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ORIGINAL RESEARCH ARTICLE

ORAL HEALTH STATUS AMONG PREGNANT AND NONPREGNANT WOMEN: A COMPARATIVE STUDY

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ABSTRACT

Background: Physiological alterations manifesting during pregnancy may influence oral health of women by increasing the susceptibility to oral infections. This study was carried out to assess oral hygiene status, gingival status, periodontal status and treatment needs (TNs) among pregnant and nonpregnant women.

Methods: A comparative cross-sectional study was conducted in patients attending Outpatient Department of Obstetrics and Gynaecology, Chitwan Medical College and Teaching Hospital, Bharatpur, Chitwan, Nepal from December 2020 to June 2021. A total of 102 pregnant (34 in each trimester) and 102 nonpregnant women of 15-49 years fulfilling all inclusion criteria were evaluated for oral health status by various indices including oral hygiene index-simplified (OHI-S), gingival index (GI), and community periodontal index and treatment needs (CPITN). Convenience sampling technique was done. Data was analysed in SPSS v.26.0.

Results: The mean scores of OHI-S, GI and CPITN were statistically (p value<0.001) higher in pregnant women compared to nonpregnant women; highest in third trimester followed by second and first trimesters. In both groups, majority were found to have score 2 for treatment needs. TN2, encompassing oral hygiene instructions and oral prophylaxis was required by 92.2% of nonpregnant women, 100% of pregnant women in first trimester, 88.2% and 5.9 % in second and third trimesters respectively. Majority (94.1%) of pregnant women in third trimester required TN3 complex treatment.

Conclusions: Pregnant women found to have poor oral hygiene status, more gingivitis and periodontal diseases as compared to nonpregnant women. Implementation of proper oral hygiene practices can prevent oral diseases and its further complications.

INTRODUCTION

The link between pregnancy and oral health has been known for many years. The World Health Organization (WHO) has highlighted the importance of oral health as a determining factor for individuals to have a good quality of life through its Global Oral Health Program.[1]

In present scenerio, it is of utmost importance to be aware about actual current scientific evidence regarding the relationship between pregnancy and oral health. Because of normal physiologic changes, pregnancy is a time of particular vulnerability in terms of oral health; periodontal diseases including gingivitis and periodontitis.[2]

This study aimed to find out oral hygiene status, gingival status, periodontal status and treatment needs (TNs) among pregnant and nonpregnant women and to observe if any difference exists between these two groups as identification of risk factors during pregnancy can help guide and establish early treatment, which have paramount importance in avoidance of their possible adverse effects on pregnancy.

METHODS

This was a comparative cross-sectional study conducted in patients visiting Outpatient Department of Obstetrics and Gynaecology, Chitwan Medical College and Teaching Hospital, Bharatpur-10, Chitwan, Nepal from December 2020 to June 2021 after obtaining the ethical approval (Ref No.CMC-IRC/077/078-075) from Institutional Review Committee of the same institute.

Convenience sampling was done. Sample size was calculated using the following formula:

$$\text{Sample size (n)} = 2\,SD^2\,(Z_{\alpha/2} + Z_{\beta})^2/d^2$$

Where,

SD = denotes standard deviation, measure of the amount of variation or dispersion of a set of values (1.9)

$Z_{\alpha/2} = Z_{0.05/2} = Z_{0.025} = 1.96$ (from Z table) at type 1 error of 5%

$Z_{\beta} = Z_{0.20} = 0.842$ (from Z table) at 80% power

d = effect size = difference between means values of two groups

Using the above formula comparable to one of the previous

study[3], Sample size (n)= $2 * 1.9^2 (1.96 + 0.842)^2 / (2.45 - 1.69)^2$

$n = 2 * 3.61 (2.802)^2 / 0.76^2$

$n = 2 * 3.61 (7.85) / 0.57$

$n = 56.68 / 0.57$

$n = 99.43 \sim 100$

In order to have an equal distribution of participants among three trimesters in pregnant group, sample size of 102 was taken in both the pregnant and nonpregnant groups with total participants 204.

Thus,

Group P (n = 102): Pregnant women (n=34 in each trimester)

Group NP (n = 102): Non-pregnant women

Inclusion criteria were healthy pregnant and nonpregnant women with reproductive age group of 15–49 years without any systemic diseases. In pregnant group, both primigravidae and multigravidae were included, and in nonpregnant participants with a minimum of 15-month postpartum period were chosen in order to avoid the effect of prolactin hormone on the levels of estrogen and progesterone in the body, the increased level of which may lead to pregnancy gingivitis. Dentate patients with at least sixteen permanent teeth were required.

Exclusion criteria were subjects suffering from any systemic illnesses or those in critical conditions. Subjects on any antibiotics, anti-inflammatory, antiplatelet, antihypertensives or immunosuppressants therapy before the commencement of study for at least the previous three months which may alter the findings were also excluded. Patients who had undergone any periodontal therapy within the period of six months before the commencement of a study, with any orthodontic appliances or on extensive prosthetic rehabilitation were excluded. Individuals with a habit of smoking cigarette, chewing tobacco or drinking alcohol, not able to carry out effective toothbrushing and contraceptives users (for control group) were also not included.

