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Association Between Pregnancy, Gingivitis, and Socioeconomic Status

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A B S T R A C T

Hormonal alterations, in particular, arise from elevated estrogen and progesterone, which influence the tissues of the gingiva, are the major cause of gingival inflammation. Pregnancy gingivitis, the most prevalent oral disease during pregnancy, is related to hormonal changes caused by pregnancy. This study will be done on pregnant women using a dental and medical clinic in Sirte, Libya, with gingivitis and risk factors. A cross-sectional study was done between April 2023 and May 2024 using a convenience sampling method. The study consisted of 98 pregnant mothers. The data was collected using a self-administered questionnaire that covered the following domains: sociodemographic information, economic status, dental hygiene habits, and personal medical history. Participants' periodontal health was evaluated using the latest classification of gingivitis and gingival health, focusing on six representative teeth with oral biofilm present. While the other volunteers seemed to have healthy periodontal tissue, 59% (58/98) of the pregnant study participants had a clinical diagnosis of gingival disease. Additionally, 34% (20/58), 34% (20/58), and 32% (18/58) of the mothers who volunteered had gingival inflammation in the first, second, and third trimesters, respectively. Some estimates indicate that approximately sixty percent of mothers experience gingivitis. Identifying risk factors is critical for stressing clinical follow-up during the prenatal period, and also for public health educators to consider as they develop health education plans for upcoming programs.

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INTRODUCTION

The orofacial region is usually the centre of social gatherings and a common cause of fear, particularly in women. Pregnancy represents profound changes in lifestyle, oral health, and mental, physical, and emotional challenges for women, and is therefore a major life event. Pregnant women with orthodontic concerns will commonly be advised to undergo early treatment and orthodontic treatment for mild crowding because of the widespread lack of understanding about oral health issues that can cause inflammatory reactions when they are pregnant. This technique has been found to lower the risk of bacterial plaque accumulation [1]. Oral hygiene is crucial for the well-being of an individual, especially of a person who is being treated orthodontically. Pregnant women are therefore encouraged to visit a dentist three times. Changes in the body during pregnancy can complicate self-care. Apart from that, pregnant women tend to experience oral infection due to immune system alteration and hormonal changes. Consequently, periodontal disease or pregnancy gingivitis might raise the risk of an early birth and low birth weight [2]. Moreover, low birth weight babies might also be correlated with periodontal disease [3].

The severity and prevalence of gingivitis during pregnancy can be aggravated despite having minor levels of dental plaque. It is a classic example of host response modification due to systemic factors. Increasing the level of oestrogen and progesterone during the third trimester in pregnant women has been linked to an increased severity of gingival inflammation by replacing nutritional needs for specific bacteria that cause the gum inflammation and inducing their proliferation. The inflammatory response to the dental plaque may be aggravated by changing hormones during pregnancy. The impact of the host's systemic circumstances on cellular and immunologic activities seems to prompt this changed response, while bacterial plaque remains the main contributing factor. Prevotella intermedius, a kind of Prevotella, is one species that has been linked to gingivitis during pregnancy. It was reported that Gingivitis was present in 40% of pregnancies [22-23]

This study aims to assess the prevalence of gingivitis and identify related variables among pregnant women in a private medical and dental clinic in Sirte, Libya.

METHODS

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A cross-sectional study was conducted on a convenience sample of 98 pregnant women aged 19-37 with a mean age of 28 ± 1 years from April 2023 to May 2024. Sociodemographic characteristics, family household income, oral hygiene habits, and personal medical history have been taken into consideration. A convenience sample of 105 pregnant women participated; however, two were excluded because they were diagnosed with hepatitis. Two had teeth crowding, and two received periodontal treatment. One was eliminated because she withdrew from participating, leaving 98 pregnant women who attended a private dental consultation. A complete and meticulous medical history should be taken prior to the start of orthodontic treatment, particularly when the patient is pregnant. If you are pregnant, however, you should see a gynaecologist to identify if there is any known comorbidities. The examinations were done, and with six representative teeth with bleeding on probing (BOP), probing depth (PD) (six sites per tooth), and gingival recession or distance from CEJ to free gingival margin (two direct sites for each tooth). The periodontium was evaluated following the new classification of gingival health and gingivitis related to dental plaque from six representative teeth. There was a trained assistant who recorded the scores on paper applications and also electronically entered data from trained data-entry operators. The outcome factor was the occurrence of gingival inflammation, which a case when clinical probing hygiene examination of the periodontium demonstrated the pocket depth of $\leqslant$ 3 mm and nature of bleeding $\geqslant$ 10%, which was based on the new classifications for healthy gingiva and biofilm-stimulated gingival inflammation.[5]
Six representative dental sites were identified as reference, using the International Dental Federation nomenclature (6). These were 12, 16, 24, 32, 36, and 44. The periodontal assessment was made with a coded probe of 11 mm (Hu-Friedy). We consider four surfaces: medial (lingual or palatal), distal, middle and mesial (buccal). Also, gingival inflammatory was determined which contained these ordinal values: probing depth $\leqslant$ 3 mm, <10% bleeding = healthy gingivitis; probing depth $\leqslant$ 3 mm, $\geqslant$ 10% bleeding (two surfaces) one or three teeth = localized gingivitis; probing depth $\leqslant$ 3 mm, $\geqslant$ 10% bleeding (three or more surfaces) four or more teeth = generalized gingivitis.

