium, seminar abstracts and textbooks were reviewed thoroughly and critically. Different web sites were used for this purpose. Many studies regarding gingivitis and periodontitis, its prevalence and risk factors have been done in Bangladesh, but studies related to comparison between two group of people pregnant and non pregnant in Bangladesh so far revealed are very limited. Those studies together with the studies carried out in different parts of the world were reviewed for the purpose of the study.

Gingivits and Periodontitis

Defination:

Gingivitis is defined as inflammation of the soft tissues of the oral cavity without the apical migration of the junctional epithelium, while periodontitis is an inflammatory condition that leads to the apical migration of the junctional epithelium, resulting in irreversible periodontal attachment loss and alveolar bone destruction (13) (14) (15). Gingivitis primarily affects the gums and coronal junctional epithelium, whereas periodontitis is characterized by the loss of connective tissue attachment, making it the main cause of tooth loss in adults (16). Periodontitis can be localized or generalized, affecting one or multiple teeth, and is often noticed by symptoms such as swollen and bleeding gums, crooked teeth, and increased tooth sensitivity (17). The main cause of periodontitis is the chronic inflammation caused by bacterial plaque and tartar, leading to deep infections and bone tissue loss .

Sign and Symptoms:

Gingivitis and periodontitis present with distinct signs and symptoms. Gingivitis, an early stage of gum disease, is characterized by inflamed and painful gums, bleeding while brushing or flossing, and gingival recession (14) (18). On the other hand, periodontitis, a more advanced form of gum disease, manifests with symptoms such as bad breath, swollen and red gums, crooked teeth, tooth sensitivity, tooth softening, and increased space between teeth (19). Additionally, periodontitis can lead to tooth loss, increased tooth mobility, and waking up with blood on the pillow (20). Recognizing these signs and symptoms is crucial for early diagnosis and intervention to prevent the progression of gingivitis to irreversible periodontitis, highlighting the importance of regular dental check-ups and proper oral hygiene practices (21).

Types of gingivitis and periodontitis:

Gingivitis is an early form of periodontal disease characterized by inflammatory changes limited to the marginal gingiva and connective tissue, without affecting the periodontal

ligament (15). On the other hand, periodontitis is a more severe condition where inflammatory changes progress to involve the periodontal ligament and alveolar bone, potentially leading to tooth loss (22). Periodontitis is further classified into chronic periodontitis (CP) and aggressive periodontitis (AgP), with ongoing debates on the biological features that differentiate these two forms (23). Additionally, periodontitis is linked to systemic diseases like type 2 diabetes mellitus, cardiovascular disease, obesity, adverse pregnancy outcomes, respiratory diseases, and rheumatoid arthritis, emphasizing its impact beyond oral health (24). The presence of a polymicrobial biofilm, including pathogens like Treponema denticola and Porphyromonas gingivalis, plays a crucial role in the pathogenesis of periodontitis by inducing inflammatory responses and tissue destruction (25).

Magnitude and extent of gingivitis and periodontitis

World situation and burden:

Periodontal diseases, including gingivitis and severe periodontitis, pose a significant global health burden. Data from various studies between 1990 and 2019 indicate a substantial increase in the prevalence and disability-adjusted life years (DALYs) attributed to periodontitis worldwide, with over 1.1 billion prevalent cases in 2019 (26) (27) (28) (29). The burden is higher in less developed regions, with Western Sub-Saharan Africa and Gambia identified as high-risk areas (30). Risk factors such as smoking, diabetes, poor oral hygiene, age, and stress contribute to the prevalence of periodontal diseases, affecting 20-50% of the global population . Urgent policy changes and enhanced prevention strategies are crucial to address this escalating public health challenge and reduce the associated economic impact on healthcare systems .

Gingivitis prevalence globally shows concerning trends, with a high burden observed in the general population. Studies indicate that more than two-thirds of the population worldwide is affected by gingival recession (GR) (31). Additionally, the prevalence of Entamoeba gingivalis infection, a pathogen associated with oral diseases, was estimated at 37%, highlighting its role as a risk factor for oral health issues (32). Furthermore,

severe periodontitis has been on the rise over the past three decades, with a substantial global burden and an 8.44% increase in age-standardized prevalence rates from 1990 to 2019, particularly affecting less developed regions (26). The incidence, prevalence, and disability-adjusted life-years (DALYs) related to periodontal diseases have also significantly increased, emphasizing the urgent need for improved periodontal care globally (33). These findings underscore the importance of addressing gingivitis and periodontal diseases as significant public health challenges.

Situation in Bangladesh:

Periodontal diseases, including periodontitis and gingivitis, are prevalent in Bangladesh across different age groups and genders. In Bangladesh studies have shown varying levels of prevalence, with a significant correlation between age and the occurrence of these diseases. The prevalence of gingivitis is higher in younger age groups, while periodontitis becomes more common in individuals over 48 years old shown varying levels of these conditions in the population. Research conducted in Bangladeshi primary school children revealed a crude prevalence of 17.5% for gingivitis (34). In adults, a study found that 37.5% suffered from periodontitis and 62.5% from gingivitis, with a significant correlation between age and periodontal diseases, especially in individuals over 48 years old (35). Factors such as gender, social class, and oral hygiene practices also play a role in the prevalence of gingivitis, with males, lower social classes, and rural populations showing higher rates of the disease . Additionally, behavioral factors like dietary habits and smoking have been identified as contributors to gingivitis among patients aged 15 to 40 years attending hospitals in Dhaka, another study highlighted that males tend to suffer more from periodontal diseases than females, with a higher prevalence of gingivitis in younger age groups and periodontitis in older age groups (36). These findings underscore the importance of early detection and intervention strategies to address periodontal diseases (37). Overall, these studies highlight the importance of age, gender, socioeconomic status, and oral health behaviors in understanding the extent of periodontitis and gingivitis in the Bangladeshi population.

Effect of gingivitis and periodontitis on women health

Gingivitis and periodontitis in women, especially during critical periods like pregnancy and menopause, can have significant implications. Gingivitis, an inflammation of the gum tissue, can progress to periodontitis, an inflammatory condition affecting the tissues around the teeth, potentially leading to tooth loss (38). Research suggests that hormonal changes during pregnancy, such as increased estrogen and progesterone levels, may contribute to the development of periodontitis, which in turn has been linked to adverse pregnancy outcomes like preterm birth and low birth weight (39) (40). Studies have shown that proper dental care, including regular brushing, flossing, and professional cleanings, is crucial for preventing and managing these conditions, with scaling interventions demonstrating significant improvements in inflammatory conditions like menopause-related periodontitis (41). Additionally, there is ongoing research to explore the relationship between periodontal diseases and fertility issues, emphasizing the importance of maintaining oral health for overall well-being (42) .

