



Oral health status of Pakistani females during pregnancy and its association with adverse pregnancy outcomes

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KeyWords

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ABSTRACT

During pregnancy female body undergo various physiological and hormonal changes. Literature showed link between these changes with oral disorders leading to adverse pregnancy outcomes (APOs). However, no conclusive evidence is available in this regard. In the present study demographic, obstetric, oral health, and practices associated data was collected from 267 postpartum females post one day of delivery by using a structured questionnaire and their medical history. Dental health was examined by qualified dentists. A high proportion (47.2%) of study subjects were presented with different type of oral disorders. Among these dental caries was present in 28.1% of females, while 27.3% were presented with gingivitis. Gingivitis and dental caries showed associations with low brushing frequency ($P=0.004$ and $P=0.024$, respectively). Gingivitis and dental caries risk were also increased with increasing sugary liquid intake. A significantly high prevalence of dental caries was seen in patients having a high intake of tea/coffee ($P=0.032$). The frequency of low weight birth (LWB) was 22.5% while preterm birth (PTB) was present in 21.7% of females. Preeclampsia was present in 11.6% cases. No association was found between gingivitis and dental caries with PTB and LWB. However, preeclampsia showed an association with gingivitis ($P=0.018$). Gingivitis and dental caries increased approximately two to a threefold risk for APOs. Preeclampsia and gestational hypertension were significantly associated with LWB ($P=0.006$ and $P<0.001$ respectively). The present study showed that pregnancy-associated changes, lack of oral hygienic practices and dietary habits, predispose females to develop various oral disorders which ultimately increases the risk of APOs.

INTRODUCTION

Pregnancy is a unique and complex phase, during which the female body experiences several changes, among which a prominent shift is seen in physiological body features and hormonal levels (Cao *et al.*, 2014). Levels of progesterone and estrogen dramatically raise during pregnancy, contributing to the ecological imbalance in the oral cavity, which can ultimately lead to pregnancy-associated gingivitis. If such changes persist and proper hygiene is not maintained, then it worsens towards the end of pregnancy and can progress to develop periodontitis and caries lesions. The effect of these contributing factors is further exacerbated by frequent vomiting, changing eating and drinking habits with more cravings towards sugary diet (Ramazani *et al.*, 2014).

For ensuring good foeto-maternal health during pregnancy, maintaining good oral health of the expecting mother is important (George *et al.*, 2013). Local inflammatory response in oral cavity against pathological shifts in oral ecology and flora during pregnancy, can contribute to various systematic disorders even adverse pregnancy outcomes (APOs) (Gaszyńska *et al.*, 2015). APOs are undesirable, such commonly seen APOs are preterm birth (PTB; delivery at <37 weeks of gestation period), low weight birth (LWB; baby weight <2.5 Kg at the time of delivery) and preeclampsia (Sukkarwalla *et al.*, 2015). Low and middle-income countries (LMIC) have been reported to have high prevalence of APOs (Harjunmaa *et al.*, 2015).

Females during pregnancy are mostly unaware about the importance of their oral health impact on their baby health (Imran *et al.*, 2015). Despite having oral health issues during pregnancy, mostly females are reluctant to take treatments because they are under impression that taking orthodontic treatments can be harmful to developing baby, as a consequence maternal oral health get compromised (Ibrahim & Ghandour, 2012). On the contrary, it has been proved that dental treatment during pregnancy is not only safe (Thomas *et al.*, 2008), but also helpful in improving maternal oral health and preventing the placental transmission of harmful microbes plus their products to developing baby (George *et al.*, 2013). In Pakistan, no oral health guidelines are available to physicians to guide females during their routine visits. Therefore, it is the need of time to develop health strategies at national level to educate the females about the safe oral health measures that can be helpful in reducing maternal hard and soft tissues infection, which might have impact on babies health (Rashid *et al.*, 2016).

In Pakistan, majority of females give little importance to oral health, oral health issues are mostly left untreated either due to less awareness about oral health, unavailability of health facilities and due to socioeconomic pressure (Imran *et al.*, 2015). Only few reports related to prevalence of oral disorders especially in pregnancy are available from Pakistani population (Baig *et al.*, 2013). World Health organization (WHO) reports approximately 18% prevalence of dental disorders in all Pakistani population (Amin & Tarar, 2016). Data related to oral disorders and impact on pregnancy outcomes in Pakistani females is limited, so there is a dire need to determine the prevalence and its associations with various demographic and obstetric characteristics. In present work, association of various demographic features and oral health status with obstetric factors was assessed for postpartum females after first day of delivery. These findings will be proved helpful in formulating oral health strategies that will help in reducing APOs, which are currently unavailable.

