



Periodontal Health Status of Pregnant Women Attending Various Government Hospitals in Faridabad City, Haryana, India

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Authors' contributions

This work was carried out in collaboration between all authors. Authors GS, CMM and JA designed the study, author RN managed the analysis of the study, authors GS and RK wrote the protocol, and wrote the first draft of the manuscript. Authors GS, BKS and N managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aims: The aim of the present study was to find out the periodontal health status among pregnant women attending various government hospitals in Faridabad city.

Methodology: This was a descriptive cross sectional single study carried on 800 pregnant women attending various government hospitals in Faridabad city, Haryana. The format consisted of a questionnaire to assess the demographic profile, type of diet, trimester, number of pregnancies, and medical complications if any, perceived oral health problems, oral hygiene attitudes, oral hygiene practices and visit to dentist. The type III clinical examination of all the subjects was done by a single examiner using Plane mouth mirrors and CPITN probe within the Gynaecology section of the hospitals.

Periodontal health status was assessed by Community Periodontal index and Loss of attachment index.

Results: Mean age of study participants was 24.53 ± 4.23 . More subjects were in third trimester (62.96%). A highest CPI score 2 was found among 53% subjects, where as score 3 was seen among 44.25% and score 4, among 2.75% subjects. Mean number of sextants recorded with CPI score of 2 were 4.06. 78.5% subjects used toothbrush and 81.25% toothpaste for oral hygiene maintenance.

Conclusion: Overall prevalence of periodontitis was 47% and increased with poor oral hygiene practices, thus requiring the necessity of interventions and preventions.

Keywords: Periodontal status; PREGNANCY; oral health; oral hygiene practices; women and oral health.

1. INTRODUCTION

Oral health is important to general health. The teeth and the periodontal structures which represent two specialized tissues account for a great importance among mouth conditions [1-3]. Good oral health is important across a person's lifespan. Women normally experience physiological, psychological and lifestyle changes during pregnancy and some of those changes can affect their dental health [4]. The oral health of pregnant women has been receiving attention, with growing evidence that poor oral health can have detrimental effects, not only for the women (for example, increasing risk of pre-eclampsia) [5,6] but also for the health of the fetus/baby [7-9]. There are many myths about dental health of pregnant women. Pregnant women may be considered as patients with temporary but higher than normal risk of developing periodontal complication [10]. There is a popular belief that of "a tooth for every child" during pregnancy [11,12].

The expectant mother may be involved in a multitude of extra activities, which can lead to a neglect of her own oral care and can result in dental problems which require extra attention during this phase [13]. Oral changes due to the complex physiologic alterations occurring in pregnancy are believed to be related to fluctuations in levels of oestrogen and progesterone, leading to an increase in oral vasculature permeability and a decrease in host immunocompetence, thereby increasing susceptibility to oral infections [14].

Periodontal disease combines a number of diseases of the periodontal tissue that can be broadly divided into gingivitis and periodontitis [7]. Periodontal disease is relatively common among pregnant women due to hormonal and vascular changes which occur during pregnancy leading to the promotion of an accentuated response to plaque [15]. These hormonal changes predispose to gingival swelling leading to increased permeability of capillaries further aggravated resultant gingival bleeding. Hence, brushing teeth becomes complicated, and development of dental caries and periodontal diseases becomes easier. [16,17].

Mother's role in the oral health of her child begins as early as her pregnancy. Maternal periodontal health during pregnancy might affect off spring's birth weight which is again critical for the general health and oral health of the child and adult life. About 18% of preterm low weight births have been attributed to periodontal disease during pregnancy [18]. Some pregnancy-related changes in gingival physiology and salivary composition may have adverse effects on oral health. The gingival changes are more readily recognizable, since the gingiva bleeds readily [19,20].

Till date, there is paucity of data related to periodontal health status among pregnant women in Faridabad city, Haryana, India. Hence, this study aimed to find out the periodontal condition among pregnant women attending various government hospitals in Faridabad city and the objectives were to know the prevalence of gingivitis, prevalence of calculus, compare the periodontal status with oral hygiene practices as well as the demographic variables in relation to periodontal status and oral hygiene practices. This study will also act as platform on which preventive and curative services may be planned for this target group.

