

ORIGINAL ARTICLE

Frequency and Factors Associated With Dental Caries In Pregnant Females Visiting Antenatal Clinic of Public Sector Hospital of Karachi, Pakistan

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ABSTRACT

Objective: To assess the frequency and factors associated with dental caries in pregnant women attending antenatal clinic of a public sector hospital of Karachi, Pakistan.

Methods: A descriptive cross-sectional study was conducted at the Sindh Institute of Oral Health Sciences, Jinnah Sindh Medical University, Karachi from July 2019-March 2020. Pregnant women of age 18-45 years visiting antenatal clinic were included. The dental examination was carried out to assess the dental caries in accordance with the WHO diagnosis criteria. Frequency of dental caries along with factors like age, socioeconomic status, educational status, occupation, BMI, residence, family structure, gestational hypertension, and gestational diabetes were noted. SPSS version 23 was used to analyze data. The univariate logistic regression was applied to identify the significant predictors of dental caries at $p < 0.10$. The factors which were significant in univariate logistic regression model were added in final single multivariate logistic regression model. $P < 0.05$ was taken as statistically significant

Results: Of 375 pregnant women, mean age was 30.32 ± 4.37 years. Most of the women were from low socio-economic class 237 (63.2%), uneducated 231 (61.6%) and belonged from rural areas 196 (52.3%). Frequency of dental caries was found to be 108 (28.8%). In multivariate logistic regression model, uneducated females (aOR=9.53, 95% CI=3.93-23.10), rural area residents (aOR=19.73, 95% CI= 7.50-51.88), presence of gestational diabetes (aOR=8.86, 95% CI=3.78-20.73) and presence of gestational hypertension (aOR=4.33, 95% CI=2.01-8.92) remained statistically significant ($p < 0.05$).

Conclusion: A higher frequency of dental caries was observed in pregnant women attending antenatal clinics. The significant factors that remained associated with dental caries in final multivariate model were education, residence, gestational hypertension and gestational diabetes mellitus.

Keywords: Dental caries, Pregnant Women, Socio-Demographic factors, Medical history

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INTRODUCTION

Females experience a variety of psychological and physical disruptions and changes in specific parts of their bodies during the gestation period. In several areas of the body, including the oral cavity, significant levels of hormonal changes encountered by pregnant women cause alterations and risks. The oral cavity is prone to many adjustments and difficulties during pregnancy, most frequent problems encountered are gingivitis and periodontitis.^{1,2}

The tooth decay is a growing infectious disease that is traditionally associated with the interplay of genetic, behavioral and socio-demographic factors. In industrialized countries, it affects up to 50 percent of adults.^{3,4} It was hypothesized that childbirth could increase the risk of initiation or development of caries

by changes in saliva composition, persistent gastric reflux or less successful oral reaction.⁵ The changes in salivary composition can be caused by higher progesterone levels, which together weaken the immune system contained in saliva which lead to mucosal inflammation and tooth decay.⁶ The increased progesterone level may also produce a decline in plasma bicarbonate level, which decreases salivary PH. Increased acid production in the oral cavity accompanied by a lack of attention paid by pregnant women to oral cavity hygiene will accelerate the onset of caries.⁷ Estrogen regulates the proliferation, differentiation and keratinization of cells leading to desquamation of the oral mucosa. Desquamated cells may expand the microbial environment by providing nutrients and ideal conditions for bacterial growth.⁶ However, due to the relatively short time frame of

pregnancy and the kinetics of dental caries progression, it is unlikely that dental caries will develop initially to extensive tooth loss within this period.⁸

Studies conducted in Pakistan, Brazil and Hungary reported frequency of dental caries between 47% and 69% among pregnant women.⁸⁻¹⁰ In a study conducted at Karachi showed the prevalence of dental caries among pregnant women was high (57%) in rural areas as compared to urban population and 29% of them had complain of bleeding gums.¹¹ Further studies have been conducted to identify periodontal diseases and its complications, gingivitis, oral hygiene practices and knowledge of periodontal diseases among pregnant women of Pakistan¹¹⁻¹³, but there is scarcity of data particularly regarding dental caries and its associated factors. Hence, the aim of present study was to assess the frequency of dental caries at current magnitude and factors associated with it in pregnant women of Karachi, Pakistan.

METHODS

This descriptive cross-sectional study was conducted at the Sindh Institute of Oral Health Sciences, Jinnah Sindh Medical University, Karachi from July 2019-March 2020. Ethical approval was sought from ethical review committee before conducting the study (Ref: SSCMS/2019/16). Written informed consent was taken from all the willing participants. All the pregnant women of age 18-45 years visiting antenatal clinic were included in the study. Pregnant women presenting with history of ischemic heart disease, hypertension or diabetes (before pregnancy assessed on medical record) or pregnant women having asthma or any psychological issues were excluded.