MATERIAL AND METHODS

Study design, settings and data collection

The present study was a hospital-based case-control study, approved from ethical review boards of Capital Hospital (Islamabad), Holy Family Hospital-Rawalpindi Medical University (Rawalpindi), and Quaid-i-Azam University (Islamabad) ethical committees (QAU-BRC). Written informed consent was obtained from all females. Postpartum females attending Gynecology Department of Capital Hospital, Islamabad and Holy Family Hospital, Rawalpindi, from January 2016 to March 2018 were included post one day of delivery. Structured questionnaire was used for data collection. Patient's medical history was also used for collecting general health related data. Dental health was assessed by the qualified dentists. All postpartum females from age ranged 18-40 years, having either healthy oral cavity or oral health issues were included. Gingivitis was confirmed in females having mean periodontal pocket depth of 3-4 mm, gums bleeding with flossing and brushing, swollen red gums, no tooth mobility and bone loss by qualified dentist. In females for dental caries status, data related to decayed, missing, filled teeth/filled surfaces (DMFT and DMFS) were also collected. Females having antibiotics intake during last three months of gestation were excluded from the study.

Data variables of questionnaire

The questionnaire comprised of 3 sections: (1) Demographic data of postpartum females: including age, height, weight, socioeconomic status, residential area, education and employment status; (2) Oral health status and practices: including bleeding gums, pain in gums, tooth erosion, tooth mobility, orthodontic treatment during pregnancy, brushing frequency, intake of juices and drinks (frequently; daily intake, and not frequently; 1-2 times a week), intake of tea and coffee, antibiotic treatments during pregnancy, smoking, intake of snuff (Naswar), hookah (Tobacco pipe of Eastern origin), and betelnut (Chalian); (3) Obstetric factors: including history of previous pregnancies, gestation period [PTB and full term birth (FTB; baby deliver at ≥ 37 weeks of gestation)], baby weight, presence of preeclampsia, blood pressure (BP) at the time of delivery, pregnancy depression and hypertension.

Statistical data analysis

For statistical analysis, IBM SPSS (version 21) was used. Mean and standard deviation (SD) was measured for descriptive data, frequencies and percentages were calculated for categorical data. For risk measurements odds ratio (OR) was calculated. Chi-square (χ^2) test and Fisher's exact test (where count was less than 5), were used to determine significant associations between different va-

riables, where $P < 0.05$ was considered as level of significance.

RESULTS

Demographic features of postpartum females

In present study, 267 postpartum females were included with mean age 27.84 ± 4.876 years. Majority of these females belonged to age group of 21-30 years (66.0%), to middle class (76.0%), living in urban areas (55.8%) and 24.7% were illiterate. Most of the females had high BMI (47.2% cases) (Table 1).

Table 1. Demographic characteristics of postpartum females ($n=267$)

Factors	Frequency <i>n</i> (%)
Age (years)	
16-20	12 (4.50)
21-25	88 (33.0)
26-30	88 (33.0)
31-35	64 (24.0)
36-40	15 (5.60)
Residential area	
Rural	118 (44.2)
Urban	149 (55.8)
Education level	
No	66 (24.7)
Primary	39 (14.6)
Middle	32 (12.0)
Metric	27 (10.1)
Intermediate	65 (24.3)
Graduation	34 (12.7)
Higher level	04 (1.50)
Socio-economic status	
Low	64 (24.0)
Middle	203 (76.0)
High	00 (0.00)
Body mass index (BMI)	
Normal	140 (52.4)
Overweight	126 (47.2)
Underweight	01 (0.40)
Total	267 (100)

Oral health status and practices of postpartum females

Most of the female were suffering from different type of oral health problems (47.2%). Periodontitis was not diagnosed in any of the female, however, 27.3% of the females were suffering from gingivitis and 28.1% from dental caries. Co-occurrence of both disorders (gingivitis and dental caries) was present in 8.2% postpartum females. Among these females, 41.66% (5/12) females of age range 16-20 years, 37.5% (33/88) of age range 21-25 years, 46.6% (41/88) of age range 26-30 years, 56.25% (36/64) of age range 31-35 years and 73.4% (11/15) of age range 36-40 years were suffering from different periodontal and dental disorders. Frequency of brushing was low among majority females, 60.7% brushed once daily and none of them were taking other oral hygienic measures such as use of antiseptic mouth wash. High intake frequency of juices/drinks (44.2%) and tea/coffee was seen among the females. Mostly postpartum females consumed tea or coffee 1-2 times a day with overall consumption was among 74.2% of the cases. Smoking, snuff, hookah, and betelnut intake was uncommon as only one female was addicted to betelnut intake (Table 2).