2. METHODOLOGY

This was a descriptive cross sectional single study carried on 800 pregnant women attending various government hospitals in Faridabad city, Haryana. The Faridabad city is having an approximate area of 742.90 sq km accommodates a population of 17, 98, 954 (2011 Population census figures) which is 7.10 percent of the state population. Almost 80% of the city population is urbanized. The sex ratio according to 2011 population census is 871 female against 877 male in the state while literacy rate is 83.0 against 76.64 in the state and is the most densely populated district in the state. Average Gynaecology outpatient department of all three government hospitals on an average is 118 approximately per day.

Ethical clearance was sought from the ethical committee of 'Sudha Rustagi College of Dental Sciences & Research, Faridabad' and permission was obtained from respective principal medical officers of all government hospitals. Informed consent was obtained from the study subject prior to enrolment into the study. To avoid duplication of the same patient star mark was placed on the outpatient department card for identification and along with this verbal confirmation was also done before starting the examination. The study duration was March - September 2012.

2.1 Sample

As per the records of Indian Medical Association there are 3 government hospitals in Faridabad city. A purposive sampling of 800 pregnant women with a mean age of 24.53 ± 4.23 was obtained from all 3 hospitals as per the inclusion and exclusion criteria. Data was collected from Gynaecology daily outpatient department patients who visited for antenatal checkups. A pilot study was conducted on 30 pregnant women to check the feasibility and sample and the periodontal disease was found in 21 women irrespective of nature and severity of the disease. The sample size was determined by using the formula: $N = Z\alpha^2 \{p(1-p)\} / L^2 \times DF$. Where, N = size of sample, $Z\alpha$ = critical value at a specified level of confidence=1.96, P = prevalence percentage, L= maximal permissible error, DF= Design factor. The calculation of sample size was performed to seek the results at 95% confidence level. The permissible error is known to be $\pm 5\%$ of p. In accordance with the prevalence of periodontal disease, $N = (1.96)^2 \{0.70(1-0.70)\} / (0.05)^2 \times 2 = 646 \approx 660$. Taking the higher value in consideration, the sample size was estimated to be 800.

Pregnant women who gave consent for both procedures and visit Gynaecology outpatient department for routine antenatal check up on the day of examination participated in the study. Subjects having any contraindication for examination like unable to open the mouth for examination, experiencing pain and discomfort as well as unable to co-operate due to their psychological and physical conditions, and medical history showing presence of diabetes were excluded from the study.

2.2 Data Collection

The format consisted of a questionnaire to assess the demographic profile, type of diet, trimester, number of pregnancies, medical complications if any (which was got from the medical records of the pregnant women), perceived oral health problems, oral hygiene attitudes, oral hygiene practices and visit to dentist. Oral hygiene practices were assessed in terms of type of cleaning (Toothbrush, finger, stick and any other), material used (toothpaste, toothpowder, charcoal, salt and any other), frequency of cleaning (once, twice, not even once) and frequency of changing toothbrush (once a month, every three months, six months, once a year) and any other oral hygiene aids. Periodontal health status was assessed using Community Periodontal index (Boxes 54-59 of WHO 1997 Form) and Loss of attachment (Boxes 60-65 of WHO 1997 Form) which is a pertinent part of WHO Oral Health Assessment form (1997) following the WHO guidelines [21]. The type III clinical examination of all the subjects was done by a single examiner using Plane mouth mirrors and CPITN probe within the Gynaecology section of the hospitals. The examiner was trained in prior, in the Department of Public Health Dentistry, Sudha Rustagi College of Dental Sciences & Research, Faridabad to limit the intra examiner variability. Repeat examination was done on 10% randomly selected subjects and kappa coefficient showed high conformity (≥ 0.78).

An intern trained to record the WHO forms and assist the examiner during the survey interviewed the subjects for the questionnaire, which was blinded to examiner. Infection control protocol was adhered to during the entire study procedure. In case of Emergency care and referral was done to the Dental College for treatment.

The data collected was entered and analyzed using using SPSS statistical software (version 11.5, IBM, SPSS Products). The mean, standard deviation, frequencies and percentages were calculated. The Chi square test was used to compare demographic variables, oral hygiene practices, type of diet and visit to dentist with that of periodontal health status. ANOVA test with Bonferroni post hoc analysis was used to compare means.

