Original Article

Predictors and prevalence of periodontitis among pregnant women of slum areas of Patna, India: An opportunity for oral health promotion

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Abstract:

BACKGROUND: There is abundant documentation in literature that presence of maternal periodontal infections has been attributed to serious health problem to the mother and the child. Regular evaluation of any illness burden is required for planning preventive and treatment strategies and fills the existing health gap. There is a lack of literature about the predictors and prevalence of periodontal diseases in expectant women in the slum areas of Patna.

MATERIALS AND METHODS: It was a cross-sectional study conducted on pregnant women of slum areas of Patna, Bihar, by convenience sampling method. Using a questionnaire, data collection was carried for demographic and oral hygiene habits information. Periodontal examination was done using modified community periodontal index criteria (WHO, 2013) by recording bleeding on probing (BoP), periodontal pockets (PD) and loss of attachment (LoA). The prevalence of potential predictors was estimated and bivariate analysis was performed with BoP, PD, and LoA and then to explore the prevalence of odds ratio (ORs) multivariate logistic regression framework was employed. The level of significance was kept at $P < 0.05$.

RESULTS: A higher level of BoP and PD was observed among women who had the habit of cleaning their teeth once daily a day than those who cleaned their teeth with brush twice a day. Oral cleanliness (hygiene) frequency established the maximum OR of 2.77 (2.07–3.71) for BoP. Gingival bleeding robustly was related with PD. Among all multivariate framework of predictors of LoA, BoP, and PD came as the firmest predictors.

CONCLUSION: Teaching correctly how to maintain oral hygiene and periodic periodontal check-up can improvise the general well-being and adverse pregnancy outcomes can be lessened.

Keywords:

Expecting mothers, periodontal disease, predictors, risk factors

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Introduction

Among all the oral diseases, severe type of periodontitis is the most prevalent situation affecting near about 11% of human beings. Its ability to cause disability and impairing the quality of life makes it a public health problem.[1,2] Periodontal diseases expresses as an array of clinical stages ranging from mild subclinical inflammatory gingivitis, to the most complex destructive forms, which could lead to loss of teeth.[3] Diagnosis is primarily based on the quantifiable evaluation of some surrogate markers such as depth of the pocket depth (PD), clinical attachment stage, and alveolar bone loss evident confirmed with the help of radiographs. Estimation of the prevalence of periodontitis is influenced by numerous factors such as age groups, population source, assessment

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procedure (full/partial mouth), and most important the case definitions.[4] The risk of serious health problems may be elevated by the existence of periodontal diseases in pregnant women.[5,6] Reservoirs of bacteria might be found in the unhealthy periodontal tissues which may reach the unborn fetus by crossing the placental barrier.[7-14] Existing literature available on animal studies has concluded that there is a possibility that periodontal problems may be associated with unfavorable long-term effects on the infant's growth and development.[15]

Despite the fact that a lot of efforts have be done to fill the vast gap in the health services and its utilization, there is persistence of inequities in oral health within numerous regions of the globe, particularly in developing countries like India.[16-18] Within the country also, there is discrepancy in certain states like BIMARU.[19] The maternal mortality rate (MMR) in these states is usually high compared to other parts of the country. The MMR was reported to be 273 in 2010–2011 in Patna[20] and although the recent reports claims a sharp fall in the rates[21] it is still considered as a challenge to the health-care system. There is a possibility that if the dental and oral conditions of the pregnant women are improved further decrease in MMR might be noticed. For the evaluation of the preventive schemes, preparing inventive therapeutic strategies, and also for structuring of innovative policies it is essential to do periodic estimation of disease burden. It has been more than 15 years since the previous national oral health survey was carried out,[22] and therefore, due to scarcity of data about the prevalence of periodontal disease among pregnant women in the slum areas of Patna the present study was conducted. The purpose of this study was to quantify the overall prevalence of PD, and also to determine the predictors related to PD among pregnant women in slum areas of Patna, India.

Materials and Methods

Ethical approval was taken from institutional review board for this cross-sectional, correlational study. Data were collected from September 2019 to November 2019 in the slum areas of Patna city.

Convenience sampling method was employed to enroll the study subjects in the study. Pregnant females in any trimester living in slum areas of Patna city was the inclusion criteria. A door-to-door survey was conducted in slum areas of Patna and enquired about any pregnant female in the family. In case of finding any such women, purpose of the study, procedure of examination was explained and consent form was explained to them. A consent form was obtained from the women if she agreed to be a study participant.