Table 2. Oral health status and practices of postpartum females (n=267)

Factors	Frequency n (%)
Oral health problems	126 (47.2)
Gingivitis	73 (27.3)
Dental caries	75 (28.1)
Dental caries + Gingivitis	22 (8.20)
Brushing frequency/day	
1 time	162 (60.7)
2 times	98 (36.7)
3 times	03 (1.10)
No brushing	04 (1.50)
Intake of drinks and juices	
Frequently	118 (44.2)
Not frequently	88 (22.8)
No intake	61(33.0)
Tea and coffee intake	
1-2 times daily	198 (74.2)
3-4 times daily	40 (15.0)
> 4 times daily	02 (0.70)
No intake	27 (10.1)
Smoking, Snuff, Hookah, and Betalnut intake	01 (0.40)
Total	276 (100)

Obstetric data of postpartum females

Mostly females were multiparous (70.8 % cases) and common mode of delivery was caesarian (65.5%). LWB and PTB prevalence was high in these females with 22.5% and 21.7% cases, respectively. Preeclampsia was common APOs and was present in 11.6% of the cases. At the time of delivery, most of the females had normal blood pressure (71.5%). Pregnancy related hypertension and depression was uncommon as it was seen in 2.2% and 3.7% of the cases, respectively (Table 3). Despite having oral health issues, only 16.9% of these females had undergone orthodontic treatment during the period of pregnancy.

Associations of obstetric factors and oral health practices with oral disorders

Preeclampsia was common in females suffering from gingivitis ($P=0.018$, $\chi^2=5.607$). Gingivitis was also more prevalent in postpartum females having low brushing frequency ($P=0.004$, $\chi^2=13.29$). It showed no association with other APOs and oral health related factors. Presence of gingivitis increased approximately two-fold risk for having PTB and preeclampsia, and also its risk was increased with decreasing brushing frequency (Table 4a).

Significantly high prevalence of dental caries was seen in patients having low brushing frequency ($P=0.024$, $\chi^2=9.367$) and high intake of tea/coffee ($P=0.032$, $\chi^2=9.36$). No association was seen between dental caries with any other obstetric and oral health related factor studied. However, odds showed risk for having APOs in females with dental caries. Likewise gingivitis, risk for dental caries was increased with decreasing brushing frequency and increasing sugary liquid intake (Table 4b).

Table 3. Frequency distribution of postpartum females according to obstetric factors (n=267)

Factors	Frequency n (%)
Parity	
Nulliparous	78 (29.2)
Multiparous	189 (70.8)
Mode of delivery	
Vaginal	92 (34.5)
Caesarian	175 (65.5)
Gestational age	
PTB	58 (21.72)

FTB	209 (78.28)
Baby weight (Kg)	
< 2.5	60 (22.5)
2.5-4.0	203 (76.0)
> 4.0	04 (1.50)
Preeclampsia	31 (11.6)
BP at the time of delivery	
High	48 (18.0)
Low	28 (10.5)
Normal	191(71.5)
Pregnancy depression	10 (3.70)
Hypertension	06 (2.20)
Orthodontic treatment during pregnancy	45 (16.9)
Total	267 (100)

Table 4a. Association of obstetric factors, oral and general health practices with gingivitis