Gingivitis and periodontitis significantly impact women's oral health, especially during pregnancy due to hormonal changes. Research indicates that hormonal fluctuations, such as increased estrogen and progesterone levels, can exacerbate gingival inflammation and alter the oral microbiota, leading to a higher prevalence of periodontal diseases in pregnant women (43) (44) (45). These conditions, if left untreated, can progress silently, causing irreversible damage to the tooth-supporting tissues and potentially increasing the risk of adverse pregnancy outcomes like gestational diabetes, preterm birth, and low birth weight (46) (38). Moreover, gender-based differences in periodontal health suggest that premenopausal women may have better periodontal status due to the immune-protective effects of estrogen, while postmenopausal women might experience worsened periodontal conditions . Additionally, periodontitis has been linked to systemic health issues like cardiovascular diseases, diabetes, and adverse pregnancy outcomes, emphasizing the importance of addressing oral health for overall well-being .

Effect of gingivis and periodontitis on pregnant women:

Gingivitis and periodontitis have significant implications for pregnant women, potentially impacting both maternal and fetal health. Research indicates that hormonal changes during pregnancy can exacerbate gingival inflammation, leading to adverse outcomes such as gestational diabetes (47). Moreover, periodontal diseases have been linked to adverse pregnancy outcomes like preterm birth, low birth weight, and preeclampsia, with a bidirectional association suggested between periodontal disease and these outcomes (48). Studies highlight the prevalence of dental caries and periodontal tissue diseases during pregnancy, emphasizing the importance of early diagnosis and effective treatment to prevent complications for both the mother and the fetus (49) (50). Additionally, evidence suggests that periodontitis may increase the risk of adverse pregnancy outcomes, but further research is needed to determine the most effective treatments for pregnant women with periodontitis (51).

Management of gingivitis and periodontitis

The management of gingivitis and periodontitis in women involves a multifaceted approach that considers various factors such as oral hygiene habits, systemic variables, and patient concerns. Studies emphasize the importance of behavioral management alongside traditional periodontal therapy to address issues like dental anxiety and poor plaque control (52). Additionally, systemic variables like hormone disorders and nutritional deficiencies can impact the immune-inflammatory response of periodontal tissues, requiring collaboration with specialists for effective treatment (53). Preventive measures play a crucial role in managing periodontitis, with a focus on lifestyle risk factors and maintaining high standards of daily plaque removal through mechanical and chemical plaque control methods (54). Overall, an interdisciplinary approach that addresses both the clinical aspects of the disease and the patient's individual needs is essential for successful management of gingivitis and periodontitis in women.

Conclusion

At last, gingivitis and periodontitis in women, especially during critical stages like menopause and pregnancy, have significant implications. Research indicates that gingival inflammation leading to periodontitis is severe and inflammatory, potentially causing tooth loss if untreated (40). Studies in Kenya show a substantial prevalence of moderate-severe periodontitis among women planning to conceive, emphasizing the need for oral care, particularly in those with multiple prior pregnancies (55). Furthermore, a history of periodontitis may be associated with reduced fecundability, suggesting a potential link between periodontal health and fertility (56). Additionally, periodontitis has been linked to cardiovascular risk factors, with higher C-reactive protein levels reported in patients with periodontitis, highlighting the systemic impact of periodontal diseases on overall health (57). These findings underscore the importance of addressing and managing gingivitis and periodontitis in women to prevent adverse outcomes and promote overall well-being.

Methodology

Study Design

A cross-sectional study design employed to conduct this study.

Study Area:

Bangabandhu Sheikh Mujib Medical University(BSMMU) is a renowned government medical institution established in 1965.

Shaheed Suhrawardy Medical College (ShSMC) is the 14th government medical college of Bangladesh which is established in 2006.Shaheed Suhrawardy Hospital was established in 1963 during the period of East Pakistan as Ayub Hospital for outdoor services. It was equipped with Pathological and Radiological supports.

Study Period

The study was conducted from July 2023 to June 2024.

Study Population:

The study focused on pregnant and non-pregnant women of childbearing age that is 15 to 49 years attending selected tertiary care hospitals in Dhaka, Bangladesh.

Inclusion Criteria:

1. Pregnant women attending selected government hospitals in Dhaka, Bangladesh.

2. Non-pregnant women of reproductive age attending selected government hospitals in Dhaka, Bangladesh.

3. Willingness to participate in the study and provide informed consent.

Exclusion Criteria:

1. Women with a history of periodontal disease or other oral health conditions prior to pregnancy.

2. Women with a history of systemic diseases or conditions that may affect periodontal health.

3. Women who are unable to provide informed consent or participate in data collection.

Sample Size Calculation:

$$n = (Z\alpha/2 + Z\beta)^2 \times (p1(1-p1) + p2(1-p2)/(p1-p2)^2$$

Putting in the values:

$Z\alpha/2 = 1.96$, (5% signifcance level)

$Z\beta = 0.84$, (Z value for 80% power or 20% Type-II error)

$p1 = 0.953$, *(for pregnant women)*

$p2=0.625$ *(for non pregnant women)*

$n=(1.96+0.84)2\times(0.953\times0.047+0.625\times0.375)\ /(0.953-0.625)^2$

≈ 191.85

Rounding up, the sample size for each group is ***192.***

Total sample size= 192+192= 384

Sampling Technique:

The selection method for this research was depended on the presence and accessibility of pregnant and non-pregnant women visiting the selected government hospitals in Dhaka, Bangladesh. A convenience sampling approach was employed to enlist participants from the hospitals OPD.

Data Collection Tools:

In this study we used a semi structured questionnaire for face to face interview. The sample size was calculated, taking the minimum prevalence of periodontal disease to be 5% .A specially designed questionnaire was distributed, informed consent was taken. Data collection was based on the following parameters; gingival index (GI) and plaque index (PI).

Data Collection Technique

Participants was informed about the procedures, and their rights. Written informed consent was obtained from each participant before enrollment. Face-to-face interviews was conducted to complete the structured questionnaire, ensured accurate and comprehensive data collection. Each participant was undergone a thorough oral examination using standardized procedures and calibrated instruments to ensure consistency and reliability of the findings. All clinical findings and questionnaire responses was documented on standardized forms, ensuring the confidentiality and anonymity of participants data.

Data Management and Analysis Plan:

Following data collection, a rigorous examination of all collected data was undertaken to ensure uniformity and completeness. The data undergone daily scrutiny with the aim of identifying and rectifying any errors or inconsistencies, including missing data, prior to the process of coding and entry into a database. Statistical analysis was executed utilizing SPSS. The outcomes of the analysis is visually depicted through tables, graphs, and charts. The result was quantified in terms of frequency, percentage, and mean with standard deviation as deemed suitable. A significance threshold of 0.05 will be deemed appropriate, meaning that p-values below 0.05 was be regarded as statistically significant.

Quality Control and Quality Assurance:

After the data collection phase, each questionnaire was undergone a rigorous examination to verify completeness and consistency. Subsequently, the collected data will undergone multiple checks, including rechecking, editing, and meticulous recording, as part of a comprehensive quality control and assurance procedure.

To ensure rigorous Quality Control, the study followed several key steps:

Monitoring Data Collection Methods: Continuous oversight of data collection processes was maintained to ensure consistency and reliability in the gathered information. Regular checks were conducted to identify and address any deviations from established protocols.