3. RESULTS

A total of 800 pregnant women were included in the study, out of which 168 (21%) were below 20 years age group, 556 (69.5%) were 20 to 30 years age group and 76 (9.5%) were above 30 years age group. Out of all study subjects, 20 (26.31%) were in the first trimester, 278 (32.92%) were in the second trimester, 498 (62.96%) were in the third trimester. Among <20 years and 20-30yrs age group least ($n=8$, 4.81%; $n=13$, 2.33% resp) were in the first trimester, and maximum ($n=106$, 63.85%; $n=345$, 62.05% resp) in the third trimester. Among more than 30 years of age group, 48 (62.56%) were in the third trimester and rest in 2nd trimester (chi square value -5.648, $p=0.227$, NS).

Educational qualification did not show any significant relation with age groups (chi-square value -10.031, $p=0.263$, NS), where in 184 (23%) were illiterate, 66 (8.25%) completed their primary education, 394 (49.25%) completed their high school education, 150 (18.75%) completed their graduation and 6 (0.75%) completed their post graduation. More number of literates were present in 20-30 years and above 30 years group more illiterates in <20 yrs.

A total of 82 (10.25%) subjects were facing some or the other medical problems during pregnancy and 700 (87.5%) subject's perceived oral problems as shown in Fig. 1 (chi square -0.507, $p=0.776$, NS). 576 (89.75%) subjects complained of teeth sensitivity and 124 (10.25%)

subjects were having bleeding gums during pregnancy. Sensitivity was more among <20 years (119, 90.47%) and gingival bleeding in Pregnancy tumour (Gingival epulis) was not found among the study subjects (chi-square – 2.63, p-0.624, NS). 88.25% (n=706) number.subjects in our study visited the dentist when oral problems aroused and 9% (n=72,) never visited a dentist, whereas, 22 (2.75%) visited at regular intervals. When compared to age groups there was no significant relation observed (chisquare-3.109, p-0.540, NS). In our study maximum subjects (488,61%) consumed mixed diet as compared to vegetarian diet and was found to be non significant when compared between age groups (312,39%) were vegetarians and were having mixed diet (chisquare – 0.018, p-0.991, NS).

Oral hygiene attitudes and practices-

Among the study subjects (Table 1), 792 (99.2%) subjects agreed that brushing teeth is essential and Among 785 (98.12%) agreed that tooth brush is better than finger for cleaning teeth. Age wise distribution of oral hygiene practices showed a significant relation with type of aid used for cleaning, frequency of changing toothbrush and mouthrinsing with water after every meal as shown in Table 2. Maximum of study subjects used toothbrush (78.5%) and toothpaste (81.25%) for oral hygiene maintenance, brushed once daily (98.5%) and rinsed their mouth after every meal (82.5%).

Table 1. Age wise distribution of favourable attitude towards toothbrushing among the study population

Age groups (in years)	Brushing teeth is essential				Tooth brush is better than finger			
	YES		NO		YES		NO	
	n	%	n	%	n	%	n	%
<20 Years (N=168)	166	98.80	2	1.19	162	96.42	6	3.57
20-30 Years (N=556)	552	99.28	4	0.71	547	98.38	9	1.6
>30 Years (N=76)	74	97.36	2	2.63	76	100	0	0
Total	792	99	8	1	785	98.12	15	1.8
	2.547				4.279			
CHI-SQUARE								
p value	0.280				0.118			

3.1 Periodontal Status

A highest CPI score 2 was found among 424 (53%) subjects, followed by score 3 (354, 44.25%) and score 4 (22, 2.75%) as depicted in Table 3. Pregnant women of 20-30 year age group had more calculus (76.19%) when compared to other age groups. Above 30 years pregnant women had more number of pockets of 4-5mm (76.31%) and 6mm or more (15.78%) when compared to other age groups which was found to be statistically significant. Among the total study population (Table 4), mean number of sextants recorded with CPI score of 2 were 4.06 ± 1.69 , mean number of sextants recorded with CPI score 3 were 1.29 ± 1.64 and mean number of sextants recorded with CPI score 4 were 0.05 ± 0.31 , which was found to be statistically significant ($p < 0.05$) among three different age group. Post-hoc analysis confirmed the relations with the mean number of sextants showing CPI score 2 showed 20-30 years, 20 years and 20-30 years in descending order of significance.