Factors		Gingivitis		P-value (χ^2)	OR (95% CI)
		No n (%)	Yes n (%)		
Gestational age	FTB	157(58.8)	52(19.48)	0.087 (2.932)	1.71(0.92-3.1)
	PTB	37(13.86)	21(7.86)		
Baby weight (Kg)	< 2.5	45(16.86)	15(5.62)	0.401	-
	2.5-4	145(54.3)	58(21.72)	(1.825)	0.83(0.43-1.6)
	> 4	04(1.50)	00(0.00)		-
Preeclampsia	Yes	17(6.36)	14(5.24)	0.018	2.47(1.14-5.31)
	No	177(66.3)	59(22.1)	(5.607)	
Pregnancy depression	Yes	09(3.38)	01(0.38)	0.209	0.28(0.03-2.29)
	No	185(69.28)	72(26.96)	(1.573)	
Frequency of brushing/day	No	00(0.00)	04(1.50)	0.004	-
	1 time	120(44.94)	42(15.73)	(13.29)	1.02(0.57-1.81)
	2 times	73(27.34)	25(9.36)		0.17(0.01-1.97)
	3 times	01(0.38)	02(0.75)		-
Tea and coffee intake	No	19(7.14)	07(3.00)	0.724	-
	1-2 times daily	145(53.40)	54(20.22)	(1.323)	1.01(0.40-2.53)
	3-4 times daily	23(8.70)	11(4.14)		1.28(0.58-2.81)
	> 4 times daily	07(3.00)	01(0.40)		0.29(0.03-2.73)
Intake of juices/drinks	No intake	47(17.60)	14(5.24)	0.216	-
	Not frequently	58(21.72)	30(11.24)	(3.064)	1.73(0.82-3.64)
	Frequently	89(33.34)	29(10.86)		0.63(0.34-1.15)

Table 4b. Association of obstetric factors, oral and general health practices with dental caries

Factors		Dental caries		P-value (χ^2)	OR (95% CI)
		No n (%)	Yes n (%)		
Gestational age	FTB	151(56.56)	58(21.72)	0.815 (0.055)	1.07(0.56-2.05)
	PTB	41(15.36)	17(6.36)		
Baby weight (Kg)	< 2.5	42(15.73)	18(6.74)	0.560	-
	2.5-4	148(55.44)	55(20.59)	(1.159)	1.15(0.61-2.17)
	> 4	02(0.75)	02(0.75)		0.37(0.05-2.70)
Preeclampsia	Yes	19(7.11)	12(4.50)	0.162	1.73(0.79-3.77)
	No	173(64.80)	63(23.59)	(1.958)	

Pregnancy depression	Yes	08(3.0)	02(0.75)	0.561	0.63(0.13-3.03)
	No	184(68.91)	73(27.34)	(0.337)	
Frequency of brushing/day	No	01(0.38)	03(1.12)	0.024	-
	1 time	124(46.44)	38(14.23)	(9.367)	9.78(0.98-96.8)
	2 times	64(23.98)	34(12.73)		0.57(0.33-1.00)
	3 times	03(1.12)	00(0.00)		-
Tea and coffee intake	No	19(7.14)	07(2.62)	0.032	-
	1-2 times daily	150(56.17)	49(18.35)	(9.367)	0.88(0.35-2.23)
	2-3 times daily	20(7.49)	14(5.24)		2.41(1.00-4.56)
	> 4 times daily	03(1.12)	05(1.87)		2.38(0.48-11.6)
Intake of juices/drinks	No intake	45(16.86)	16(6.0)	0.870	-
	Not frequently	64(23.98)	24(8.98)	(0.278)	1.05(0.50-2.20)
	Frequently	83(31.08)	35(13.10)		1.12(0.60-2.07)

Associations between different obstetric factors

LBW was common in postpartum females suffering from preeclampsia ($P=0.003$) and with gestational hypertension ($P<0.001$). It was not significantly associated with postpartum females having pregnancy depression. Gestational age of baby did not showed any associations with preeclampsia, hypertension and depression (Table 5).

Table 5. Association of LWB and PTB with other obstetric factors

Factors		Baby weight (kg)			P-value (χ^2 value)	Gestational Age		P-value (χ^2 value)
		< 2.5	2.5-4	> 4		FTB	PTB	
Preeclampsia	No	48	186	02	0.003	185	51	0.902
	Yes	12	17	02	(11.931)	24	07	(0.015)
Gestational hypertension	No	57	202	02	<0.001	205	56	0.485
	Yes	03	01	02	(46.438)	04	02	(0.487)
Pregnancy Depression	No	59	194	04	0.565	200	57	0.360
	Yes	01	09	00	(1.141)	09	01	(0.840)