Thorough Review and Cross-Checking: After data collection, a meticulous review and cross-checking process were conducted on all interview forms. This rigorous examination aimed to identify and rectify any discrepancies or inconsistencies in the collected data.

Daily Sessions for Data Cleaning, Editing, and Verification: Daily sessions were dedicated to data cleaning, editing, and verification to eliminate errors before entering the database. This proactive approach ensured the accuracy and integrity of the dataset.

Regular Calibration and Validation: Periodic calibration and validation of measurement instruments were performed to uphold precision in data collection. This involved verifying and adjusting instruments to maintain their accuracy throughout the study.

For Quality Assurance, the following measures were implemented:

Meticulous Documentation of Research Procedures: Quality assurance was ensured through meticulous documentation of research procedures, methodologies for data collection, and analysis techniques.

Detailed Records of Participant Consent and Data Sheets: Detailed records of participant consent, data sheets, and any deviations from the original research plan were maintained throughout the study period.

Schedule for Regular Progress Updates: A structured schedule for regular progress updates and milestones was implemented to adhere to the predetermined timeline and ensure timely completion of the study.

These quality control and assurance measures were essential in maintaining the reliability, accuracy, and integrity of the study's findings, enhancing the overall credibility of the research outcomes.

Ethical Consideration:

Ethical clearance was obtained from the Ethics Review Committee of Bangladesh University of Professionals (BUP) to conduct the study, and appropriate ethical procedure was strictly maintained throughout the study.. Informed written consent was obtained from eah of the respondents. Other issues, such as avoiding harm, was addressed, and patients was informed that participation or non-participation will not affect their treatment. Confidentiality of their data was ensured, and their identity will not be revealed. Collected information will only be used for research purposes, maintaining confidentiality will be observed. No forceful attempt was taken to interview any unwilling respondent.

Results

A cross sectional study was carried out to determine the proportion of periodontal and gingival diseases among pregnant and non pregnant women attending OPD of BSMMU and SShMc, Dhaka. A total 229 women of reproductive age were enrolled according to inclusion and exclusion criteria. They were interviewed with a specific pre-designed and pre tested questionnaire and some information were gathered by document review. Collected data were cleaned, edited and analyzed with the help of software SPSS windows version 20. The analyzed data have been presented in this chapter through tables and appropriate graphs.

The results of the study have been described as follow:

- Sample profile
- Proportion of gingival and periodontal disease among the respondent
- Factors associated with periodontal and gingival disease
- Assesment of oral hygiene practice and dental care utilization among respondent

Sample profile

Socio-demographic characteristics of the respondents

The study identified the socio-demographic characteristics of the respondents including sex, age, residence, religion, marital status, level of education ,respondent's indivisual income and family income This section gives frequency of the related variables.

Age Distribution of the Respondents

The age distribution of the respondents was higher in younger adults. The majority of the respondents fall within the 25-34 years age group, which constitutes 62.5% of the sample (n=142). This is followed by the 15-24 years age group, representing 27.5% (63 respondents). The 35-44 years group comprises 8.3% (19 respondents), and the smallest

group is the 45-49 years, with only 2.2% (5 respondents). This age distribution suggests that the study predominantly focuses on young to middle-aged adults.(Table 1)

Educational Background of the Respondents

The educational background of the respondents is diverse, spanning from no education to master's degree holders. The largest group consists of individuals with secondary education, accounting for 32.8% (75 respondents) of the total sample. This is followed by respondents with a master's degree (20.5%, 47 respondents) and those with a graduation degree (20.1%, 46 respondents). Primary education is held by 14.4% (33 respondents), while undergraduates represent 5.2% (12 respondents). A small proportion of the respondents have no formal education, making up 7.0% (16 respondents). This distribution indicates a relatively high level of education among the respondents, with a significant portion having completed secondary education or higher.(Table 1)

Religious Affiliation of the Respondents

The religious affiliation of the respondents is predominantly Islamic, with 78.6% (180 respondents) identifying as Muslims. Hinduism is the second most common religion, practiced by 11.4% (26 respondents), followed by Christianity at 9.6% (22 respondents). Buddhism is represented by only 0.4% (1 respondent). This distribution reflects the religious demographics of the region where the study was conducted, indicating a majority Muslim population with minority groups of Hindus, Christians, and Buddhists.(Table 1)

Marital Status of the Respondents

The marital status of the respondents reveals that the majority are married, accounting for 71.6% (164 respondents). Unmarried individuals represent 27.9% (64 respondents), while divorced respondents make up only 0.4% (1 respondent). This high proportion of married individuals suggests that the study sample includes a significant number of adults in stable family units.(Table 1)

Individual Income of the Respondents

The income levels of the respondents are categorized into four brackets: lower income, lower middle income, upper middle income, and high income. The majority of the respondents fall within the lower income bracket (0 – 9585 BDT per month), constituting 76.4% (175 respondents). The lower middle income group (9595 – 37590 BDT per month) comprises 21.0% (48 respondents), while the upper middle income group (37598 – 116657 BDT per month) includes only 2.6% (6 respondents). No respondents fall within the high income bracket (116666 BDT and above). The mean income level is 6159.39 (SD 10846.402) , indicating a predominance of low-income individuals in the sample.(Table 1)

Family Income of the Respondents

Family income classification provides a broader perspective on the financial status of the respondents' households. The lower middle income group (10000-29999 BDT per month) is the largest, representing 48.0% (110 respondents). The upper middle income group (30000-99999 BDT per month) follows with 42.8% (98 respondents). The high income group (100000 BDT and above) comprises 6.1% (14 respondents), while the low income group (0-9999 BDT per month) is the smallest at 3.1% (7 respondents). The mean family income classification is 36354.14 (SD38537.357) indicating a generally higher family inc)ome compared to individual income, with a significant portion of households falling within the lower middle and upper middle income brackets.(Table 1)

Table 1: Socio-demographic characteristics of the respondents

Characteristics	**Number**	**N= 229**
Age groups (Years)	**n**	**Percentage %**
15-24	63	27.5
25-34	142	62.5
35-44	19	8.3

45-49	5	2.2
Mean	27.64	
SD	5.662	
Total	229	100.0
Educational degree of the Respondents		
No education	16	7.0
Primary	33	14.4
Secondary	75	32.8
Under graduation	12	5.2
Graduation	46	20.1
Masters	47	20.5
Total	229	100
Religion of the respondents		
Islam	180	78.6
Hinduism	26	11.4
Christianity	22	9.6
Buddhism	1	.4
Total	229	100.0
Marital status of the Respondents		
Unmarried	64	27.9
Married	164	71.6
Divorced	1	.4
Total	229	100.0
Income level of the Respondents/ BDT per month*		
Lower Income (0 – 9,585)	175	76.4
Lower Middle Income (9,595 – 37,590)	48	21.0
Upper Middle Income (37,598 – 1,16,657)	6	2.6
High Income (1,16,666 and above)	0	0
Mean (SD)	6159.39 (10846.402)	
Total	229	100.0
Family Income Classification (BDT per month)**		
Low Income (0-9,999)	7	3.1

Lower Middle Income (10,000- 29,999)	110	48.0
Upper Middle Income (30,000- 99,999)	98	42.8
High Income (1,00,000 and above)	14	6.1
Mean SD	36354.14 (38537.357)	
Total	229	100.0

Pregnancy status of the Respondents

The pregnancy status of the respondents shows a nearly even distribution, with 46.7% (107 respondents) being pregnant and 53.3% (122 respondents) being non-pregnant. This balance allows for comparative analysis between pregnant and non-pregnant individuals within the sample, particularly concerning their health and oral hygiene practices.