A sample size of 375 was estimated using OpenEpi sample size calculator taking statistics for dental caries among pregnant as 63.3%, margin of error as 4.9% and 95% confidence level.¹⁴ The dental examination was carried out to assess the dental caries in accordance with the World Health Organization (WHO) diagnosis criteria by a single examiner.¹⁵ The data regarding socio-demographic factors and medical history were obtained using pre-designed questionnaire after dental assessment. Socio-demographic determinants included age, nationality, educational status, socio-economic status, employment status, antenatal care (number of antenatal visits), number of children, living status, residence and body mass index whereas medical assessment included presence of any comorbidity such as gestational diabetes (women presenting with FBS >92mg/dl or PLBS >140mg/dl and further evaluation by

oral glucose tolerance test (OGTT) to confirmed the diagnosis of gestational diabetes. The cut-offs for each glucose level were: FBS > 92 mg/dl, 1 Hour > 180 mg/dl and 2 Hours > 153 mg/dl.¹⁶ If any of the above values came abnormal, the patients were labeled as gestational diabetes. Gestational hypertension was defined as pregnant women with blood pressure >140/90 mmHg with no history of hypertension or taking anti-hypertensive drugs prior to the pregnancy confirmed on medical history and clinical examination.¹⁷ SPSS version 23 was used to analyze data. Mean and standard deviation (SD) was computed for quantitative variables whereas frequency and percentage were computed for qualitative variables. In bivariate analysis, chi-square was used to assess the association between dental caries and qualitative variables whereas independent t-test/Mann Whitney U test was applied to see the statistical difference between dental caries and quantitative variables. The univariate logistic regression was applied to identify the significant predictors of dental caries at $p < 0.10$, the unadjusted odd ratios (ORs) along with 95% CI were estimated. The factors which were significant in univariate logistic regression model were added in final single multivariate logistic regression model and adjusted ORs were computed along with 95% CI, in order to identify the most significant predictors of dental caries after adjustment. $P < 0.05$ was taken as statistically significant for bivariate and multivariate analysis.

RESULTS

Of 375 pregnant women, mean age was 30.32 ± 4.37 years. Majority of them were from low socio-economic class 237 (63.2%), were uneducated 231 (61.6%) and belonged from rural areas 196 (52.3%). Only 19 (5.1%) women were employed and 32 (8.5%) were non-Pakistani. Most of them were living in joint family system 294 (78.4%) and had 2 or more children 74 (19.7%). The mean BMI of the patients was 32.94 ± 5.20 kg/m². Gestational hypertension was observed in 124 (33.1%) and gestational diabetes mellitus in 89 (23.7%) women. Most of them had no antenatal visits 302 (80.5%).

The frequency of dental caries was observed in 108 (29%) pregnant women. (Figure 1) A significant association of dental caries was observed with socio-economic status (p -value < 0.001), educational status (p -value < 0.001), residence (p -value < 0.001), antenatal visits (p -value < 0.001), living status (p -value 0.004), gestational diabetes (p -value < 0.001), and hypertension (p -value < 0.001). (Table 1)

Table 1: Comparison factors associated with dental caries (n=375)

Variables	Dental Caries		p-value
	Yes	No	
Age (Mean \pm SD)	30.30 \pm 4.23	30.33 \pm 4.43	0.953
Socio-economic status			
Low	88 (37.1%)	149 (62.9)	0.001*
Middle	15 (13.2%)	99 (86.8)	
Upper Middle	5 (20.8%)	19 (79.2)	
Education status			
Uneducated	97 (42%)	134 (58)	0.001*
Educated	11 (7.6)	133 (92.4)	
Residence			
Urban	6 (3.4)	173 (96.6)	0.001*
Rural	102 (52)	94 (48)	
Occupation			
Unemployed	100 (28.1)	256 (71.9)	0.189
Employed	8 (42.1)	11 (57.9)	
Nationality			
Pakistani	102 (29.7)	241 (70.3)	0.189
Non-Pakistani	6 (18.8)	26 (81.3)	
Antenatal visit			
No visit	97 (32.1)	205 (67.9)	0.004*
Yes	11 (15.1)	62 (84.9)	
Living status			
Joint family	94 (32)	200 (68)	0.010*
Nuclear family	14 (17.3)	67 (82.7)	
Gestational hypertension			
Yes	66 (53.2)	58 (46.8)	0.001*
No	42(16.7)	209 (83.3)	
Gestational diabetes mellitus			
Yes	58 (65.2)	31 (34.8)	0.001*
No	50 (17.5)	236 (82.5)	
BMI (Mean \pm SD)	32.48 \pm 4.88	33.12 \pm 5.32	0.279