Table 2. Age wise distribution of oral hygiene practices among the study population

Age groups (in years)	Type of Aid Used for Cleaning (n, %)			Material Used For Cleaning Teeth (n, %)			Frequency of Cleaning (n, %)		Frequency of Changing Toothbrush (n, %)				Mouthrinsing (n, %)			
	Tooth brush	Finger	Chewin g stick	Tooth paste	Tooth powder	Charcoal	Once	Twice	1 month	3 month	6 month	Once a year	Never	Rarely	Frequ ently	After every meal
<20 (N=168)	128 76.19%	32 19.04%	8 4.76%	130 77.38%	34 20.23%	4 2.38%	164 97.61%	4 2.38%	4 2.38%	24 14.28%	118 70.23%	22 13.0%	4 2.4%	16 9.63%	16 9.63%	126 75.9%
20-30 (N=556)	440 79.13%	112 20.14%	4 0.7%	456 82%	100 17.98%	0	548 98.56%	8 1.43%	2 0.35%	96 17.26%	376 67.62%	82 14.74%	6 1.07	46 8.27%	46 8.27%	472 84.89%
>30 (N=76)	60 78.94%	16 21.06%	0	64 84.2%	12 15.78%	0	76 100%	0	0	6 7.89%	62 81.5%	8 10.52%	0	6 7.89%	6 7.89%	62 81.57%
Total	628 78.5%	160 20%	12 1.5%	650 81.25%	146 18.25%	4 0.5%	788 98.5%	12 1.5%	6 0.75%	126 15.75%	556 69.5%	112 14%	10 1.25%	68 8.52%	68 8.52%	660 82.5%
CHI-SQUARE	15.584			16.11			2.054		14.54				14.209			
P value	0.004,S			0.300, NS			0.358, NS		0.024, S				0.027, S			

Table 3. Age wise distribution of highest CPI and LOA score among the study population

Age groups (in years)	Highest CPI Score						Highest loss of attachment score					
	Calculus (Score 2)		Pocket Depth 4-5 MM (Score 3)		Pocket depth 6mm or more (Score 4)		LOA 0-3MM (Score 0)		LOA 4-5MM (Score 1)		LOA 6-8MM (Score 2)	
	n	%	n	%	n	%	n	%	n	%	n	%
<20 (N=168)	128	76.19	40	23.80	0	0	168	100	0	0	0	0
20-30 (N=556)	290	52.15	256	46.04	10	1.79	544	99.6	6	1.07	6	1.07
>30 (N=76)	6	7.89	58	76.31	12	15.78	74	97.36	0	0	2	2.63
Total	424	53	354	44.25	22	2.75	786	98.25	6	0.75	8	1
CHI-SQUARE	133.66						6.439					
P VALUE	0.000,S						0.169,NS					

Table 4. Mean number of sextants showing CPI and LOA scores among the study population

Age groups (in years)	Mean CPI Scores						Mean Loa Scores					
	Calculus (Score 2)		Pocket Depth 4-5 MM (Score 3)		Pocket Depth >6 MM (Score 4)		LOA 0-3MM (Score 0)		LOA 4-5MM (Score 1)		LOA 6-8MM (Score 2)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<20 (N=168)	4.90	1.22	0.50	0.92	0.00	0.00	6.00	0.00	0.00	0.00	0.00	0.00
20-30 (N=556)	4.0	1.60	1.30	1.62	0.032	0.23	5.93	0.52	0.03	0.27	0.01	0.14
>30 (N=76)	2.52	2.00	2.97	1.68	0.34	0.74	5.94	0.32	0.02	0.16	0.02	0.16
Total	4.06	1.69	1.29	1.64	0.05	0.31	5.94	0.45	0.02	0.23	0.01	0.13
F Value	59.900		69.795		39.879		1.472		1.472		1.231	
P Value	0.000, S		0.000,S		0.000,S		0.230,NS		0.230,NS		0.292,NS	
Post HOC Analysis	b>a a>c		b>a c>a		c>a c>b							