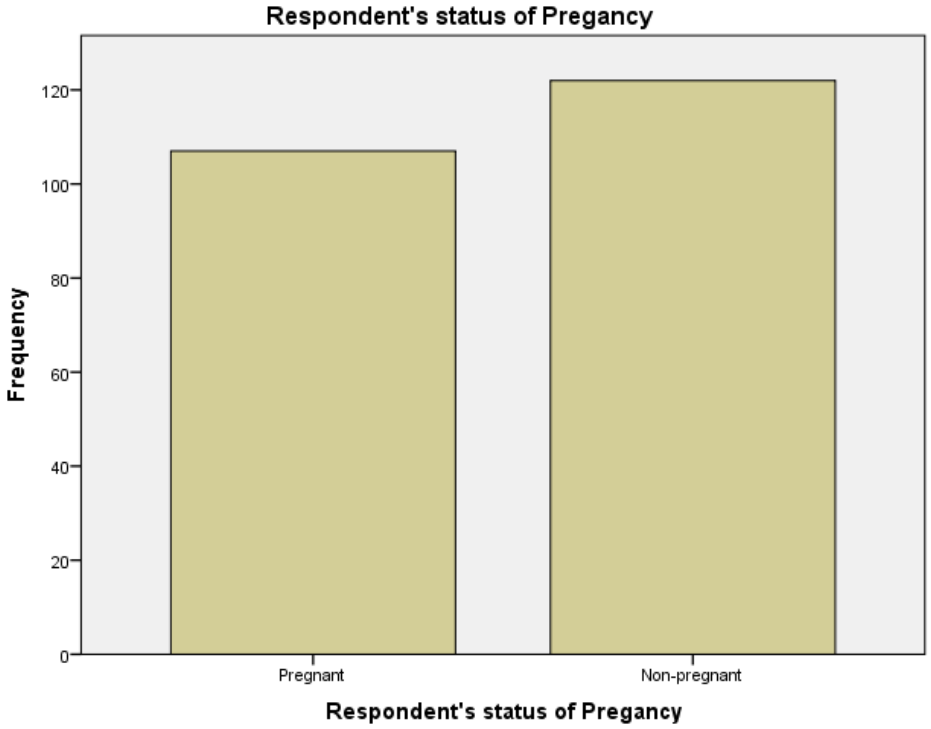


Figure: 1 Pregnancy status of pregnancy

Oral Health of the Respondents

The oral health of the respondents was assessed through various indices, including the plaque index, gingival index, gingival bleeding on probing, depth of periodontal pockets, and gingival recession.

Plaque Index

The data indicates a higher severity of plaque accumulation and inflammation among pregnant respondents compared to non-pregnant respondents. Specifically, a greater number of pregnant individuals experience moderate to severe inflammation (84 out of 107 pregnant respondents,78.5%) compared to non-pregnant individuals (48 out of 122 non-pregnant respondents, 39.3%). p- value is <0.001 which shows significant difference suggests that pregnancy status is associated with variations in the Plaque Index Score among respondents.(Table 2)

Pregnant respondents have a higher prevalence of moderate to severe plaque accumulation and associated inflammation, whereas non-pregnant respondents are more likely to have an absence of or mild inflammation. This significant difference suggests that pregnancy status is associated with variations in the Plaque Index Score among respondents.

Table 2: Plaque index of the respondents

		Plaque Index Score n(%)				Total	
		Absence of inflammation	Mild inflammation – slight change in color and little change in texture	Moderate inflammation – moderate glazing, redness, edema and hypertrophy. Tendency to bleed upon probing	Severe inflammation – marked redness and hypertrophy. Tendency to spontaneous bleeding		p value
Respondent's status of Pregancy	Pregnant	7(6.54%)	16(14.95%)	50(46.72%)	34(31.77%)	107(100 %)	.000
	Non-pregnant	43(35.24%)	31(25.40%)	45(36.88%)	3(2.45%)	122(100 %)	
Total		50(21.83%)	47(20.52%)	95(41.48%)	37(16.15%)	229(100 %)	

Gingival index

The gingival index data reveals that a significant number of non-pregnant respondents exhibit an absence of gingival inflammation (62 out of 122, 50.8%), whereas a much smaller proportion of pregnant respondents show no inflammation (7 out of 107, 6.5%).

Additionally, mild inflammation is relatively common in both groups, though it is more prevalent among non-pregnant individuals (33 out of 122, 27%) compared to pregnant individuals (13 out of 107, 12.1%). p-values of <0.001, which are less than 0.05, indicating significant differences in Gingival Index scores based on pregnancy status.

Non-pregnant respondents are more likely to exhibit no gingival inflammation, while mild inflammation is somewhat common in both groups, albeit slightly more frequent in non-pregnant respondents. These differences suggest that pregnancy status is associated with variations in the Gingival Index among respondents, with pregnant individuals showing a higher tendency towards moderate and severe inflammation compared to non-pregnant individuals.(Table 3)

Table 3: Gingival Index of the Respondent

		Gingival Index n(%)				Total	
		absence of inflammation	mild inflammation – slight change in color and little change in texture	moderate inflammation – moderate glazing, redness, edema and hypertrophy. Tendency to bleed upon probing	severe inflammation – marked redness and hypertrophy. Tendency to spontaneous bleeding		P value
Respondent's status of Pregancy	Pregnant	7(6.54%)	13(12.15%)	61(57%)	26(24.29%)	107 (100%)	
	Non-pregnant	62(50.81%)	33(27.04%)	21(17.21%)	6(4.91%)	122 (100%)	.000
Total		69(3013%)	46(20.087%)	82(35.80%)	32(13.97%)	229(100 %)	

Bleeding on probing

A higher prevalence of gingival bleeding among pregnant respondents (57 out of 107, 53.3%) compared to non-pregnant respondents (45 out of 122, 36.9%) indicates increased periodontal issues among the pregnant population. This finding aligns with the observations from the plaque and gingival indices, underscoring the need for enhanced dental care during pregnancy.