DISCUSSION

Hormonal changes during pregnancy and suboptimal oral health practices can lead to poor oral health conditions, ultimately resulting in the development of oral hard tissues and mucosal infections (Gaffar *et al.*, 2016). In present work, a high percentage (47.2%) of females were having different oral health issues (gingivitis and dental caries), but only 16.9% of these females underwent orthodontic treatments during pregnancy. Despite having oral health problems during pregnancy, they were not taking any antibiotic treatment. Data from this study of Pakistani population is same as exists in highly developed countries even United State of America (USA), where several national level health policies for improving oral health during pregnancy exist, but only 44.7% females consult the physician for their dental health during their gestational phase. This number is even lower among Australian females which is about 30-36% females consulting dentist (George *et al.*, 2013). In Sudan, 90% of the females do not consult dentist because they either consider that during pregnancy having a dental problem is a normal sign or taking treatments will be harmful for both mother and fetus (Ibrahim & Ghandour, 2012). In Pakistan, only few studies are available related to female visiting dentists during pregnancy. A study conducted by Sukkarwalla *et al.*, (2015), reported that only 13% pregnant females visit dentist for treatment purpose. Females avoid taking dental treatments due to time constrain (24%), anxiety to treatments (21%) and cost of treatment (20%) also.

Almost all females brushed daily but with varying frequency, brushing once was predominant (60.7%), which is in line with the previous study from Karachi Pakistan where almost similar brushing frequency rate was reported (Mohiuddin *et al.*, 2015). Females from this study with low brushing frequency (Once a day) commonly suffered from gingivitis ($P=0.004$) and caries lesions ($P=0.024$). Among such affected females, sugary tea and coffee drinkers showed significantly high prevalence of dental caries ($P=0.032$). The reason might be that during pregnancy, these females had changed dietary habits more cravings to sugary food intake. Such availability of high sugar content can shift the ecological balance in oral cavity and lead to colonization of cariogenic flora.

Pakistan comes at sixth position in term of its population size. It is ranked second in terms of stillbirths and third in terms of newborn mortality (Ghaffar *et al.*, 2015). Annually, estimated rate of premature birth is about 15 million, of which approximately 1.1 million

babies die after birth. About 5-18% of PTB cases are seen commonly across 184 countries. In developing countries every year, this level is increasing alarmingly. Cases from South Asian countries, Sub-Sahara Africa and some cases from developed countries like USA account for 60% of PTB (Satterfield *et al.*, 2016). In Europe and Africa, estimated rate of PTB is about 5% and 18%, respectively. Like other Asian countries, PTB incidence is also unfortunately increasing with 748,100 cases seen annually in Pakistani population. Pakistan, in term of PTB is also ranked 4th after India, China and Nigeria. Studies related to PTB incidence in Pakistani population are limited (Hanif *et al.*, 2017). Present work recorded relatively high (21.72%) PTB rate compared to the previous studies from different regions of Pakistan. Shaikh *et al.*, (2011), reported 15.7% rate and in another meta-analysis this rate was about 18.89%. The reason for this difference in rate might be due to difference in geographic location in Pakistan. As most of the Pakistani population is living in rural areas, where common practice is delivery at home and also even in some urban area's babies are mostly born at home. It is believed that PTB and LWB cases from Pakistan are still unreported.

Like incidence of PTB, LWB prevalence is also very high in Pakistan, similar to other LMICs. Annually, about 15% babies, born with low weight worldwide. Of these low weight babies, globally about 17% die before the age of 5 years (Khan *et al.*, 2015). WHO in 2016, reported 32% cases of LWB from Pakistan (WHO, 2016). A study from Lahore (Pakistan), showed that about 19% baby born have low weight. Higher rate of LWB compared to the present finding was reported by studies from Lahore and WHO, but, lower LWB rate was reported by Najmi in 2000 (Najmi, 2000). These differences in rate of LWB could be due the reason that these previous studies are carried out from different region (urban and rural). To get the clear estimate of PTB and LWB increasing burden, there is a need to conduct a comprehensive survey across Pakistan.