The study comprised of an interview and oral examination. The subjects were verbally informed about the study and an informed consent was obtained for the same. Participation was voluntary and utmost confidentiality and personal identity of all the participants were assured.

Demographic variables and general information including those related to oral hygiene practices and habits and pregnancy status were collected during the interview. The patients were allowed to sit on a wooden chair with their heads resting comfortably during the examination. The WHO Type III examination was followed using mouth mirror, sharp explorer, and adequate illumination.[4] The pregnancy was confirmed either by pregnancy test, clinical examination or ultrasonographic examination by a qualified doctor.

The clinical examination was carried out and recorded by a single examiner. OHI-S, GI and CPITN were used to assess oral hygiene status, gingival status and periodontal status and treatment needs respectively.

In periodontal chart, debris and calculus scores for teeth #16, 11, 26, 46, 31, 36 were recorded and simplified oral hygiene index was determined.

Full mouth examination using four different gingival areas of tooth including distofacial papilla, facial margin, mesiofacial papilla and entire lingual margin was performed, using a mouth mirror and periodontal probe, to record the gingival index. Gingival index was recorded for each surface of a tooth as 0 (no inflammation/ normal gingiva), 1 (mild inflammation, no bleeding on probing), 2 (moderate inflammation, bleeding on probing) and 3 (severe inflammation, spontaneous bleeding). The sum of scores divided by the number of total surfaces was calculated. The scores was 0.1 to 1, 1.1 to 2 and 2.1 to 3 inferred as mild, moderate and severe gingivitis respectively. The case was defined as a case of gingivitis if the mean gingival index was more than 0.[5]

Since periodontitis cannot be assessed by visual examination alone; it was diagnosed with the use of a CPITN-C probe that was inserted into the gingival crevice between the teeth and gums. Loss of attachment abbreviated as LOA recorded in millimeters is a measure of the severity of destruction of tooth-supporting connective tissue and alveolar bone. Loss of attachment is typically accompanied by a deepening of the gingival crevice, the depth of which is termed probing depth.

Collected data were coded, entered into Microsoft Excel and transformed to IBM SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, N.Y., USA) for statistical analysis. Mean and standard deviation were used to express continuous data. Mean values of each parameter were compared between the groups using one-way analysis of variance (ANOVA). Independent sample t-test was applied to compare the mean values of OHI-S, GI and CPITN between two groups. The p-value <0.001 was considered statistically highly significant; p-value <0.01 as very significant; p-value <0.05 as significant and p-value >0.05 as not significant.

RESULTS

Individuals with an age ranging from 15-49 years were selected for the study; of which the maximum participants were of age group of 25-30 years as depicted in Table 1.

Table 1: Age-wise distribution of the study participants

Age (years)	P1	P2	P3	NP
<25	8 (23.5)	15 (44.1)	9 (26.5)	11 (10.8)
25-30	14 (41.2)	15 (44.1)	17 (50)	47 (46.1)
>30	12 (35.3)	4 (11.8)	8 (23.5)	44 (43.1)

The mean scores of OHI-S, GI and CPITN were found to be significantly higher in pregnant women in comparison to nonpregnants as tabulated in Table 2.

Table 2: Comparison of various parameters between pregnant and nonpregnant using independent sample t-test

Indices	Group	n	Mean±SD	T value	p-value
OHI-S	P	102	2.72±0.98	5.21	0.000
	NP	102	2.12±0.60		
GI	P	102	1.47±0.77	8.18	0.000
	NP	102	0.80±2.95		
CPITN	P	102	2.88±0.90	6.07	0.000
	NP	102	2.24±0.58		

The mean scores of OHI-S, GI and CPITN were found to be significantly higher in third trimester followed by second and first trimesters as shown in Table 3.

Table 3: Comparison of various parameters between different trimesters of pregnancy using one-way analysis of variance (ANOVA) test

Indices	Group	n	Mean±SD	F value	p-value
OHI-S	P1	34	2.09±0.62	67.13	0.000
	P2	34	2.29±0.57		
	P3	34	3.76±0.74		
GI	P1	34	0.52±0.18	1179.64	0.000
	P2	34	1.53±0.11		
	P3	34	2.37±0.16		
CPITN	P1	34	2.09±0.28	148.50	0.000
	P2	34	2.62±0.69		
	P3	34	3.94±0.23		

As shown in Table 4, participants in both pregnant and non-pregnant groups majority were found to have score 2 for treatment needs. TN 2, encompassing oral hygiene instructions and oral prophylaxis was required by 92.2% of nonpregnant, 100% of pregnant women in first trimester, similarly 88.2% and 5.9 % in second and third trimesters respectively required TN2. TN 3 incorporating complex treatment was required for majority (94.1%) of pregnant women in third trimester.