786 (98.25%) subjects recorded a LOA score 0, 6 (0.75%) subjects recorded a LOA score 1 and 8 (1%) subjects recorded a LOA score 2 as shown in Table 3. Differences in prevalence of highest LOA score among different age group were found to be statistically non significant ($p>0.05$). Table 4 shows the mean number of sextants recorded, with LOA score 0 (5.94 ± 0.45), LOA score 1 (0.02 ± 0.23) and LOA score 2 ($.01\pm 0.13$). The highest LOA scores 0 and 1 was observed among 20-30 years, whereas score 2 was more in > 30 years age group.

All number subjects (800, 100%) required referral for dental care, among which 8 (10.52%) were in requirement of urgent dental care.

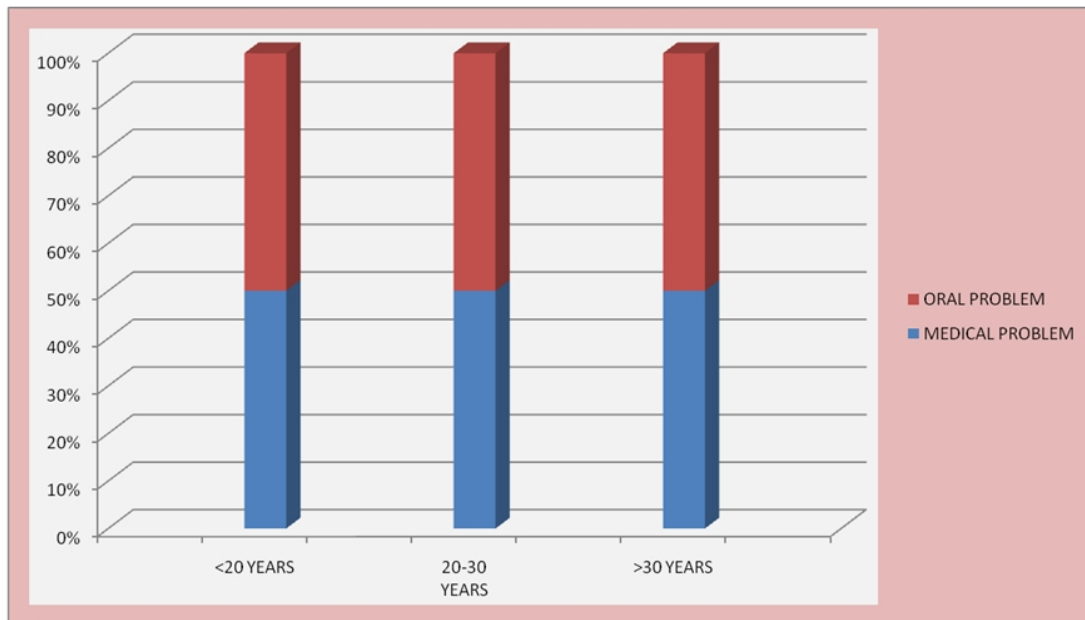


Fig. 1. Oral and medical problems among the study population

4. DISCUSSION

Women's health issues have come to the forefront of medical research only within the last decade. Although teeth are gender free, the supporting tissues of the periodontium are vulnerable to the physiological variations in the levels of circulating hormones in males and females Tilakaratne et al. [22]. Pregnancy is an important milestone in the life-course of a woman with the dual factors of pregnancy affecting oral health and oral health affecting the pregnancy outcome. Various alterations of oral hygiene during pregnancy have been cited in the literature [23]. For a long time we have known that risk factors such as smoking, alcohol use and drug use may contribute to produce an alteration, disruption or teratogenic consequence. New research suggests a new risk factor – periodontal disease. On the other side, the effect of maternal periodontal health on prematurity and low birth weight babies has been well documented in previous studies. Thus, dentistry can be vital in improving prenatal outcome and maternal or foetal dental health through screening, referral, education and treatment of pregnant clients [24,25].