Using a questionnaire, socio-demographic factors such as age, total family income, education, parity, and general health) and data regarding oral health behavior like (technique of brushing and frequency, time of the last dental visit) were collected. With the choices of excellent (3), good (2), bad (1), every women declared her general health on her own by a single item.[23]

Patients were made to sit in upright position on a chair and oral examination was performed by means of odontoscope and a calibrated probe called community periodontal index (CPI) of treatment needs in natural light by two dentists who were calibrated. Modified CPI criteria (WHO, 2013)[24] was applied for periodontal disease diagnosing through recording gingival bleeding (BoP) and the pockets (PD) all around dentition and attachment loss (LoA) around the index teeth six in number but the presence of calculus was not consider. All examinations were performed by two trained examiner and recorder. The reproducibility was checked before the survey by the kappa statistics and was found to be 0.82.

Statistical analysis
IBM Statistical Package for Social Sciences Version 22® (SPSS statistics IBM Corp, Armonk, NY: IBM Corp.) for analyzing the data. Through prevalence estimates and 95% confidence intervals of prevalence was calculated. Stratification of age groups was done into 18–25 years, 26–35 years, and ≥35 years. Factors like yearly family income were divided into <1999 as very low and above 1999 as low. The characteristics of study participants were determined and subsequently prevalence of probable predictors was estimated. For the predictors bivariate analysis was performed with BoP, PD, and LoA. For the significant variables multivariate logistic regression framework was employed to calculate approximately the prevalence of odds ratios (ORs) for the prevalence of severe type of periodontitis. For the entire analyses, $P < 0.05$ was considered significant.

Results

Description of the population is shown in Table 1. Age range (in years) was 18–37, with 64% in the 26–35 years of age group. 92.5% indicated they brushed their teeth only once daily. One of the key findings was that about 70% of these expecting women had not been to professional oral examination from more than 1 year. Another major finding was that 76% women had BoP present and 32% had either shallow or deep periodontal pockets, lowest prevalence of LoA even <19% was observed [Table 1].

Gingival bleeding was more prevalent among the females who had low literacy levels (96.7%) when compared to women who had higher education (55%) which was

Table 1: Descriptive of the population

Variable	n (%)
Age group (in years)	
18-25	23 (19.01)
26-35	78 (64.46)
>35	20 (16.53)
Family income	
Very low	73 (60.33)
Low	48 (39.67)
Education	
<primary	61 (50.41)
>primary	60 (49.59)
General health (self-report)	
Excellent	84 (69.42)
Good	25 (20.66)
Poor	12 (9.92)
Gravida	
Primiparous	47 (38.84)
Multiparous	74 (61.16)
Frequency of cleaning teeth	
Once daily	112 (92.56)
Twice daily	9 (7.44)
Timing of last dental visit (year)	
With-in last 1 year	37 (30.58)
>1 year	84 (69.42)
Gingival bleeding (BoP)	
Absent (CPI bleeding score 0)	29 (23.97)
Present (CPI bleeding score <1)	92 (76.03)
PD	
Absent (pockets up to 3 mm)	82 (67.77)
Present (4 mm and above)	39 (32.23)
LoA	
Absent (LoA up to 3 mm)	97 (80.17)
Present (4 mm and above)	24 (19.83)

LOA=Loss of attachment, CPI=Community periodontal index, PD=Periodontal pockets, BoP=Bleeding on probing

statistically significant [Table 2]. It was also observed higher levels of gingivitis and periodontitis among women who cleaned their oral cavity just one time a day than who cleaned their oral cavity with toothbrush twice a day [Tables 2 and 3]. Age of pregnant females, education, gravida status, oral hygiene frequency, and frequency of dental visits were statistically significant in the bivariate analysis [Table 2]. While performing adjusted analysis, socio-demographic factors – age of pregnant females, education, family income, gravida status, oral hygiene frequency, and frequency of dental visits emerged as significant predictors of gingival bleeding [Table 2]. The frequency of oral hygiene established the maximum OR of 2.77 (2.07–3.71).