Higher prevalence in pregnant respondents, indicating increased periodontal issues. (Table 4)

Table 4: Gingival bleeding on probing

	Pregnant **n(%)**	**Non Pregnant** **n(%)**	**total**
Gingival Bleeding on probing			
Absent	54 (50.5%)	77 (63.1%)	133
Present	53 (49.5%)	45 (36.9%)	98
total	107(100%)	122 9100%)	229

Depth of periodontal pocket

The data indicates that pregnant respondents tend to have deeper periodontal pockets, a sign of more advanced periodontal disease. Specifically, 28 out of 107 pregnant respondents (26.2%) have pockets of 3 mm depth, compared to only 6 out of 122 non-pregnant respondents (4.9%). This highlights the importance of preventive dental care and regular checkups for pregnant individuals.

Pregnant respondents have deeper periodontal pockets, signifying more advanced periodontal disease.(Table 5)

Table 5: Depth of periodontal pocket in mm

	Pregnant n(%)	**Non Pregnant n(%)**	**total**
Depth of periodental pocket in mm			
1mm	27 (25.2%)	69 (56.6%)	96
2mm	52 (48.6%)	47 (38.5%)	99
3mm	28 (26.2)	6 (4.9%)	34
total	107 (100%)	122(100 %)	229

Gingival recession among Respondents

Gingival recession is more prevalent among pregnant respondents (64 out of 107, 59.8%) compared to non-pregnant respondents (24 out of 122,19.7%). This suggests more severe gum issues among the pregnant population, which is critical for dental practitioners to consider when treating pregnant patients.

Higher incidence among pregnant respondents, pointing to more severe gum issue.

Table 6: Gingival recession

	Pregnant n(%)	**Non Pregnant n(%)**	**total**
Gingival recession			
Absent	43 (40.2%)	98 (80.3%)	141

Present	64(59.8%)	24 (19.7%)	88
Total	107 (100%)	122 (100%)	229

Co-morbidities in Respondents

Hypertension in the Respondents:

The prevalence of hypertension in the sample is relatively low. Out of the total 229 respondents, only 20 (approximately 8.7%) have hypertension. The occurrence is slightly higher among non-pregnant respondents (14 out of 122, about 11.5%) compared to pregnant respondents (6 out of 107, about 5.6%).

Diabetes Mellitus in the Respondents:

Higher proportion of the pregnant respondents reported Diabetes mellitus compared to non-pregnant respondents (14% vs 5.7% respectively). Out of the total 229 respondents, 22 (9.6%) have diabetes mellitus. Among pregnant respondents, 15 out of 107 (about 14%) have diabetes mellitus, while among non-pregnant respondents, only 7 out of 122 (about 5.7%) have the condition. This indicates that pregnant individuals in the sample are more prone to diabetes mellitus, suggesting potential health risks associated with pregnancy. (Table 4)

Table 7 Gingival bleeding on probing

	Pregnant **n(%)**	**Non Pregnant** **n(%)**	**total**
Respondent has Hypertension			
No	101 (94.4.5)	108 (88.5%)	209

Yes	6(5.6%)	14 (11.5%)	20 (8.7%)
Total	107 (100%)	122(100%0	229
Respondent has Diabetes Mellitus			
No	92 (86%)	115 (94.3%)	207
Yes	15 (14%)	7 (5.7%)	22 (9.65)
Total	107 (100%)	122 (100%)	229

Dental Hygiene Practices

Tooth Brushing Habit

The majority of respondents brush their teeth regularly, but there is a notable difference between pregnant (80.4%) and non-pregnant (99.2%) respondents. A higher proportion of non-pregnant individuals brush their teeth regularly, suggesting a potential decline in oral hygiene practices during pregnancy. Factors such as nausea, fatigue, or other pregnancy-related issues may impact daily routines and contribute to this trend.**:** A higher proportion of non-pregnant respondents brush their teeth regularly, indicating a possible decline in oral hygiene practices during pregnancy.(Table 8)

Table 8 Response to brushing

	Pregnant **n(%)**	**Non Pregnant** **n(%)**	**total**
Does repondent brush their teeth			
Yes	86 (80.3%)	121 (99.2 %)	207

No	21(19.6 %)	1 (.8%)	22
Total	107 (100%)	122 (100%)	229

Teeth and Tongue Cleaning Methods:

A significant number of respondents, particularly pregnant individuals (72%), do not engage in active teeth and tongue cleaning beyond basic rinsing. This is higher compared to non-pregnant respondents, where 53.3% do not engage in regular cleaning practices. This lack of active cleaning could contribute to the higher levels of oral health issues observed among pregnant respondents. The reliance on water rinses or other unspecified methods suggests a gap in comprehensive oral hygiene practices, which may need to be addressed through targeted education and intervention.

Many respondents, especially pregnant ones, do not engage in thorough teeth and tongue cleaning, relying instead on basic rinsing or other methods. This trend may contribute to the observed higher levels of oral health issues among pregnant individuals.(Table 9)

Table 9 Method of cleaning teeth and tongue

	Pregnant **n(%)**	**Non Pregnant** **n(%)**	**total**
How respondent clean their teeth and tongue			
Do nothing	77 (72%)	65 (53.3%)	142
Water rinse	28 (26.2%)	55 (45.2%)	83
other	2 (1.9%)	1 (.8%)	3

Total	107 (100%)	122 (100%)	229

Frequency of using Dental floss:

Both groups have a low frequency of daily flossing, with 86% of pregnant respondents and 85.2% of non-pregnant respondents not flossing. This indicates that regardless of pregnancy status, flossing is not a common practice among the respondents, suggesting a need for better education on the importance of flossing.Both groups have low daily flossing rates, with a slightly higher frequency among pregnant respondents. (Table 10)

Table 10: Frequency of using Dental floss

	Pregnant **n(%)**	**Non Pregnant** **n(%)**	**total**
Frequency of floss per day			
No	92 (86%)	104 (85.2%)	196
Yes	15 (14%)	15(12.3%)	30
total	107 (100%)	122 (100%)	229

Preference of food

The majority of respondents prefer home-cooked food, with 91.6% of pregnant and a significant portion of non-pregnant respondents choosing it. A smaller percentage of pregnant respondents (7.5%) prefer fast food compared to non-pregnant respondents, indicating that dietary preferences might be more health-conscious among pregnant

individuals. Most respondents prefer home-cooked food, with a smaller percentage of pregnant respondents opting for fast food.(Table 11)

Table 11: Preference of type of food

	Pregnant **n(%)**	**Non Pregnant** **n(%)**	**total**
Preference of type of food			
fast food	8 (7.5%)	24(19%)	32
home cooked food	98 (91.6%)	93(76.23%)	191
other	1 (.93 %)	5(4.09%)	6
Total	107(100%)	122(100%)	229

4.5.5 Dental Check up During Pregnancy

Only 5.6% of pregnant respondents have had a dental checkup during their pregnancy, indicating a low frequency of dental visits among this group. This is concerning given the increased oral health issues observed among pregnant respondents and highlights the need for increased awareness and access to dental care during pregnancy.