*significant, All data presented as number (%)

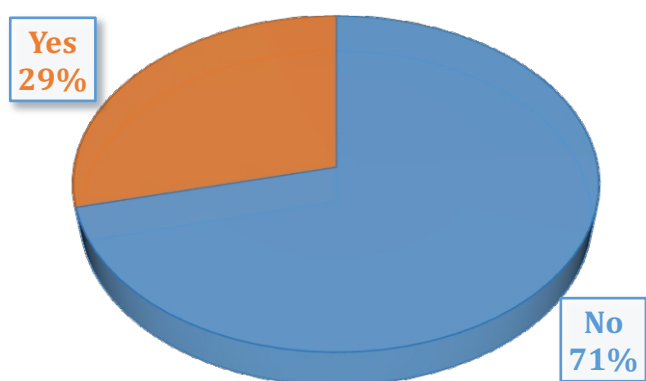


Figure 1: Frequency of dental caries in pregnant females visiting antenatal clinic (n=375)

The odds of dental caries among low socioeconomic status was 2.24 times higher as compared to odds of dental caries among high socioeconomic status (OR=2.24, 95% CI = 0.81-6.22). The odds of dental caries among middle socioeconomic status was 42% lower as compared to high socioeconomic status (OR=0.576, 95% CI = 0.187-1.77). Uneducated females had 8.75 times higher odds of dental caries (OR=8.75, 95% CI=4.48-17.1) as compared to educated females and relationship was statistically significant (p=0.001). Rural area residents had 31.28 times higher odds of dental caries than urban residents (OR=31.28, 95% CI=13.22-73.99). Females with no antenatal visit had 2.66 times higher odds of dental caries as compared to females with at least 1 antenatal

visits (OR=2.66, 95% CI=1.34-5.29) and relationship between dental caries and antenatal visits was statistically significant ($p=0.005$). Females living in joint family had 2.24 times higher odds of having dental caries as compared to females living in nuclear family (OR=2.24, 95% CI=1.20-4.20) and family status was significantly associated with dental caries ($p=0.011$). The odds of dental caries among females with gestational hypertension was 5.66 times higher as compared to odds of dental caries among females without gestational hypertension (OR=5.66, 95% CI=3.49-9.18, $p=0.001$). Lastly, the odds of dental caries among gestational diabetes was 8.83 times higher than females without gestational diabetes (OR=8.83, 95% CI: 5.18-15.03) and showed statistically significant association ($p=0.001$). (Table 2)

All the factors which were significant in univariate analysis ($p<0.10$) were moved into single multivariate logistic regression model to ascertain the effect of predictors on the likelihood that pregnant females have dental caries. The multivariate logistic regression model was statistically significant ($p<0.05$). The model explained 66% (Nagelkerke R^2) of the variation in the dental caries and 88% of the cases were correctly classified. Uneducated females were 9.53 times more likely to exhibit dental caries as compared to educated females (aOR=9.53, 95% CI=3.93-23.10). Rural area residents were 19.73 times more likely to exhibit dental caries as compared to urban area residents (aOR=19.73, 95% CI= 7.50-51.88). Women with gestational diabetes were at 8.86 higher risk of having dental caries as compared to women without gestational diabetes

Table 2: Regression analysis for the variables associated with dental caries (n=375)

Variables	OR (95% CI)	p-value	aOR (95% CI)	p-value
Age	0.998 (0.95-1.05)	0.953	-	-
No of children	0.924 (0.75 -1.13)	0.445	-	-
Socio economic status				
Low	2.244 (0.81 -6.22)	0.120	-	-
Middle	0.576 (0.19 -1.77)	0.336		
High	Ref			
Education				
Uneducated	8.752 (4.49 -17.07)	0.001*	9.538 (3.94-23.10)	<0.001*
Educated	Ref		Ref	
BMI	0.976 (0.94-1.02)	0.278	-	-
Residence				
Rural	31.28 (13.23 -73.99)	<0.001*	19.736 (7.51-51.88)	<0.001*
Urban	Ref			
Occupation				
Employed	1.862 (0.73 -4.77)	0.195	-	-
Unemployed	Ref			
Nationality				
Non-Pakistani	0.545 (0.22 -1.37)	0.198	-	-
Pakistani	Ref			
Antenatal visit				
No	2.667 (1.34 -5.29)	0.005*	2.182 (0.79-6.01)	0.132
Yes	Ref		Ref	
Living status				
Joint family	2.249 (1.20 -4.21)	0.011*	1.782 (0.73-4.37)	0.206
Nuclear Family	Ref		Ref	
Gestational hypertension				
Yes	5.663 (3.49 -9.18)	<0.001*	8.861 (3.79-20.74)	<0.001*
No	Ref		Ref	
Gestational diabetes mellitus				
Yes	8.831 (5.19 -15.04)	<0.001*	4.34 (2.11-8.92)	<0.001*
No	Ref			

