DENTAL STATUS AND ITS SOCIO-DEMOGRAPHIC INFLUENCES AMONG PREGNANT WOMEN ATTENDING A MATERNITY HOSPITAL IN INDIA

Condição dentária e sua influência sócio-demográfica entre mulheres grávidas, pacientes de um hospital maternidade na Índia

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Abstract

OBJECTIVES: The purpose of present study was to estimate the oral hygiene, gingival and periodontal status in a sample of pregnant women and to explore the association of various socio-demographic factors on the oral hygiene status. **MATHERIAL AND METHODS**: Pregnant women in varying stages of pregnancy attending the district maternity hospital at Udaipur city constituted the target population. Clinical evaluation was done for oral hygiene status in addition gingival status and periodontal status. **RESULTS**: There was a significant increase in mean gingival score with increase in trimester. Pocket depths of 6-8 mm were only prevalent (8.7%) in the 3rd trimester. Stepwise multiple linear regression analysis revealed that the best predictors in the descending order for oral hygiene index were occupation of husband, trimester, income, occupation, age, whereas occupation of husband, age and income provided a variance of 19.7% in debris level. **CONCLUSIONS**: It was observed that Gingival and periodontal statuses deteriorated as the trimester of pregnancy proceed and various socio-demographic factors in addition to trimester significantly influenced oral hygiene status. Hence, oral health intervention programs should be targeted to the risk groups.

Keywords: Oral hygiene; Gingival status; Periodontal status; Pregnancy; Socio-demographic factors.

Resumo

OBJETIVOS: *O objetivo do presente estudo foi estimar o estado gengival e periodontal numa população de mulheres grávidas e expostas a associação de vários fatores sócio-demográficos na condição da higiene bucal.* **MATERIAL E MÉTODO**: *Mulheres grávidas em vários estágios de gravidez, pacientes do Hospital Maternidade de Udaipur, India, constituíram a população-alvo. Foi efetuada avaliação clínica do estado da higiene bucal e avaliou-se as condições gengivais e periodontais*. **RESULTADOS**: *Houve um aumento significativo no escore gengival com progressão trimestral da gravidez. Bolsas gengivais de 6-8 mm prevaleceram no terceiro trimestre (8.7 %). Análise de regressão múltipla linear revelou que os melhores preditores em ordem descendente para índices de higiene bucal foram ocupação do marido, trimestre, rendimento, ocupação, idade sendo que a ocupação do marido, idade e rendimentos proveram variação de 19.7 em níveis de resíduos.* **CONCLUSÕES**: *Observou-se que as condições gengival e periodontal deterioram-se conforme avançou o trimestre da gravidez e vários fatores sócioeconômicos, em adição ao trimestre, influenciaram significativamente a condição da higiene bucal. Assim sendo, programas de intervenção na higiene bucal devem ser dirigidos para os grupos de risco.*

Palavras-chave: *Higiene bucal; Gravidez; Condição sócio-demográfica; Condição gengival; Condição periodontal.*

INTRODUCTION

Good oral health care during pregnancy is essential but an overlooked factor (1). Pregnancy is a state during which a woman may be practically amenable to disease, prevention and health promotion interventions that could enhance her own health or that of her infant. However, relatively few investigators have studied the implications of these findings and assumptions. There are few programs in aim to achieve widespread improvement in oral health of pregnant women or their infants.

Recently the dental community has focused on potential association between periodontitis and pregnancy outcomes (2-4). Furthermore, oral health may contribute to generate health outcomes (5). Strategies has been proposed for preventing *Streptococcus mutans* transmission from pregnant women to her child and ultimately early childhood caries (6).

Dentistry can be vital in improving prenatal outcome and maternal or fetal dental health through screening, referral and education of pregnant clients. Walsh (7) stated that the young mother is at a "teachable moment" in her life because she wants her new baby to be healthy.

Various alterations of oral hygiene during pregnancy has been cited in the literature. Hormonal alterations during pregnancy tend to increase incidence of dental diseases like gingivitis, and may even contribute for low salivary pH thus in turn leading to increased incidence of dental caries, although no attempt was done in the present study to assess dental caries.