Very few pregnant respondents have had dental checkups during their pregnancy, highlighting the need for better dental care access and education for this group.(Table 12)

Table 12: Dental check up during pregnancy

	Pregnant (n%)	**Non Pregnant (n%)**	**total**
Dental checkup during this pregnancy			
Yes	6 (5.6%)	0	6
No	101(5.6%)	0	101
Not applicable	0	122	122
total	107 (100%)	122	229

Discussions

A cross sectional study was carried out to determine the proportion of periodontal and gingival diseases among pregnant and non-pregnant women attending gynae OPD of BSMMU and SShMc, Dhaka. A total number of 229 women of reproductive age from 15 to 49 were selected, female patient those who are excluded with a history of periodontal disease or other oral health conditions prior to pregnancy, patient those who have a history of systemic diseases or conditions that may affect periodontal health and also those who are unable to provide informed consent or participate in data collection. The results indicated that pregnant women exhibit a higher incidence of periodontal and gingival diseases compared to non-pregnant women. Socio-demographic factors, oral hygiene practices, and dietary habits were evaluated to understand their influence on oral health status.

Sample characteristics

This study constitute of 229 sample which provides a detailed analysis of the socio-demographic characteristics of the sample population. The research identified various factors such as age distribution, educational background, religious affiliation, marital status, individual income, and family income among the respondents. The age distribution of the respondents in the study skewed towards younger adults, with the majority falling within the 25-34 years age group, indicating a focus on young to middle-aged adults (58). The educational background of the respondents was diverse, with a significant portion having completed secondary education or higher, reflecting a relatively high level of education among the sample (58) The religious affiliation of the respondents was predominantly Islamic, mirroring the religious demographics of the region where the study was conducted (58) The marital status of the respondents showed that the majority were married, suggesting a significant number of adults in stable family units (58) In terms of income, the study categorized respondents into different income brackets, with a predominance of low-income individuals in both individual and family income classifications (58). A study emphasized the need for periodontal preventive measures for pregnant women, irrespective of demographic and clinical characteristics, to ensure oral health during pregnancy(59). Additionally, research on secondhand smoke exposure during pregnancy in low-income and middle-income countries highlighted the prevalence of daily household smoke exposure among pregnant women in Bangladesh,the socio-demographic characteristics of pregnant women, including educational background, income levels, and marital status, play a role in determining oral hygiene practices and dental care utilization (59)(64)(66)(72)In conclusion, the socio-demographic characteristics outlined in the study on periodontal and gingival disease among pregnant and non-pregnant women in Bangladesh provide valuable insights into the profile of the sample population.

Prevalence Comparison

Research conducted globally supports these observations. For instance, a study in Brazil found that pregnant women exhibited significantly higher levels of plaque and gingival

bleeding compared to non-pregnant women (1). Similar results were observed in studies from the United States, where hormonal changes during pregnancy were linked to increased gingival inflammation and periodontal pocket depth (62). These studies underline the universal impact of pregnancy on periodontal health, irrespective of geographic and cultural differences.Closer to the context of Dhaka, studies from South Asian regions have reported comparable trends. In India, for example, pregnant women were found to have a higher prevalence of gingivitis and periodontitis, with oral health deteriorating progressively through the trimesters of Pregnancy (5). This aligns with the findings of the current study, where most pregnant respondents experienced more severe periodontal issues as their pregnancies advanced prevalence rates of periodontal and gingival diseases differ between pregnant and non-pregnant women, as evidenced by various studies. Pregnant women tend to exhibit higher severity of plaque accumulation and inflammation compared to non-pregnant women (60).

This difference is also reflected in the gingival index, where pregnant individuals show a higher tendency towards moderate and severe inflammation (61). Additionally, pregnant women have a higher prevalence of gingival bleeding, deeper periodontal pockets, and gingival recession compared to non-pregnant women (62). These findings suggest that pregnancy status is associated with variations in oral health indices, indicating a greater susceptibility to periodontal and gingival issues during pregnancy. The observed trends align with previous studies that have reported a higher prevalence of periodontal diseases among pregnant women (63)

Factors such as hormonal changes during pregnancy, increased susceptibility to inflammation, and alterations in oral microbiota contribute to the elevated risk of periodontal and gingival diseases in pregnant individuals (64). The association between periodontal diseases and adverse pregnancy outcomes underscores the importance of addressing oral health during pregnancy (65).

Disparities in dental hygiene practices, such as lower frequency of flossing and less active teeth and tongue cleaning methods among pregnant women, highlight the need for targeted education and intervention programs to improve oral health outcomes (67).

Additionally, the preference for home-cooked food among pregnant women indicates a health-conscious dietary choice compared to non-pregnant individuals (68). In conclusion, pregnant women exhibit higher prevalence rates of periodontal and gingival diseases compared to non-pregnant women, emphasizing the importance of tailored oral health care during pregnancy. Understanding the differences in oral health outcomes between pregnant and non-pregnant individuals can guide healthcare providers in implementing effective preventive measures and promoting better oral hygiene practices among pregnant women.

Risk Factors Analysis

The findings of this study are consistent with a substantial body of research indicating an increased susceptibility to periodontal diseases during pregnancy. Hormonal changes during pregnancy, including elevated levels of estrogen and progesterone, are known to enhance vascular permeability and gingival fluid flow, leading to heightened inflammatory responses in the gums, edema and bleeding in periodontal tissues, making pregnant women more susceptible to periodontal diseases (69) Additionally, immune responses during pregnancy can lead to exacerbated periodontal disease, as pregnant women may experience down-regulated Treg cells, which are essential for immune regulation (70). These immunological changes during pregnancy can contribute to increased susceptibility to infectious diseases, including periodontal pathogens (71). Socioeconomic factors also play a crucial role in oral health outcomes during pregnancy. Studies have shown that pregnant women with lower education levels and lower socioeconomic status are at a higher risk of periodontal disease compared to those with higher education and socioeconomic status (72). Factors such as stress, malnutrition, and chronic diseases like diabetes mellitus have been associated with an increased risk of periodontal diseases, particularly in populations with lower socioeconomic status. Moreover, the study highlighted that pregnant women exhibit a higher prevalence of gingivitis and periodontal diseases compared to non-pregnant women, emphasizing the need for tailored oral health care during pregnancy. The presence of risk factors such as older age, poor oral hygiene, tobacco use, and alcohol consumption can further exacerbate periodontal issues in pregnant women (73) Additionally, the lack of active

teeth and tongue cleaning practices among pregnant individuals compared to non-pregnant individuals may contribute to the higher levels of oral health issues observed in pregnant women (74) In conclusion, hormonal changes, immune responses, and socioeconomic factors are significant risk factors that specifically affect pregnant women, making them more vulnerable to periodontal diseases compared to non-pregnant women. Understanding these risk factors is crucial for implementing targeted interventions and improving oral health outcomes in pregnant populations.