Among pregnant women from a low education background, it was observed that 45.9% suffered from PD while those from higher education setting 18.3% had PD, this finding was found to be significant statistically. Those who brushed only once a day had presence of pathological pockets (34%). From the study, it was

observed that no statistical significant results were obtained for the prevalence of pockets amongst family income, gravity, previous dental visits, and the general health status. Bleeding from Gingiva came out to be robustly related with the periodontal disease. In the bivariate analysis, age, education, presence of gingival bleeding, and frequency of oral hygiene were significant predictors of PD. In multivariate framework for the predictors of PD, only BoP came as the most potent predictor as it has an OR of 6.89 (3.46–12.11) when adjusted to poor oral hygiene [Table 3].

LoA was observed in 23% pregnant women with low education and in 14.5% with high education, this difference was statistically significant. Only 3 primiparous and 21 multiparous females were noted with LoA. No statistically significant were observed for the prevalence of PD when compared for age, family income, and general health status. Similarly, like PD for LoA also, the presence of gingival bleeding was found to be strongly associated, as only 3 women had PD without BoP. In the bivariate analysis, age, presence of gingival bleeding, and PD along with the frequency of oral hygiene were significant predictors of LoA. In multivariate framework for predictors related to LoA, BoP, and PD came forth as the firm predictor with an OR of 6.28 (4.49–7.32) and 8.73 (6.94–13.08), respectively when adjusted to poor oral hygiene [Table 4].

Discussion

The main aim and objective of the present study was to put forth and to establish the prevalence of periodontal disease while shaping and exploring predictors of PD. Our results showed that around 76% of the pregnant women had BoP present and 32% had PD. This was in accord with pregnant women in Lagos Nigeria[25] who had 33% prevalence of periodontal disease and lower than 73% periodontal disease prevalence rate in Malian women[23] and 67% in Uganda.[12]

In the present study, age of the pregnant female was significantly associated with BoP, PD, and LoA, signifying that age was significant predictor of periodontitis. This was in contrast to the conclusions of Rosanna F Hess *et al*.[23] Onigbinde *et al*.,[25] However, it should be taken into consideration that despite the statistically insignificance in these studies older expectant women had higher chances of sufferings from more severe kind of periodontitis which was analogs to the present study. The increase in the severity of periodontitis along with age has been well-documented.[26,27] This might be attributed to the altered host resistance against the disease progression resulting in supportive periodontal tissue loss. On the other hand, this could be due to increasing effect of untreated periodontal infection

Table 2: The prevalence and odds ratios of predictors for bleeding on probing

Predictor	BoP, *n* (%)		Crude OR	95% CI	*P*	Adjusted OR	95% CI	*P*
	Absent 29	Present 92						
Age group (in years)								
18-25	14 (60.87)	9 (39.13)	1.41	0.86-1.78	0.007*	1.32	1.10-1.68	0.004*
26-35	9 (11.54)	69 (88.46)						
>35	6 (30.00)	14 (70.00)						
Family income								
Very low	11 (15.07)	62 (84.93)	0.91	0.64-1.29	0.604	1.26	0.97-1.69	0.029*
Low	18 (37.50)	30 (62.50)						
Education								
<primary	2 (3.28)	59 (96.72)	1.81	1.35-2.17	<0.001*	2.08	1.86-2.32	0.012*
>primary	27 (45.00)	33 (55.00)						
General health (self-report)								
Excellent	12 (14.29)	72 (85.71)	0.65	0.33-1.09	0.825	0.74	0.55-1.01	0.05
Good	14 (56.00)	11 (44.00)						
Poor	3 (25.00)	9 (75.00)						
Gravida								
Primiparous	17 (36.17)	30 (63.83)	1.48	1.04-2.10	0.028*	2.05	1.54-2.73	<0.001
Multiparous	12 (16.22)	62 (83.78)						
Frequency of cleaning teeth								
Once daily	27 (24.11)	85 (75.89)	2.03	1.84-2.49	<0.001*	2.77	2.07-3.71	<0.001
Twice daily	2 (22.22)	7 (77.78)						
Timing of last dental visit (year)								
With-in last 1 year	17 (45.95)	20 (54.05)	1.58	0.93-2.06	0.063	1.66	1.19-1.95	0.037*
>1 year	12 (14.29)	72 (85.71)						

*P<0.05 was considered significant. CI=Confidence interval, OR=Odds ratio, BoP=Bleeding on probing

course over the time frame.[28] This becomes an area for oral health education as we it is well evident that teeth can be sustained all through life with good oral hygiene habits and the problem of gingival and periodontium can be prevented if followed meticulously.