Studies documenting the effect of hormones on oral health of pregnant women suggest that 25 to 00% of these patients experience gingivitis and 10% experience pyogenic granuloma (8, 9). Gingival changes during pregnancy have been well-documented. Increase in both the rate of estrogen metabolism and synthesis of prostaglandins by the gingiva contribute to the gingival changes observed during pregnancy (10, 11). Alterations in progesterone and estrogen levels have been shown to affect the immune system, rate and patterns of collagen production in the gingiva thus reducing the body's ability to repair the gingival tissue (12, 13) and compromised immune mechanism may even precipitate the risk for periodontal infection.

Periodontal infection which can be reservoir for inflammatory mediators may pose a potential threat to the placental fetus, thereby increasing the likelihood of preterm delivery. It is important to understand that establishing a healthy oral examination is the most important objective in planning dental care for pregnant patient. This objective can be achieved by meticulous plaque control. Brushing is essential during pregnancy,

but flossing is also important in cases where plaque retention is a problem. However, access to dental care during pregnancy is impeded in part by a limited window of opportunities for treatment. The American Dental Association (ADA) suggests that elective dental care should be avoided, if possible, during the first trimester and the last one-half of the third trimester (8). This time frame apparently is widely recommended because it includes the periods of greater risk of harm to the developing embryo or fetus, as well as the least comfort for the mother (9, 14).

Hence, the best option is to treat during the second trimester when fetus development is completed and the pregnant women present smaller abdominal distention. Though there is voluminous literature regarding the oral health status of pregnant women, scanty data is available from Indian subcontinent and no study assessed the influence of various socio-demographic factors on the oral hygiene status. The purpose of present study is to estimate the oral hygiene, gingival and periodontal status in a sample of pregnant women and to explore the association of various socio-demographic factors on the oral hygiene status.

The data thus obtained could be helpful in planning oral health education and promotion programs for the pregnant women.

MATERIALS AND METHOD

Women in varying stages of pregnancy attending the district maternity hospital at Udaipur City constituted the target population. The final sample accounted to 206 women, 38 belonging to 1st trimester and 84 in 2nd and rest in their 3rd trimester. The ages of women ranged from 18 to 35 years of age.

All the women present on the days of the survey were included in the study and those who were experiencing labor pain, along with those who were uncooperative or unwilling to give consent, comprised the exclusion criterion.

Clinical examination was done by a single examiner based on the WHO criteria for periodontal assessment using the CPI probe. Informed written consent was obtained from all participants and ethical clearance was obtained from ethical committee of Darshan Dental College and Hospital, Udaipur, India.

The other indices used for clinical evaluation were simplified oral hygiene index in addition to Loe and Silness gingival index (15). Prior to clinical examination, socio-demographic information regarding age, trimester, family income, occupation and education of the subject and their spouses was procured.

Loe and Sillness gingival index (15) is used to evaluate gingival status. It is used to estimate the severity of gingivitis by evaluating gum color, consistency and bleeding during probing by the use of a periodontal probe. Mesial, vestibular, distal and lingual marginal gingiva of six index teeth (teeth 16, 21, 24, 36, 41, 44) are examined.

The oral hygiene variables of each subject were assessed using Simplified Oral Hygiene Index (OHI-S) proposed by Greene and Vermillion (16). The six index teeth examined were as recommended by the index. OHI-S has two components: Debris Index (DI) and Calculus index (CI). The average individual debris score and calculus score were determined and these were added together to obtain the OHI-S for each subject.

In CPI for each tooth (3rd molars excluded, presence of bleeding, calculus and depth of periodontal pockets were measured. The Community Periodontal Index (CPI) (17) was used to record the periodontal conditions; however, registrations only included score 0 (healthy), score 1 (bleeding) and score 2 (calculus) for children between the ages 12 to 15 years. Score 3 (shallow periodontal pockets) and score 4 (deep periodontal pockets) were also registered for the sample population who were aged 16 years and more but there were no subjects with deep periodontal pockets (score 4).