Possible Reasons for Observed Trends

Physiological Changes during Pregnancy:

Physiological changes during pregnancy, such as increased levels of progesterone and estrogen, play a significant role in impacting oral health. These hormonal fluctuations contribute to higher susceptibility to periodontal and gingival diseases among pregnant women. Studies have shown that pregnant individuals experience more severe plaque accumulation, inflammation, and periodontal issues compared to non-pregnant individuals (75) (69). The prevalence of periodontal diseases during pregnancy can range from 36% to 100% (76). Pregnant women are more likely to exhibit moderate to severe levels of gingivitis, highlighting the association between pregnancy and oral health issues (76). The results of various studies indicate that pregnant women have a higher prevalence of gingival inflammation, bleeding on probing, deeper periodontal pockets, and gingival recession compared to non-pregnant women (75). These findings underscore the importance of regular dental check-ups and enhanced oral hygiene practices during pregnancy. Additionally, factors like hypertension and diabetes mellitus show varying prevalence rates among pregnant and non-pregnant women, with pregnant individuals being more prone to diabetes mellitus (75)

Furthermore, the socio-demographic characteristics of pregnant women, including age, education level, religion, marital status, and income, can influence their oral health status during pregnancy (59)(66)(72)75).It is crucial for healthcare providers to consider these factors when addressing oral health issues in pregnant women. Education and awareness

programs focusing on oral hygiene practices during pregnancy are essential to improve the oral health outcomes of pregnant individuals (77). In conclusion, the physiological changes during pregnancy, coupled with hormonal fluctuations, significantly impact oral health, leading to a higher susceptibility to periodontal and gingival diseases. Understanding the interplay between pregnancy and oral health, along with addressing socio-demographic factors, can help in developing targeted interventions to promote better oral health outcomes for pregnant women.

Behavioral and Lifestyle Factors:

Analyzing lifestyle and behavioral factors that may differ between pregnant and non-pregnant women is crucial for understanding the impact of pregnancy on overall health. Changes in diet, oral hygiene practices, and healthcare access during pregnancy can significantly influence maternal and fetal well-being. Studies have shown that dietary practices among pregnant women play a vital role in maternal and fetal health outcomes. Factors such as dietary knowledge, food security, edible crop production, and attitude towards nutrition can influence dietary practices during pregnancy (78)(79) Lifestyle interventions focusing on diet and exercise have been effective in reducing excessive gestational weight gain and improving overall health during pregnancy (80) Additionally, pregnant women with overweight or obesity may exhibit lower physical activity levels and poorer dietary habits, emphasizing the need for targeted interventions in this population (81) Dietary diversity, quantity, and quality are essential for pregnant women to meet their nutritional requirements and prevent adverse outcomes (82)(83). Studies have highlighted the importance of increasing nutritional knowledge, promoting dietary diversity, and ensuring adequate nutrient intake during pregnancy (83)(84). Poor maternal nutrition during pregnancy can lead to adverse outcomes such as preterm labor, low birth weight, and intrauterine growth restrictions (85). Behavioral factors such as tooth brushing habits, teeth and tongue cleaning methods, and frequency of dental flossing can impact oral health during pregnancy. Research has shown that pregnant women may experience changes in oral hygiene practices, with a higher proportion of non-pregnant individuals maintaining regular tooth brushing habits compared to pregnant women (2). Furthermore, the preference for home-cooked food over fast food among pregnant

women indicates a health-conscious dietary choice during pregnancy, access to dental care during pregnancy is essential for maintaining oral health. However, studies have indicated that a low percentage of pregnant women undergo dental check-ups during pregnancy, highlighting the need for increased awareness and access to dental services for this population (2) Factors such as oral health awareness, oral hygiene practices, and dental care utilization can vary among pregnant women based on their socio-demographic characteristics and lifestyle habits(64)(87)

Implications for Public Health

Health Policy and Programs:

The study on the proportion of depression among pregnant and non-pregnant women attending healthcare facilities in Bangladesh revealed a higher prevalence of gingival and periodontal diseases among pregnant individuals compared to non-pregnant individuals (86). The socio-demographic characteristics of the sample indicated that the majority of respondents were young to middle-aged adults, with a significant portion having completed secondary education or higher. The study also identified a predominantly Muslim population with minority groups of Hindus, Christians, and Buddhists, reflecting the religious demographics of the region. Moreover, the income distribution showed a predominance of low-income individuals in the sample, both at the individual and family levels (5). In terms of oral health assessment, pregnant respondents exhibited a higher severity of plaque accumulation and inflammation compared to non-pregnant respondents. Significant differences were observed in gingival inflammation, bleeding on probing, depth of periodontal pockets, and gingival recession between pregnant and non-pregnant individuals (89). The study also highlighted the prevalence of comorbidities such as hypertension and diabetes mellitus among pregnant women, emphasizing the need for tailored oral health education and interventions to improve oral hygiene practices and overall health outcomes (90). The implications of the study findings for public health policies in Bangladesh suggest the importance of implementing targeted programs to enhance oral health awareness, access to dental care, and promote better oral hygiene practices among pregnant women. Addressing these aspects can potentially

improve the oral health outcomes of pregnant women and reduce the burden of oral diseases during pregnancy.

Clinical Practice:

To manage and prevent periodontal and gingival diseases in pregnant women, dental practitioners should consider the following recommendations based on the results of a study conducted on pregnant and non-pregnant women attending healthcare facilities in Dhaka: The study included a diverse group of women, with a majority falling within the 25-34 years age group, having completed at least secondary education, predominantly Muslim, and mostly married. The income levels varied, with a significant portion falling within the lower income bracket. The study found a nearly even distribution between pregnant and non-pregnant women, allowing for comparative analysis of their health and oral hygiene practices.

Oral Health Assessment

Plaque Index: Pregnant women showed a higher prevalence of moderate to severe plaque accumulation and inflammation compared to non-pregnant women, indicating the need for enhanced dental care during pregnancy (1).

Gingival Index: Pregnant women exhibited a higher tendency towards moderate and severe inflammation compared to non-pregnant women, emphasizing the association between pregnancy status and variations in the Gingival Index (1).

Bleeding on Probing: Pregnant women had a higher prevalence of gingival bleeding, indicating increased periodontal issues among this group(1).

Depth of Periodontal Pocket: Pregnant women tended to have deeper periodontal pockets, signifying more advanced periodontal disease, highlighting the importance of preventive dental care during pregnancy (89)

Gingival Recession: Pregnant women showed a higher incidence of gingival recession, pointing to more severe gum issues, which dental practitioners should consider when treating pregnant patients (89)

Co-morbidities: The study identified a low prevalence of hypertension and a higher prevalence of diabetes mellitus among pregnant women, emphasizing the need to address these conditions in conjunction with periodontal health (90)

Dental Hygiene Practices

Tooth Brushing Habit: A higher proportion of non-pregnant women brushed their teeth regularly compared to pregnant women, suggesting a potential decline in oral hygiene practices during pregnancy (88).