Gingivitis

One major issue is gingivitis, the most common oral health condition seen in expectant mothers. Inflammation of the superficial periodontal tissues is a defining feature of the condition. Many variables have been linked to the condition's worsening during pregnancy, including (i) increased levels of hormones like progesterone and oestrogen, (ii) changes in oral flora, and (iii) a weakened immune system, which lowers the body's ability to maintain and repair healthy gum tissue.(4)

1. Changes in the epithelial barrier to bacterial insult.
2. Effect on the collagen turnover.

Impact of oestrogen on the periodontium

Oestrogen may decline keratinization while increasing epithelial glycogen, which reduces the effectiveness of the epithelial barrier. It causes cellular proliferation in blood vessels. It induces Polymorphonuclear Leukocyte (PMNL) phagocytosis. Repress leukocyte production and inhibit PMNL chemotaxis from the bone marrow. Inhibiting pro-inflammatory cytokines released by human marrow cells. Reducing T-cells mediates inflammation. Stimulating the synthesis and maturation of the gingival connective tissue and inducing the proliferation of the fibroblast cells of the gingiva. It raises the gingival inflammation level without an increase in dental plaque accumulation.

Effect of Progesterone on periodontium

Vascular dilatation brought on by progesterone increases permeability and prostaglandin synthesis. As a result, there are elevated levels of prostaglandin E2 and PNML in the gingival cervical fluid (GCF). Additionally, it can stop PDL fibroblasts from producing collagen and non-collagen proteins, which would stop human gingival fibroblasts from proliferating. Changes in the rates and patterns of collagen synthesis impair the gingiva's capacity for repair and maintenance. Moreover, it can quicken the metabolic breakdown of folate, a nutrient that is necessary for tissue maintenance and repair.

RESULTS

The data suggested the mean age of the 98 pregnant women sampled, aged 19 to 37 years, was 28.47 years. Regarding residence, there were pregnant women with gingivitis 17% (10/58) living in rural residencies, while 83% (48/58) were residents of urban city [residencies] areas. 25.9% (15/58) had some elementary school, 34.5% (20/58) had some high school, and 24.1% (14/58) had some college. Crucially, the rest of the women who remained were certified in literacy, 15.5% (9/58). A family income analysis was the next step, and it revealed that pregnant women with gingivitis recorded 16% (9/58) had high income, had, 34% (20/58) had medium income, and 50% (29/58) had low income. Regarding the gestational period, 32% (18/58) were in the third trimester, whereas in the second and first trimesters, the numbers and percentages were equal, 34% (20/58). For participants who completed the study, they disclosed that 55% (32/58) had never visited a dentist to receive dental health education during pregnancy, and only 45% (26/58) had taken a health education course while visiting a dentist. Respondents estimated their tooth brushing average to be once to three times a day, with a mean of 3.06 times a day. When studying the question, "How many times a day do you brush your teeth?" 19% (11/58) replied brushing their teeth three times or more a day, 81% replied brushing

less than three times a day (47/58). When you consider that all of the responses had brushing, and then another form of oral hygiene. Regarding the use of oral hygiene aids, 66% (38/58) used them, and 34% (20/58) did not use them. In contrast with healthy gingiva, pregnant women (Table 2).