Data collected was entered into spreadsheets and was subjected to statistical analysis by SPSS (*statistical package social sciences*), version 15.0. Means and standard deviations were assessed and one way ANOVA was executed for comparing the means under various categories. Step wise multiple linear regression analysis was executed to estimate the linear relationship between dependent variables (DI, CI and OHI) and various independent variables (age, trimester, family income, occupation and education of the subject and their spouses).

Stepwise multiple linear regression analysis examines the variables in the block at each step for entry or removal. Variables are entered or removed from the model depending on either the significance (probability) of the F value or the F value itself.

RESULTS

Debris was more prevalent than calculus irrespective of age, with mean debris scores more for the younger age groups when compared with the older age groups. There was no definite trend for calculus prevalence, youngest age group presenting the highest mean score 3.45 (1.328) as illustrated in Table 1 Furthermore, mean OHI score deteriorated as the age increased.

Statistical analysis revealed that there was a significant difference for mean debris index and oral hygiene index. There was no definite trend for mean calculus score with increase in trimester illustrated in Table1; however, a definite decrease in the mean debris score and OHI with increase in trimester, with mean debris score and oral hygiene score more for 1st trimester as compared with 3rd trimester.

TABLE 1 - Mean DI, CI, OHI-S scores among pregnant women according to age and trimester

Age *	DI	F(sig)	CI	F(Sig)	OHI	F(sig)
18-22	1.65(0.75)	1.14(.004)	1.30(0.00)	0.22(0.88)	3.45(1.32)	2.71(0.04)
23-26	1.20(0.55)		1.07(0.64)		2,23(0.97)	
27-30	0.98(0.34)		1.16(0.76)		2.10(1.009)	
30 and above	0.940(.24)		1.04(0.39)		1.98(0.60)	
Total	1.149(0.51)		1.08(0.64)		2.20(0.97)	
Trimester	**DI**		**CI**		**OHI**	
1	1.15(0.38)	0.02(0.97)	1.16(0.40)	0.52(0.59)	3.45(1.32)	0.87(0.42)
2	1.15(0.51)		1.04(0.68)		2,23(0.97)	
3	1.14(0.56)		1.07(0.70)		2.10(1.009)	
Total	1.14(0.51)		1.08(0.64)		2.20(0.97)	

The mean gingival score by age group is presented in Table 2. Gingival score increases with age i.e. in 1st age group it is 0.87(SD 0.20) while with 4th age group it is 1.33(SD 0.36).

TABLE 2 - Mean Gingival index scores of pregnant women in relation to age and trimester

Age *	GI	F(SIG)
18-22	0.87(0.20)	4.65(.004)
23-26	1.05(0.30)	
27-30	1.11(0.36)	
30 and above	1.39(0.36)	
Total	1.08(0.33)	
Trimester	**DI**	**F(SIG)**
1	1.005(0.42)	1.83(0.16)
2	1.08(0.30)	
3	1.12(0.30)	
Total	1.08(0.33)	

There was a significant increase in mean gingival score with increase in trimester. The mean score in 3rd trimester was 1.128(SD 0.30) in contrary to 1.0 (0.42) in the former trimester. The prevalence of periodontal disease was found to be 97.8% (Table 3). Periodontal disease prevalence was determined by considering subjects with CPI scores 1, 2, 3 and 4 as diseased and the subjects with CPI score 0 were considered as healthy.

TABLE 3 - Periodontal status of pregnant women assessed by CPI according to age and trimester

Age *	N	Score 0	Bleeding	Calculus	shallow pockets	Deep pockets
18-22	4			4(100%)		
23-26	150	4(2.7%)	50(33.3%)	72(48.0)%)	16(10.7%)	8(5.3%)
27-30	44	2(4.5%)	12(27.3%)	24(54.5%)	6(13.6%)	
30 and above	18		8(44.4%)	4(22.2%)	6(33.3%)	
Total	216	6(28.5%)	70(32.4%)	104(48.1%)	28(13.0%)	8(3.7%)
Trimester**						
1	44	2(4.5%)	12(27.5%)	20(45.5%)	10(22.7%)	
2	80	4(5.0%)	20(25.0%)	37(46.3%)	19(23.7%)	
3	92		38(41.3%)	40(43.5%)	6(6.5%)	8(8.7%)
Total	216	6(27.8%)	70(32.4%)	97(44.9%)	35(16.2%)	8(3.7%)

*X^2 = 19.159, = 0.85, **X^2 = 26.915, p<0.001.