Table 4: Descriptive statistics for treatment needs of the study participants

	Scores for Treatment Needs			
Groups	Score 1	Score 2	Score 3	Total
NP	1 (0.9)	94 (92.2)	7 (6.9)	102
P1	0 (0)	34(100)	0 (0)	34
P2	0 (0)	30 (88.2)	4 (11.8)	34
P3	0 (0)	2 (5.9)	32 (94.1)	34

DISCUSSION

The birectional relationship between oral diseases and pregnancy has been known for many years. Oral health in pregnant women has become a field of research since 1960.[6] Thus, this study was planned for assessment of oral health status, gingival status, periodontal status and treatment needs during pregnancy as education of women prior to conception and in the antenatal period can prevent most of the dental problems, as well as help in sustainment of sound oral hygiene during and after pregnancy.

Our study showed higher mean OHI-S score in pregnant women as compared to nonpregnant group and this difference was found to be statistically highly significant (p<0.001). This observation was in concordance with few previous studies.[7-9] The higher proportion of pregnant women (35%) exhibited poor oral hygiene status reflecting a high degree of oral uncleanliness as compared to nonpregnant women (18.33%) in a study conducted by Kashetty et al.[10] It is also possible that pregnancy gingivitis may make brushing and routine dental care troublesome which may hasten deposition of local irritants such as debris and calculus.[11] It is of paramount significance to make patients aware regarding the importance of sound oral hygiene practices. Few studies showed no difference in oral hygiene status between two groups in contradictory to the findings of our study.[12,13]

The results of our study showed mean GI score of pregnant group significantly higher (p<0.001) as compared to nonpregnant group. Rose et al. suggested that an increased incidence of gingivitis may happen during pregnancy.[14] Our finding of increasing prevalence of gingival disease as the trimesters of pregnancy progressed was similar with the findings by Mital et al.[15]

Silness and Loe et al. observed an increase in severity of gingivitis from the second month of pregnancy which reached maximum during the eighth month.[14] Other authors also had reported the gradual increase in severity of gingivitis towards the end of pregnancy.[13,14] The inflammatory changes in gingiva associated with pregnancy have been termed as pregnancy gingivitis (gingivitis gravidarum), which is most prevalent oral manifestation associated with pregnancy and has been reported to occur anywhere from 30% to 100%,[16] most commonly in the range of 60% to 75%.[17]

Hormonal alterations during pregnancy are believed to influence susceptibility to gingivitis. It is widely accepted that increased circulating levels of female sex hormones play a key role in the etiology of pregnancy gingivitis.[12]

At least four mechanisms that may contribute to the exacerbation of gingival infammation in the presence of high levels of estradiol and progesterone had been described in the literature.[18] The first is the vasodilatory effect of estrogens, which increases the blood supply to the gingival tissue with a consequent exacerbation of the infammatory response. Other mechanisms speculated are suppression of the immune system, phenotypic alterations of the gingiva and quantitative and qualitative alterations of the supra and subgingival flora.[19] It has been documented that inadequate control of oral biofilms, which is associated with the evolutionary characteristics, has a tremendous impact on the progression of oral diseases.[20]

The difference in proportion between the CPITN scores of

periodontal disease of pregnant and nonpregnant group in our study was highly significant, similar to observation by Vogt et al.[21] The differences could be mainly due to effects of hormonal alterations manifestated in pregnancy. The local deposits might also be considered as precipitating factors for more periodontal diseases in pregnancy. In the present study, maximum number of participants in both groups in first and second trimesters were found to require TN2 (oral hygiene instructions and oral prophylaxis) and TN3 by women in third trimester similar to the findings of other studies. [8,10,22]

The maternal periodontal disease may also be considered a possible independent risk factor for several adverse pregnancy outcomes such as preterm deliveries, low birth weight, and spontaneous abortions.[23, 24]

Good oral health and control of oral disease has the potential to reduce the transmission of pathogenic bacteria from mothers to their children thus protecting both woman and child health and quality of life before and during pregnancy. The pregnancy should be a teachable moment whereby a coordinated effort between the oral health and prenatal communities can benefit maternal and child oral health outcomes.[25]

There are few limitations in the current study which include small sample size and lack of longterm evaluation. Thus, further longitudinal studies can be conducted recruiting larger sample size in future. Furthermore, biochemical assessment of the hormonal level can be done to find out the corelation between the hormonal changes and oral health status. Only clinical evaluation was done though radiographs are widely considered as a reliable tool for an assessment of alveolar bony changes but incongruously might involve ethical issues as the radiographic exposure of pregnant women for any treatment may not be justifiable.

CONCLUSION

The findings of the present study supports the fact that pregnant women had poor oral hygiene status, more gingival inflammation and periodontal diseases with its increased severity as the trimester progressed out; making them more susceptible for oral health diseases as compared to nonpregnant women. Oral diseases are preventable during pregnancy, by making pregnant women aware and educating them of the importance of good oral health. Regular dental checkup is encouraged for well-being of fetus and child.

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