



KNOWLEDGE AND PRACTICE REGARDING MAINTAINING ORAL HYGIENE AMONG PREGNANT WOMEN IN LALITPUR, NEPAL

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Abstract

Background

Oral Hygiene (OH) plays a significant role in the overall health of a human being. Gingivitis, periodontitis, dental caries and erosion are some of the common oral health problems observed in women during pregnancy. The hormonal changes occurring during pregnancies are the main causes for the periodontal problem. Further lack of oral hygiene, vomiting during first trimester and frequent intake of sugary meals deteriorate the oral health condition during pregnancy. Oral hygiene is often neglected and given less priority compared to other components during antenatal health care. The maintenance of oral hygiene during pregnancy to avoid the subsequent oral health problems is dependent on the existing knowledge among women regarding the health issues. Thus, the aim of this study was to identify the existing knowledge and practice regarding maintaining oral hygiene among pregnant women of Lalitpur district of Nepal.

Methods

A descriptive cross-sectional study was conducted from June 2013 to August 2014 on 120 pregnant women who attended the Out Patients Department for antenatal checkup at Chapagaun Primary Health Care and Resource Centre (PHCRC), Lalitpur, Nepal. By using semi-

structured an interview was conducted for all the participants of the study and inferential statistics was used to analyze the data.

Result

The findings showed that most pregnant women 65.8% had moderate level of knowledge and majority of the respondents 55% had insufficient level of practice regarding maintaining oral hygiene during pregnancy. The study revealed a significant association between the level of knowledge with education levels of respondents ($p=0.032$) and number of pregnancy ($p=0.014$). The study however revealed there is no association between the oral hygiene practice with level of education ($p=0.117$), number of pregnancy ($p=0.199$) and occupation of respondents ($p=0.082$). The association between level of knowledge and level of practice, Spearman rank Correlation (r) was found significant association ($r=0.341$, $p=0.001$).

Conclusion

There is lack of knowledge and practice of maintaining oral hygiene during pregnancy among the pregnant women. Therefore, it is important to provide oral health education to these specific targeted groups i.e. pregnant women during antenatal checkup. This will inadvertently improve their knowledge and practice on maintaining oral hygiene thereby resulting in better oral health and avoid any pregnancy related oral health conditions.

Keywords: Oral Hygiene, Pregnant women, Knowledge, Practice, Dental Care, Dental Visit.

Introduction:

Oral health is very important for all pregnant women as it impacts the overall well-being of both the mother and her child during conception, pregnancy and even after delivery [1]. Oral health is an important component of physical and psychological wellbeing of a human being thereby ensuring quality of life. In addition to this, disease

prevention and oral health promotion are widely neglected areas in the field of public health[2]. Due to this persistent focus on decreasing the latter indicators, other maternal health issues are often undermined [3]. To cater for the burgeoning issue of periodontal problems during the European Workshop on Periodontology the World Health

Organization (WHO) has strongly advocated to identify relevant country specific preventive programme. These include instruction of self-performed effective oral hygiene and also health education activities based on the Common Risk Factor Approach as contextualized by the recent UN's resolution to establish the 2030 sustainable development goals [4]. As majority of focus during pregnancy is largely concentrated around maternal mortality and morbidity rates, it should not therefore undermine the importance of good oral health which also impacts the latter.

During pregnancy, hormonal and vascular changes can affect both mother and fetus. Such changes have been suggested to predispose women to gingivitis, periodontal disease, dental decay, and development of hyperplastic tissue, preterm delivery, low birth weight babies, and preeclampsia among others [5]. Clinical observation has shown that the prevalence of Periodontal Disease (PD) during pregnancy varies from 35% to 100% [6]. Even in Nepal generalized and local mild gingival inflammation and calculus were observed to be common in adult Nepalese women while in terms of periodontal health among women of child bearing age falls in the bottom 15% [7]. It was found that pregnant women in rural Nepal lacked knowledge about where to receive care for tooth and/or gum pain and relied heavily on the existing social and cultural beliefs that are persistent in the community [8]. Additionally, while women were more likely than men to report seeking dental care services, only 4.8% of these women had actually seen a dentist in the past 6 months [9].