Table 1. Variables received for gingivitis among pregnant women

criteria *	Gingivitis classification	Frequency N= 98	%
Depth ≤ 3 mm with <10% bleeding	Healthy	40	41%
Depth ≤ 3 mm with ≥ 10% bleeding in 1-3 teeth	Localized	17	17%
Depth ≤ 3 mm with ≥ 10% bleeding in ≥ 4 teeth	Generalized	41	42%
Total		98	100%

**Parameters of the new classification of gingival health and biofilm-induced gingivitis. (59% gingivitis, 41% healthy)*

Table 2. Bivariate analysis of variables related to gingival disease among pregnant women.

Variables	Gingivitis N=58(59)%	Healthy N=40(41%)
Age		
19-28	30(52%)	23(58%)
29-37	28(48%)	17(42%)
Location Rural	10(17%)	16(40%)
Urban	48(83%)	24(60%)
Educational level		
Elementry	15(25.9%)	10(25%)
High	20(34.5%)	13(32.5%)
Collage	14(24.1%)	12(30%)
literacy	9(15.5%)	5(12.5%)
Household income		
Low	29(50%)	3(8%)
Medium	20(34%)	27(67%)
High	9(16%)	10(25%)
The gestational period		
1st time of pregnancy	20(34%)	20(50%)
2nd trimester	20(34%)	12(30%)
3rd trimester	18(32%)	8(20%)
Health Education		
Did not receive	32(55%)	16(40%)
Did receive	26(45%)	24(60%)
Toothbrushing		
<3	47(81%)	10(25%)
≥ 3	11(19%)	30(75%)
Oral hygiene aids:		
Do not use	20(34%)	9(23%)
Use	38(66%)	31(77%)

DISCUSSION

The cross-sectional design of this study is subject to inherent limitations concerning the elucidation of temporality. With regard to dental appointments, failure to attend dental clinics during pregnancy has been shown to increase the risk of gingival disease, as evidenced by the outcomes of Onigbinde et al. (7). The decline in dental appointment sections during pregnancy has been demonstrated to exacerbate biofilm development and gingival inflammation (8, 9). In the present study, it was found that 81% of pregnant females brush their teeth once or twice daily, while 34% do not use dental hygiene equipment. Consequently, this prompts the consideration of the condition's presence. It is imperative to eradicate irritating factors, especially for pregnant women who suffer from gingivitis, as they serve to exacerbate the epidemiological patterns of periodontal condition and impact the loss of gingival attachment (16). The most prevalent form of gingivitis is described as generalized gingivitis. The morbidity of gingival disease recorded in other research studies contrasts with our findings due to the epidemiological indices that have been utilised.

In the field of periodontal disease research, the progression of the disease has been categorised by several authors. The most prevalent category is moderate (10, 11), followed by mild (12, 13). The present study recorded a high incidence of gingival inflammation in pregnant females, with 59% of the sample suffering from the condition. This figure is similar to the results of the American Dental Association, which reported that 60% to 75% of pregnant women have gingivitis (14). The duration of tooth brushing is a pivotal factor in determining the efficacy of plaque removal (15). The findings of this study demonstrated that the duration of tooth brushing among the study population remained inadequate in comparison with the duration recorded in other studies. Research studies have been conducted that report the presence of risk factors related to the development of gingivitis during pregnancy. These factors include socioeconomic variables (17, 18, and 19) and racial determinants (15, 18). The data obtained pertained to the education levels and country of origin, with the majority of pregnant women originating from countryside areas and having limited or no education. Nevertheless, the investigation revealed no significant correlation.

Concerning the remaining variables, the absence of oral hygiene equipment would be a reasonable predictor of the effect, given that this habitual manner is acquired at an early stage. Health promotion and education are a pivotal element in facilitating the entry of auxiliaries into the primary care level of specific protection (20). Pereda-Rojas et al. (21) posit that it is incumbent upon healthcare providers to implement measures to safeguard the oral health of pregnant women, encompassing educational interventions and health promotion initiatives, with a view to averting the onset of gingival diseases. Pregnant women must raise awareness to avoid the development of oral health conditions.

Limitation

It is acknowledged that a significant restriction of

this cross-sectional study is the utilisation of a convenience sample. Consequently, the findings are not representative of the entire population and cannot be generalised. Consequently, the study may be susceptible to recall bias. It is recommended that future research be informed by the findings of longitudinal studies.

CONCLUSION

This result is consistent with that of other researchers who also found that 59% of people had gingival disease. The risk factors that have been found only highlight how important health education is in encouraging the use of dental hygiene products. It is also the responsibility of dental healthcare professionals to stress the importance of clinical reviewing and monitoring for expectant mothers during their pregnancy. Statement of conflict of interest: There are no disclosed conflicts of interest for the writers.

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