There were no healthy subjects comprised among first age group and last age group. The healthy population comprised of a mere 2.7% and 4.5% in the second and third age group respectively. The results showed that the proportions of subjects who reported bleeding, calculus and periodontal pockets decreased steadily with age and high statistical significant difference was observed among various age groups. Subjects who presented bleeding were less (27.3%) in the 27- 30yr old group and more (44.4%) in the 30 and above old group. Calculus was the greatest problem (48.0%) in subjects belonging to 23-30yr old age group.

In the youngest age group (18-22yr old group) pocket depths of 6-8 mm were recorded among 18% individuals. The highest percentage of subjects with shallow and deep pockets were found in the 18-22 and 23-26 years-old age group, being 18% and 5.3% respectively. According to trimester, the healthy subjects comprised of 4.5% among 1st trimester and 5.0% with 2nd trimester,

no subjects were found healthy in the third trimester. Bleeding was highest in the 3rd trimester (54.3%) and lowest in the 1st trimester (27.3%).

Calculus was a major problem for the women in all the trimesters. Pocket depths of 6-8 mm were only prevalent (8.7%) in the 3rd trimester. There was a rise in the prevalence of shallow periodontal pockets from first to second trimester which decreased in the ultimate trimester.

All the independent variables were included a stepwise multiple linear regression analysis. The best predictors in the descending order for oral hygiene index were occupation of husband, trimester, income, occupation, age, whereas occupation of husband, age and income provided a variance of 19.7% in debris level (presented in Table 4). It is evident from table that the variables (occupation, occupation of husband, income and trimester) in the model explain 13.5% variance in calculus. Occupation of husband was the predictor for all the components of oral hygiene index.

TABLE 4 - Step wise multiple linear regression analysis with DI, CI and OHI as dependent variables

Debris index				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of Estimate**
1	0.30 (a)	0.09	0.08	0.51
2	0.37(b)	0.14	0.13	0.49
3	0.44(c)	0.19	0.18	0.48

a Predictors: (Constant), occupation of husband
b Predictors: (Constant), occupation of husband, age
c Predictors: (Constant), occupation of husband, age, family income

Calculus index				
1	0.20(a)	0.04	0.03	0 .63
2	0.25(b)	0.06	0.05	0.63
3	0.31(c)	0.10	0.08	0.62
4	0.36(d)	0.13	0.11	0.62

a Predictors: (Constant), occupation of the subject
b Predictors: (Constant), occupation of the subject, occupation of husband
c Predictors: (Constant), occupation of the subject, occupation of husband, family income
d Predictors: (Constant), occupation the subject, occupation of husband, family income, trimester

OHI-S				
1	0.25(a)	0.06	0 .05	0 .94
2	0.33(b)	0.11	0.09	0.92
3	0.40(c)	0.16	0. 14	0.89
4	0.46(d)	0.21	0.18	0.87
5	0.46(d)	0.23	0.20	0.86

a Predictors: (Constant), occupation of husband
b Predictors: (Constant), occupation of husband, trimester
c Predictors: (Constant), occupation of husband, trimester, income
d Predictors: (Constant), occupation of husband, trimester income, occupation
e Predictors: (Constant), occupation of husband, trimester income, occupation, age

DISCUSSION

Although the present study aimed to estimate the oral hygiene, gingival and periodontal status and to explore the association of various socio-demographic factors on the oral hygiene status of pregnant women, the results are limited as they do not represent the whole pregnant population of the country.

A number of features inherent in this study deserve some clarification for convenience; the study was conducted in a single maternity hospital and socio-demographic data collected was based on subjective information.