Planning of oral health intervention programmes for antenatal females require some baseline data regarding their oral health needs. Though there is ample literature available worldwide about the periodontal status of expecting mothers but insufficient data is available from the Indian subcontinent. Thus, the present cross sectional study was conducted to assess the periodontal health status and treatment needs among pregnant women attending various government hospitals in Faridabad city of Haryana.

The majority of periodontally healthy subjects were with high educational level, or those who paid more attention to oral health and regular dental examination which is similar to Dhaliwal et al. in 2013. [26] People who visit dentist only when tooth ached often show worse periodontal status. In the present study the proportion of pregnant females, visiting dentist at regular intervals was very less (2.75%) as compared to a study conducted by Class et al. [27] in Wellington, (50% - once a year prior to pregnancy), Christensen et al. [28] in Denmark (90%) and Baskaradoss et al. (12.7%) [29]. However, a higher rate of non attendance was reported by Wandera et al. [30] in Uganda (62.5%) and this might reflect differences in the availability of appropriate dental care. Majority of the subject's (88.25%) of the study population had visited a dentist whenever a problem occurred. This type of behaviour is known as illness behaviour-when self-care is initiated in response to illness and/or signs of disease [31]. A methodological limitation of this present study is that information was collected regarding general pattern of dental attendance and not especially during pregnancy.

4.1 Oral Hygiene Attitude and Practices

In the present study 99% subjects said that toothbrushing is essential and 98.12% subjects said that toothbrush is better than finger as oral hygiene aid. This is in complete agreement with studies conducted by Natalie et al. [32] on Australian pregnant women (99%) and Ganesh et al. [33] (2011) in Chennai (96.6%). 88% pregnant women in Saudi (Mansor et al, 1993) felt that brushing their teeth is essential [34]. In the present study, 78.5% subjects used tooth brush and our findings are less than that reported by Ifesanya et al. [35] in Ibadan, South Western Nigeria (89.1%) and Ganesh et al. [33] in Chennai (93.3%).

In the present study, frequency of cleaning on daily basis was found to be once daily in maximum number.of (98.5%) subjects. However, study conducted by Christensen et al. [29] in Denmark reported maximum tooth brushing frequency of twice daily (96%). Also the report of twice daily brushing was reported by Mansor et al. [34] in Saudi (77%), Ifesanya et al. [35] in Nigeria (33.8%) and Honkala et al. [36] (2005) in Kuwait (71%). This implies that pregnant females in other countries are more aware of need of twice daily brushing and proper oral hygiene maintenance but in our study we could not assess the oral hygiene status due to inconvenience of oral examination for longer duration in pregnant women .

In the present study, (82.5%) had the habit of rinsing mouth with water after every meal which is more than the study conducted by Ganesh et al. [31] in Chennai (43.8%). Maximum (69.5%) number.of subjects changed their toothbrush subjects changed their toothbrush every six months. However, Chennai pregnant women changed the brushed very frequently [33.0% - every month, 47% - three months, 17.5% - six months and 2.5% - yearly] [30]. It is worth noting here that all these variables of attitudes and practices related to oral hygiene maintenance were assessed using self report methods, which are prone to recall and social desirability bias.

Teeth brushing, being the most important oral health behaviour is still erratic during pregnancy for some people who hold the old Indian superstition. And gestation reaction such as vomiting would make women reduce the brushing frequency and time. False brushing method (e.g. horizontal or vertical brushing), inadequate brushing frequency or time would naturally lead to poor oral hygiene and periodontal destruction.

4.2 Oral Problems during Pregnancy

In the present study, majority of the subjects (87.5%) reported oral problems during pregnancy, which was higher than the results of Mona TLR et al. [37] in Washington (47%), Thomas et al. [32] among Australian pregnant women (65%) and Baskaradoss, in 2011 (40%) [29]. This difference in the incidence of oral problems during pregnancy probably could be due to meticulous oral hygiene maintenance as well as advanced and efficient oral health care delivery system in those countries. It is well documented that the changing level of female sex hormones due to pregnancy may influence the susceptibility to gingivitis. In the present study, gingival bleeding was perceived by only one-tenth of the subjects, a relatively low rate as compared to the prevalence of periodontal disease found among pregnant women in earlier clinical studies conducted by Silness et al. [38]. However, studies on the validity of self reported gingival health have shown some underestimation of disease experience when compared to clinical evaluations as shown by Schwartz E [39] and Gilbert et al. [40].