Hormonal changes during pregnancies are the major factors associated with pregnancy related

oral conditions, however, evidences also indicate that poor oral hygiene maintenance coupled with harmful habits such as smoking and alcohol consumption further aggravates the problem [10]. Women in developing countries like Nepal are predisposed to more carbohydrates and sugary meals during pregnancy which further enhance the chances of having dental caries. Furthermore, regular episodes of vomiting during the first trimester and the later stages of pregnancy raise issues of erosion of the teeth [11, 12]. The oral hygiene maintenance not only involves mothers but has its effect on the new born as well. Mothers who have themselves experienced extensive tooth decay and therefore most likely harbor high titers of *Streptococcus mutans* in their saliva will more effectively transmit this infection vertically, thereby putting their young children at elevated risk from early childhood caries [13]. Various studies have shown poor oral health knowledge and practice among pregnant women even in countries like Nigeria and India [14,15]. It has been reported that the pregnant women and mothers, who are often receptive to new information and responsibilities and have received oral health education during their pregnancy have better oral health status compared to their counterparts living in underprivileged communities and have hardly received any oral health education [16]. Similarly, due to its very little impact on mortality oral health has been neglected which is proven by how little study has been done in this area in Nepal. As such, very few studies have been published on knowledge and practice of oral health among pregnant women in Nepal. In addition to this there also has not been any study done till date to assess

the oral hygiene maintenance among the same group which propels the need of this study.

Methodology:

Descriptive cross-sectional study was conducted in 120 pregnant women who attended OPD for antenatal checkup at Chapagaun Primary Health Care and Resource Centre (PHCRC). The data was collected between periods of June 1st, 2013 to August 30, 2014. A semi-structured interview schedule was developed to measure the knowledge and practice regarding maintenance of oral hygiene during pregnancy among pregnant women. The entire pregnant woman who attended clinic for antenatal checkup during the time of data collection period was selected for the study. None of the participant rejected to take part in the study. After data collection individual informal teaching was given on "Importance of oral hygiene maintenance during pregnancy" was given by the researcher. The questionnaire consisted of three sections (socio-demographic information, 21 questions on knowledge and 20 questions on practice). Overall adequacy of knowledge and practice was graded according to the following criteria: If scored $< \text{Mean} - \text{SD}$ inadequate Knowledge, If scored $\text{Mean} \pm \text{SD}$ moderate knowledge and If scored $> \text{Mean} + \text{SD}$ adequate Knowledge. Similarly, the practice was graded according to the following criteria: If scored $< \text{Mean}$ insufficient practice and If scored $> \text{Mean}$ sufficient practice. The mean score of knowledge was 20.15 ± 3.84 and practice was 24.06 ± 3.61 , which was used as a basis of knowledge level and practice level. The total knowledge score was 40 and practice was 34. The reliability of the instrument was established by pretesting the

instrument with 12 (10%) of the total sample size at Harisiddhi Sub- Health Post, Lalitpur. Split Half test for internal reliability was conducted, for practice $\alpha = 0.74$ was obtained. The overall consistency of both knowledge and practice was tested and the result was $\alpha = 0.782$. Data was entered Statistical package for Social Science (SPSS) 20 version. Descriptive statistics such as frequency, percentage, mean, median, standard deviation was used. Inferential statistics namely the Fisher's Exact Test, and Chi square test were used to find out the association between selected socio-demographic variables with knowledge and practice regarding maintaining oral hygiene during pregnancy. A Spearman rank correlation was also used to find out the association between knowledge and practice. P-value of < 0.05 was considered statistically significant. Ethical approval was taken from the Institutional Review Board (IRB) of Institute of Medicine, Tribhuvan University, Kathmandu, Nepal.

Results:

A total of 120 volunteer participants were included in this study. The age of the respondents ranged between 15 to 35 years. Among them, majority of the respondents 33.3% were aged between 26-30 years where the SD of mean was 24.5 ± 5.44 years. On the basis of ethnic group majority of the respondents 59.2% belonged to the Janajati, followed by Brahmin 22.5% and Dalit groups 10.8%. Furthermore, regarding number of pregnancies it was observed that 53.3% of the respondents were multigravida and 33.3% of the respondents had attained secondary level of education.