The results of the present study support earlier reports, confirming that gingival index score increase significantly with age and trimester. The mean score in first trimester was 1.0±0.42 which

rose to 1.12±0.30 in third trimester and it was 0.87±0.20 in youngest age group, in contrary to 1.33±0.36 in the oldest. Hugoson (18) observed a similar trend where mean gingival score increased from 2.06±0.11 to 2.60±0.05 from first to third trimester and it has been attributed to accentuated inflammatory response to dental plaque. However, pregnant women have increased levels of female sex hormones which may play a central role in the etiology of this condition (18-20).

From a periodontal perspective, the effects of hormonal level on the gingival status of pregnant women may be accompanied by increased levels of *Bacteroide*s, *Provtevella*, and *Porphyromonas* (21). These findings are exacerbated by poor plaque control and mouth breathing (22). The mean GI scores of pregnant women reported in this study were high indicating a mild to moderate gingival inflammation. Such findings may be related to the fact that the majority of pregnant women were in their second or third trimester. Gingivitis is even associated with circulating estrogen. However, the mechanism by which these steroids increase gingival inflammation is not known. Interleukin-6 (IL-6), a pleiotropic cytokine produced by many cell types including human gingival fibroblasts (hGF), is secreted in response to inflammatory challenges such as bacterial lipopolysaccharide and interleukin-1 (IL-1) (23). Cellular proliferation and the number of cells entering the S-phase of the cell cycle are significantly increased in mass cultures of fibroblasts stimulated by estradiol (24).

Pocket depths of 6-8 mm were only prevalent (8.7%) in the 3rd trimester and there were no subjects with deep pockets in the former trimesters in accordance to a previous study where periodontal status deteriorated which was assesses by Russell´s periodontal index as the trimester increased (25). A possible reason for the increased periodontal pocket depth is the swelling and loosening of the gingival tissues around the teeth caused by inflammation so allowing the probe to penetrate deeper within the tissues (26, 27) or may be due to increased levels of microorganisms like *Bacteroides*, *Provtevella*, and *Porphyromonas* and the role of subgingival microbial species in the etiology of periodontal diseases has been extensively documented (28-30). Furthermore, *Fusobacterium nucleatum* has been linked with adverse pregnancy outcomes. Since *Fusobacterium nucleatum* is associated with periodontal infections rather than genital or uterine infections. It is supposed that the infection doesn't enter the womb by an ascendant route; rather it enters the mother's bloodstream making its way down from the oral cavity.

It was observed from the present study that there was a rise in the prevalence of shallow periodontal pockets from first (22.7%) to second trimester (23.7%) which decreased later in the ultimate trimester (6.5%). Similar trend was reported by many previous studies attributed to a marked increase in estrogen and progesterone levels during pregnancy that peak at the eighth month, and then starts to decrease in the ninth month (15, 18, 28-34).

Oral hygiene status improved as the trimester increased, the plausible reason may be the increase in health consciousness and being more sensitive and desirous of offering her baby the best with the increase in trimester but contradictory results were obtained by previous reports where mean OHI-S deteriorated as the trimester increased (35, 36).

Linear regression analysis was performed to identify many of those independent variables which predispose to poor oral hygiene status. It revealed that the best predictors in the descending order for oral hygiene index were occupation of husband, trimester, family income, occupation of the subject, age.

Ogunwade (37) confirmed the association of socioeconomic status with gingival inflammation score and plaque scores which was attributed to inaccessibility of dental clinics and unawareness among lower socioeconomic subjects. Moreover, influence of education was demonstrated by Mark et al. (38) who observed that severity of gingivitis increased with lower levels of education.

CONCLUSIONS

The present study confirmed the previous reports which observed deterioration in gingival and periodontal status as the trimester of pregnancy proceed. Furthermore, it was observed that various socio-demographic factors in addition to trimester significantly influenced oral hygiene status. Hence, oral health intervention programs should be targeted to the risk groups. It is anticipated that the results of the present study would aid to draw attention of the concerned authorities towards the oral health needs of pregnant women.

ACKNOWLEDGEMENTS

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