4.3 Periodontal Status

Calculus was recorded as the commonest finding in 53% of study population which is comparable with studies conducted in Kaunas, Lithuania by Vasiliauskiene I [41], Kumar et al. [42] in Udaipur, & Wandera et al. [30] in Mbale district Uganda in which prevalence of calculus was 58.7%, 48% & 63.4% respectively. The finding did not correlate with the study conducted in Brazil by Tonello et al. [43] and Karunachandra et al. [44] in Western Province of Sri Lanka (38.6% & 30.3% resp).

The mean number of sextants recorded with CPI score of 2 were 4.06, mean number of sextants recorded with CPI score 3 were 1.29 and mean number of sextants recorded with CPI score 4 were 0.05 which is comparable to study conducted by Acharya et al. [45] in which the mean number of sextants for CPI score 2, 3 & 4 was recorded as 2.66, 0.70 & 0.10 respectively. A statistically significant difference in the highest CPI score recorded was observed among various age groups in the present study. There was a maximum prevalence of calculus in less than 20 years age group (76.19%) and maximum prevalence of 4-5 mm pockets (76.31%) and 6 mm pockets (15.78%) was observed among more than 30 years age group. The results were analogous to the study conducted by Kumar et al [42]. This is plausible considering the cumulative oral disease experience with advancing age in addition to the risk posed by many issues associated with pregnancy, such as hormonal changes, changes in dietary habits and oral hygiene practices.

In the present study 44.25% subjects had shallow pockets and 2.75% subjects had deep pockets which is similar to the study conducted by Karunachandra et al. [44] among antenatal women in Sri Lanka which states that pregnant women have a higher prevalence of 4-5 mm periodontal pockets despite higher access to dental care. However our study results was higher when compared to Baskaradoss, (25%) [29]. This may be attributable to the influence of pregnancy hormones on development of false pocketing and consequently

increased probing depths [14]. Oral changes due to the complex physiologic alterations occurring in pregnancy are believed to be related to the fluctuations in levels of estrogen and progesterone, leading to an increase in oral vasculature permeability and a decrease in host immunocompetence, accompanied with increased levels of *Bacteroides*, *Prevotella*, and *Porphyromonas* thereby increasing susceptibility to periodontal disease. Three main schools of thought have prevailed in regard to its etiology. Some believe in a local etiology, others in vitamin C as a primary factor, and others in the importance of the hormonal factors. In contrast, Dhaliwal et al. [25] showed a very few pregnant women having the periodontal diseases. [26] The ovarian hormones (progesterone and 17 β - estradiol) have been found to alter the micro- environmental of oral bacteria. Other studies correlate the environmental inflammation to the plasminogen activator inhibitor type 2 (PAI- 2) or the modulation of progesterone of Interlukien- 6 (IL- 6) production by gingival fibroblast [45,46].

In conclusion, the overall prevalence of periodontal diseases among pregnant women in Faridabad was 47%, thus requiring the necessity of interventions and preventions. It means that dental examination should be included as one of the basic activities of antenatal care along with blood pressure monitoring, weight gain assessment, and obstetric examination. Educating and motivating women to maintain good oral hygiene and providing affordable dental health care is fundamental in reducing dental disease. It is expected that knowledge affects behaviour and by increasing knowledge healthy behaviours could also become better. Improving dental health education may need to become a priority in antenatal care to educate women at risk.

Pregnant women are exposed to a great deal of educational materials on the physical signs of pregnancy. They receive information on diet and weight. Unfortunately, little instruction and preparation is dentally oriented. Just as the medical profession recognizes and responds to this prime time for education, the dental profession can also take this opportunity to influence the development of positive attitudes toward dental health. Promotion of oral health among the health care professionals, anticipatory guidance for females planning for pregnancy and among guidance to oral health professionals for delivering care to oral health professionals.

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CONSENT

Consent had been obtained from the patients prior to the study as well as consents were obtained from the required authorities to conduct the study in hospital.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee (Ethical committee of *Sudha Rustagi College of Dental Sciences & Research, Faridabad, India*).and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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