In this study from the bivariate analysis, it was found that being multigravida was not associated with the occurrence of periodontal disease. Similar findings were seen by Yas[29] and Onigbinde *et al*.[25] Contrary results that the periodontal disease are more prevalent in multigravida were observed by Taani *et al*.[30] Conversely, the multivariate analysis of the present study also reveals significant association between being multigravida and presence of periodontal disease. Rather than an intrinsic parity related defect, tissue destruction build up throughout the time could be the reason for such findings.[30]

The finding of increased frequency of periodontitis in women with lesser education was consistent with findings of other studies.[23,25,28] Lower educational status may lead to little knowledge of the periodontal health and the ways of maintaining oral hygiene also compounded by under-utilization of dental services.[25,28] As in the slum dwellers one can expect lower levels of education, but with oral health education and health promotion females can be made oral health literate and would be an area of concern for the dental professionals.

In this study, women who brushed more than once had lesser prevalence of BoP, PD, and LoA. This was in contrary to the results revealed by Rosanna F Hess[23] that recurrent brushing also could not better PDI and CPI scores. They justified it because of flawed brushing method and the improper period of brushing, rather than the frequency of brushing every day by the pregnant woman in their study population. The entire study gives an idea that how much oral health is neglected even at the crucial periods of life especially pregnancy. Intensive programs to educate these females about frequency and proper technique of brushing can make a favorable change in the oral health of these females and of course pregnancy outcomes also.

Relative frequency of recent dental visits could not influence bleeding from gingiva in this study. Whereas, in the study conducted by Rosanna F Hess *et al*. [23]Onigbinde *et al*.[25] and Piscoya *et al*.[28] slightly better scores were found in women who had in the past obtained professional dental care as compared to those who had not. This might be due to the fact that enquiry was not made about treatment obtained during dental visit in our study which might have resulted in inconclusive results.

Sign of periodontal disease can vary from mild subclinical changes to LoA and bone loss leading to tooth mortality. The differences in the findings might

Table 3: The prevalence and odds ratios of predictors for periodontal pockets

Predictor	PD, *n* (%)		Crude OR	95% CI	Adjusted OR	*P*	95% CI	*P*
	Absent	**Present**						
Age group (in years)								
18-25	17 (73.91)	6 (26.09)	1.04	0.68-1.59	0.049*	1.91	1.24-2.94	0.031*
26-35	58 (74.36)	2 (25.64)						
>35	7 (35.00)	13 (65.00)						
Family income								
Very low	17 (23.29)	56 (76.71)	1.14	0.84-1.47	0.173	0.51	0.27-0.96	0.093
Low	26 (54.17)	22 (45.83)						
Education								
<primary	33 (54.10)	28 (45.90)	1.09	1.10-1.40	0.02*	0.64	0.35-1.18	0.015*
>primary	49 (81.67)	11 (18.33)						
General health (self-report)								
Excellent	62 (73.81)	22 (26.19)	1.17	0.87-1.16	0.304	1.07	0.82-.41	0.594
Good	18 (72.00)	7 (28.00)						
Poor	2 (16.67)	10 (83.33)						
Gravida								
Primiparous	40 (85.11)	7 (14.89)	1.01	0.71-1.43	0.971	1.33	1.01-1.74	0.038*
Multiparous	42 (56.76)	32 (43.24)						
Frequency of cleaning teeth								
Once daily	73 (65.18)	39 (34.82)	2.11	1.62-2.39	0.026*	1.45	0.98-1.87	0.043*
Twice daily	9 (100.00)	0 (0.00)						
Timing of last dental visit (year)								
With-in last 1 year	24 (64.86)	13 (35.14)	1.74	1.29-2.11	0.035*	1.29	0.88-1.89	0.19
>1 year	58 (69.05)	26 (30.95)						
Gingival bleeding								
Absent	22 (75.86)	07 (24.14)	7.52	4.03-15.31	<0.001*	6.89	3.46-12.11	<0.001
Present	63 (68.48)	29 (31.52)						
Loss of attachment								
Absent	82 (84.54)	15 (15.46)	1.63	1.31-2.07	0.022*	1.12	0.89-1.53	0.085
Present	0 (0.00)	24 (100.00)						