Prevalence of preeclampsia was high (11.6%) in the present studied females and was significantly associated with LWB. Preeclampsia and hypertension are the common pregnancy related complications, which affect about 2-8% of the females in gestation period (Connealy *et al.*, 2014) and especially in developing poor countries causing about 60,000 maternal deaths per year (Sheikh *et al.*, 2015). It is also associated with increasing incidence of fetal morbidity, mortality (Walker *et al.*, 2014), intrauterine growth restriction and PTB (Shamsi *et al.*, 2010). A survey by WHO in LMICs, showed about 4% prevalence of preeclampsia and it was significant in causing maternal and perinatal death, PTB and LWB. This WHO report showed that among Asian countries, India, showed prevalence rate of 4.60% and about 2.80% in China (Bilano, Ota, Ganchimeg *et al.*, 2014). High rate of preeclampsia was recorded in present study subjects compared to previous reports, it was high among multiparous females with high BMI.

Among these studied postpartum females oral disorders (gingivitis and dental caries) were prevalent. It could be the due to craving towards sugary diet and frequent vomiting, which might be also responsible for disturbing oral flora and oral health. In addition, these females also had high intake of juices and tea. Initially, dental caries was considered as disease of developed countries, affecting 60-90% of children and elders. But now it has become a major health problem especially in developing countries, because of the poor oral hygienic measures and diet (Mohiuddin *et al.*, 2015). It is even the most prevalent disease among Pakistani children (Kamran *et al.*, 2017).

Among these studied females after interviews it transpired that these females are not aware of importance of their dental health during pregnancy. WHO reported about 31% prevalence of periodontitis in overall Pakistani population (Amin & Tarar, 2016). Umer *et al.*, (2016), conducted a study in Sargodha (Pakistan), reported 14.5 % prevalence of gingivitis and 45.9% prevalence of dental caries in children. However, there is no data available on the prevalence of dental issues in Pakistani postpartum females. Compared to present study high rates of dental disorders is found in other countries such as 63.1% cases among pregnant females from Malawi, Of which 27.8 % females had deep caries lesions, 23.5 % periapical infections and 31.9% diagnosed with periodontitis (Harjunmaa *et al.*, 2015). Variation in geographical location, race, ethnicity and age could be the reason for differences in prevalence rate among different regions of the world. Risk of dental disorders increases with age, with incidence rate ranging from 36%-67% (Ali *et al.*, 2016). About 65 million adults from USA, of over age of 30 years are suffer from different periodontal disorders. Geographical area also affects the periodontal health status by affecting 5-70% of the population worldwide (Vanterpool *et al.*, 2016). In present study, in comparison to previous studies the prevalence of oral disorder was low. However, increasing trend was seen in disease occurrence with increasing age as 41.66% in young females (16-20 years) to 73.4% cases among females of age range 36-40 years. Periodontal diseases usually progress to more severe form with increasing age. However, in present study majority of the females were of age 21-35 years, that's might be the reason for low prevalence of periodontal disorders among present study subjects.

Literature showing periodontal disease and APOs associations are available, however, until now no conclusive evidence is available (Azofeifa *et al.*, 2014). One out of every five females during pregnancy, suffers from periodontitis and is at the risk of developing APOs, where calculated risk of ten-fold of PTB in females with moderate to severe cases of periodontitis compared to periodontitis-free females (Offenbacher *et al.*, 2001). In present study, oral health problems did not show any association with PTB and LWB, however, they were significantly associated with preeclampsia. Females with APOs also showed low prevalence of dental caries. Presence of different oral disorders also increased approximately one to two-fold risk for PTB and preeclampsia. This risk was lesser than as reported by Offenbacher *et al.*, (2001) it was because in present study females were either suffering from gingivitis or dental caries

but not with periodontitis, which is a more aggressive form of periodontal disorders.

Conclusion

In conclusion, present study provides the overview of dental health status and practices followed by females during pregnancy from Rawalpindi and Islamabad (Pakistan). These postpartum females despite suffering from oral health problems did not seek dental treatment. Brushing frequency was associated with oral health problems. No direct association was observed for APOs like PTB and LWB, but other APOs like preeclampsia was associated among the females having oral disorders. Preeclamptic females delivered LWB, might be possible indirect relationship need to be further investigated. There is a need for conducting such studies at national level to get the clear estimates of oral health issues during pregnancy and its association with pregnancy related complications. Present study data cannot be considered as representative of all population as it was conducted in only two hospitals of twin cities of Pakistan. There is also a dire need to investigate this issue in rural area of Pakistan which represent majority of the Pakistani population with lack of awareness for dental hygiene and its possible adverse outcomes. However, findings from the present work are significant for initiating oral health awareness strategies, to provide the pregnant females knowledge of maintaining their good oral health and its positive effects on their baby's health.

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