*significant, OR: Odds Ratio, aOR: Adjusted Odds Ratio

(aOR=8.86, 95% CI=3.78-20.73). Women with gestational hypertension were at 4.33 times higher risk of having dental caries as compared to women without gestational hypertension (aOR=4.33, 95% CI=2.01-8.92). (Table 2)

DISCUSSION

Pregnant women are more vulnerable to tooth decay due to an increase in oral cavity's acidic environment, decreased sugar intake consumption, and oral health carelessness. Recurrent vomiting is normal during pregnancy, enhancing acidic environment that leads to development of carious pathogens and increased demineralization that makes teeth caries-prone. Untreated carious lesions increase the occurrence of cellulitis and abscess.¹⁸

A handful amount of studies has been conducted regarding socio-demographic status and dental caries among school children and rural communities¹⁹⁻²². However, different factors related with dental caries among pregnant women remains negligent. Therefore, the present study determines the frequency and risk factors of dental caries among pregnant women. Present study showed that 29% of the pregnant females had dental caries. There are several studies conducted in this context. An Australian author observed 54% of the pregnant females had oral problems²³ and other authors have proclaimed dental problems as a challenge among pregnant women.^{24,25}

The oral health status is essential entity to be examined among pregnant women in order to facilitate pregnant women with higher oral hygiene and lesser oral problems during their pregnancy. As Pakistan is comprised of mostly low socio-economic class and the study was conducted at government sector, majority females belong to low socioeconomic status and were uneducated. In the present study about 63.2% belonged from low socio-economic class and 62% were uneducated. In one study, pregnant women were found to be more likely to develop dental caries as compare to non-pregnant women who were uneducated.¹⁴ The study conducted in Multan²⁶ showed that education, income and age does not play any role in developing caries or even periodontal disease. In another study conducted at Kulsoom Bai Valika Hospital Karachi²⁷, 53.6% pregnant women had acquired primary level of education and mean age of pregnant women was 31.32 ± 4.318 years slightly analogous to current study findings. Hence, in the present study we found dental caries was significantly associated with socioeconomic status, education and residence in

bivariate analysis ($p < 0.05$), but showed no association with age ($p > 0.05$).

The present study also showed significant association between antenatal visit and pregnant females having dental caries in bivariate analysis. This explains that pregnant females who regularly visit their antenatal clinics for check-ups could have slightly lower chance of developing caries. There is lack of awareness among pregnant women regarding dental visits¹⁴ and present study also showed that most of the females did not visit antenatal clinic.

The present study also sought medical factors associated with pregnant women having dental caries. The results showed that gestational hypertension and diabetes have positive association with dental caries among pregnant women. However, the results showed that 66 females with dental caries had gestational hypertension and 58 had gestational diabetes. In other study²⁸, it was found that 38% pregnant women had gestational diabetes. In a study, gestational diabetes was found to cause enamel development defects in new born of diabetic female.²⁹ Though there is a significant association between diabetes and caries³⁰, however, the study showed that the findings are similar and few pregnant women having gestational diabetes experienced dental caries.

This study might be helpful in providing baseline data regarding frequency and associated factors of dental caries which could lead to improvement in awareness of pregnant women. Since this was a cross-sectional study; therefore it cannot establish temporal associations and in this regard future longitudinal studies are suggested to establish causal associations for risk factors with dental caries. Additionally, true results (wider confidence interval for odd ratios) might have been hampered due to reporting bias or limited sample size.

CONCLUSION

In pregnant women, the frequency of dental caries was high. Dental caries were closely related to education, residence, gestational hypertension and gestational diabetes mellitus. For better outcomes, oral hygiene awareness should be encouraged in women by gynecologists during first trimester of pregnancy.

ETHICAL APPROVAL: The study protocol was approved by the Ethical Review Committee of Sir Syed College of Medical Sciences for Girls Karachi, Pakistan.

AUTHORS' CONTRIBUTION: MA concept & idea of study, give the final review, IK & AAS literature review & final approval,

SAR & MH methodology & data collection, KA data analysis, interpretation of results, wrote the manuscript.

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