Teeth and Tongue Cleaning Methods: Many pregnant women did not engage in active teeth and tongue cleaning beyond basic rinsing, indicating a gap in comprehensive oral hygiene practices (88)

Frequency of Using Dental Floss Both pregnant and non-pregnant women had low frequencies of daily flossing, highlighting the need for better education on the importance of flossing

Preference of Food: Most respondents preferred home-cooked food, with pregnant women showing a more health-conscious dietary preference compared to non-pregnant women (94)

Dental Check-up During Pregnancy: A very low percentage of pregnant women had dental check-ups during pregnancy, underscoring the need for increased awareness and access to dental care during this period (12)

In conclusion, dental practitioners should focus on providing tailored oral health education, promoting regular dental check-ups, and addressing periodontal issues in pregnant women to ensure optimal oral health outcomes for both the mother and the baby.

Limitations of the Study

Study Design and Sample Size:

In a cross-sectional study aimed at determining the proportion of gingival and periodontal diseases among pregnant and non-pregnant women, various socio-demographic characteristics of the sample were identified. The study focused on young to middle-aged adults, with a significant portion having completed secondary education or higher, predominantly identifying as Muslims, being married, and falling within lower income brackets. The pregnancy status of the respondents was nearly evenly distributed, allowing for comparative analysis between pregnant and non-pregnant individuals regarding their health and oral hygiene practices. The impact of sample size and selection criteria on the generalizability of the findings is crucial. While the study provided valuable insights into the oral health status of pregnant and non-pregnant women, limitations related to the study design, such as its cross-sectional nature, should be acknowledged. Cross-sectional studies have advantages and disadvantages, with limitations in establishing causality. Additionally, the study's sample size of 229 individuals may have implications for the generalizability of the findings, emphasizing the importance of adequate sample sizes for robust results (91). The findings regarding oral health indicators like the Plaque Index, Gingival Index, bleeding on probing, depth of periodontal pockets, and gingival recession among pregnant and non-pregnant respondents provide valuable insights. These results suggest significant differences in oral health status based on pregnancy status, emphasizing the need for tailored dental care during pregnancy. However, the generalizability of these findings may be influenced by the sample size and selection criteria, stressing the importance of considering these factors in interpreting the results (35). In conclusion, while the study sheds light on the oral health status of pregnant and non-pregnant women attending OPDs, it is essential to consider the limitations related to the study design and sample size when interpreting the findings. Future research endeavors should aim to address these limitations to enhance the generalizability and robustness of the results.

Data Collection Methods:

Data Collection Methods for Assessing Oral Hygiene Practices and Lifestyle Factors When collecting data on oral hygiene practices and lifestyle factors, it is crucial to consider the limitations associated with self-reported data and potential biases in clinical assessments and data recording. Self-reported data on oral hygiene practices and lifestyle factors may be subject to recall bias, social desirability bias, or misinterpretation of questions (92). Therefore, it is essential to design questionnaires carefully, pre-test them, and ensure that the questions are clear and unbiased to minimize these limitations(92). Clinical assessments and data recording can also introduce biases, such as observer bias or measurement errors 1. To mitigate these biases, it is important to standardize assessment protocols, provide adequate training to assessors, and use validated tools and techniques for data collection Additionally, ensuring inter-rater reliability and periodically calibrating assessors can enhance the quality and consistency of data collected (92)In a cross-sectional study assessing periodontal and gingival disease among pregnant and non-pregnant women, data collection methods included interviews using a pre-designed questionnaire, document review, and clinical assessments. The study focused on various aspects, including the sample profile, proportion of periodontal and gingival disease, factors associated with these conditions, and assessment of oral hygiene practices and dental care utilization. The study revealed that the majority of respondents were young to middle-aged adults, with a significant portion having completed secondary education or higher (92). The sample predominantly consisted of married individuals with lower individual and family income levels, indicating a socioeconomically diverse population. The data also highlighted the religious demographics of the region, with a majority of Muslim respondents. Regarding oral health assessments, pregnant respondents showed higher plaque accumulation, gingival inflammation, bleeding on probing, deeper periodontal pockets, and gingival recession compared to non-pregnant respondents. These findings suggest a potential association between pregnancy status and variations in oral health indicators. Moreover, the study identified a low frequency of dental check-ups during pregnancy, emphasizing the need for increased awareness and access to dental care among pregnant women. In conclusion, when collecting data on oral

hygiene practices and lifestyle factors, researchers should be mindful of the limitations associated with self-reported data and potential biases in clinical assessments. By employing rigorous data collection methods, standardizing protocols, and ensuring data quality, researchers can obtain reliable and informative insights into oral health status and associated factors among different population groups.

This study provides significant insights into the prevalence and determinants of periodontal and gingival diseases among pregnant and non-pregnant women in Dhaka. The findings highlight the need for targeted interventions, health education, and policy support to improve oral health outcomes, particularly among vulnerable groups such as low-income families and pregnant women. By addressing the socio-demographic, economic, and cultural factors influencing oral health, healthcare providers and policymakers can develop effective strategies to promote overall well-being within the community.

Recommendations

The findings of this study have several important implications:

Targeted Oral Health Programs: Given the higher incidence of oral health issues among pregnant women, there is a need for targeted oral health programs that address the specific needs of this group. Education on the importance of maintaining oral hygiene during pregnancy and regular dental checkups should be emphasized.

Health Education and Promotion: The relatively high levels of education among respondents provide an opportunity for effective health education and promotion. Leveraging this demographic's educational background can help disseminate information on good oral hygiene practices and overall health maintenance.

Socioeconomic Considerations: The predominant low-income status of respondents suggests that economic barriers might limit access to dental care and health services.

Policymakers and healthcare providers should consider subsidized or free dental care programs for low-income families to improve their oral health outcomes.

Comprehensive Healthcare: The presence of diabetes and hypertension among respondents, particularly among pregnant women, indicates the need for comprehensive healthcare that integrates dental care with overall health management. Regular screening for these conditions and coordinated care plans can help manage and mitigate health risks.

Cultural Sensitivity: The diverse religious composition of the sample highlights the importance of culturally sensitive healthcare interventions. Tailoring health messages and programs to respect cultural and religious practices can enhance their acceptance and effectiveness.

Behavioral Interventions: The data on dental hygiene practices suggest a need for behavioral interventions to encourage regular tooth brushing and proper oral hygiene. Programs that address barriers to maintaining oral health during pregnancy, such as nausea and fatigue, can be particularly beneficial.

Integrated Care: Healthcare providers should integrate dental care into prenatal care protocols to improve maternal and child health outcomes.

Policy Interventions: Policies promoting access to affordable dental care for pregnant women could help alleviate barriers to oral health services.

Conclusion

This comprehensive analysis of the dataset reveals significant insights into the demographic, socioeconomic, and health-related characteristics of the respondents. The findings highlight the need for targeted interventions to address oral health issues, particularly among pregnant women. Socioeconomic factors and educational background play crucial roles in shaping health behaviors and access to care. By understanding these

factors, healthcare providers and policymakers can develop effective strategies to improve health outcomes and promote well-being within the community.

The data underscores the importance of integrating oral health into overall health promotion and ensuring that vulnerable groups, such as low-income families and pregnant women, receive the necessary support and care. Through targeted programs and culturally sensitive approaches,

Conflict of Interest

The authors declare that they have no conflicts of interest related to the publication of this research.

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