*P<0.05 was considered significant. CI=Confidence interval, OR=Odds ratio, PD=Periodontal pockets

be attributed to the divergence in populace under study and can also be owing to variation in the criteria employed in describing periodontitis.[31] In this study, modified CPI criteria (WHO 2013) was utilized to assess periodontal disease whereas all the other studies[23,25,28] used CPI to record periodontal status and none of them reported regarding the LoA. The original CPI criteria had a few shortcomings including assessment of PD and not considering LoA.[32]

Recommendations

Numerous studies have linked periodontal diseases to adverse pregnancy outcomes, particularly preterm births and preeclampsia[10] which might lead too high maternal mortality ratio (MMR). By determining the prevalence of periodontitis in pregnant women of slum areas of Patna city further studies can be done to evaluate the control in MMR by controlling periodontal diseases of this region. The study can be one of the landmarks where females in the reproductive age especially socially disadvantaged or marginalized like in the slum areas should be educated about oral examination before planning pregnancy, and if not done then at least about proper frequency of brushing

and the right way of doing the same. The government of India can have some policies in place for such population so that adverse maternal outcomes can be minimized and infants overall growth can be achieved.

Limitations

There is a possibility of sampling bias as convenience sampling was employed for the selection of the sample. Since only women of slum areas were included findings cannot be generalized to all pregnant women in Bihar, India. Moreover, as the examination was performed in the door to door manner and not in ideal conditions on dental chair the results might be erroneous. The slum population meant only women from certain socio-economic background and of urban locality were included, thus warranting the need for further studies including women from different regions as well as socio-economic background.

Conclusion

Age, oral hygiene frequency, parity, and education were found as predictors of periodontitis in pregnant women.

Table 4: The prevalence and odds ratios of predictors for loss of attachment

Predictor	Loss of attachment, *n* (%)		Crude OR	95% CI	*P*	Adjusted OR	95% CI	*P*
	Absent	Present						
Age group (in years)								
18-25	21 (91.30)	2 (8.70)	1.48	1.04-2.10	0.028*	2.05	1.54-2.73	<0.001
26-35	66 (84.62)	12 (15.38)						
>35	10 (50.00)	10 (50.00)						
Family income								
Very low	56 (76.71)	17 (23.29)	1.14	0.84-1.47	0.173	0.51	0.27-0.96	0.093
Low	41 (85.42)	7 (14.58)						
Education								
<primary	42 (68.85)	19 (31.15)	1.09	1.10-1.40	0.452	0.64	0.35-1.18	0.155
>primary	55 (91.67)	5 (8.33)						
General health (self-report)								
Excellent	69 (82.14)	15 (17.86)	1.17	0.87-1.16	0.304	1.07	0.82-1.41	0.594
Good	20 (80.00)	5 (20.00)						
Poor	8 (66.67)	4 (33.33)						
Gravida								
Primiparous	44 (93.62)	3 (6.38)	1.01	0.71-1.43	0.971	1.33	1.01-1.74	0.038*
Multiparous	53 (71.62)	21 (28.38)						
Frequency of cleaning teeth								
Once daily	88 (78.57)	24 (21.43)	2.11	1.62-2.39	0.026*	1.45	0.98-1.87	0.043*
Twice daily	9 (100.00)	0 (0.00)						
Timing of last dental visit (year)								
With-in last 1 year	26 (70.27)	11 (29.73)	0.65	0.33-1.09	0.825	0.74	0.55-1.01	0.05
>1 year	71 (84.52)	13 (15.48)						
Gingival bleeding								
Absent	26 (89.66)	3 (10.34)	6.01	4.40-7.86	<0.001*	6.28	4.49-7.32	<0.001
Present	71 (77.17)	21 (22.83)						
PD								
Absent	82 (84.54)	0 (0.00)	9.30	7.47-13.29	<0.001*	8.73	6.94-13.08	<0.001*
Present	15 (15.46)	24 (100.00)						

*$P<0.05$ was considered significant. CI=Confidence interval, OR=Odds ratio, PD=Periodontal pockets

BoP, PD and LoA were the clinical finding found in almost all the pregnant women so teaching correctly how to maintain oral hygiene and periodic periodontal check-up can improvise the general well-being and adverse pregnancy outcomes can be lessened.

Conflicts of interest
There are no conflicts of interest.

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