Knowledge Regarding Maintaining Oral Hygiene

Most of the pregnant mothers had a good understanding of the term oral hygiene. It was observed that 82.5% of the women perceived the meaning of oral hygiene to be preventing from oral disease, followed by 74.2% citing it as cleanliness of teeth and 60.8% indicating cleanliness of gums. It was observed that 87.5% pregnant women responded that they could maintain oral hygiene by regularly brushing their teeth. The respondents' knowledge on the benefits of oral hygiene ranged from increased salivary flow 14.2%, to keep gum

and teeth healthy 91.7%, to prevent halitosis 92.5%. The study results revealed that 70% of the respondents knew that the effects of smoking and alcohol intake on oral hygiene while 59.5% of the respondents believed the this ill habits caused oral cancer. Most of them received the information regarding maintaining oral hygiene during pregnancy from the school 62.5% while only 12.5% had received oral health counselling from medical/dental personnel.

Table 1 Respondents' Knowledge Regarding Common Dental Problems and cause dental problems during Pregnancy

Correct Response	Frequency(n)	Percentage (%)
Common dental problems during pregnancy**		
Tooth decay	32	26.7
Gum bleeding	71	59.2
Dental sensitivity	58	48.3
Risk factors that cause dental problems during pregnancy**		
Frequent Consumption of Sugary Foods Without rinsing mouth	110	91.7
Lack of Fluoride in Water /Toothpaste	51	42.5
Lack of Awareness Regarding Oral Health	74	61.7
Hormonal Change	32	26.7
Frequent Vomiting in Early Pregnancy	35	29.2
Lack of Brushing Practice	103	85.8

Multiple Response**

Table 1 show that most of the pregnant women had knowledge on common dental problem during pregnancy. The respondents pointed out that gum bleeding 59.2%, dental sensitivity 48.3% and tooth decay 26.7% as the common dental problems that occur during pregnancy. Although majority of the respondents were aware of the detrimental impact of sugary drinks 91.7% and benefits of tooth brushing 85.8%, not many were aware of oral health risks associated with frequent vomiting 29.2% or hormonal changes 26.7%."

Respondents' Knowledge Regarding Brushing the Teeth

Regarding brushing teeth during pregnancy, all of the respondents answered that pregnant mother should brush their teeth. The majority of the respondents favored the use of soft brush for brushing their teeth 65.8%. Similarly, regarding the amount of toothpaste required during toothbrushing, only 28.3% opined correctly that it should be of pea size. The results indicated that

64.2% of the respondents were in favor of doing it after their main courses. It was observed that 85% of the respondents used a tooth brush and tooth paste for brushing their teeth. While 60.8% of the respondents indicated using vertical and back and forth motion during toothbrushing. Regarding the use of tools to remove dental plaque, more than half of the respondents 55% opted for a tooth brush. Similarly, when enquired regarding their

knowledge on 'fluoride' only 24.2% gave the correct response i.e. mineral, while only 35% respondents indicated the actual function of 'fluoride' i.e to prevent dental caries. Only 15% of respondents have knowledge that at least one visit to a dentist or any dental professional during pregnancy is necessary while the remaining indicated that it was not necessary to visit them.

Table 2 Association of Level of Knowledge with Selected Demographic Variables

Selected Socio-demographic variables		Level of Knowledge			P-value
		Inadequate	Moderate	Adequate	
Education level of respondents	Illiterate	3	5	0	0.032*
	Literate	4	6	1	
	Primary Level	14	19	1	
	Secondary level	5	29	6	
	Bachelor	2	16	5	
	Post graduate	0	4	0	
Number of Pregnancy	Primigravida	8	38	10	0.014**
	Multigravida	20	41	3	
Occupation of respondents	daily wage	4	5	0	0.212*
	household worker	14	41	4	
	Farmer	5	9	2	
	Service	3	13	6	
	Business	2	11	1	

P value ≤ 0.05 * Fisher's Exact Test, **Chi Square Test

Table 2 indicates that the association between education levels of respondents (p =0.032), number of pregnancy (p=0.014) with the level of knowledge were significant. The majority of secondary level educated pregnant woman and

multigravida pregnant woman have moderate level of knowledge regarding oral hygiene. The occupation of the respondents (p=0.212) does not influence their knowledge on oral hygiene as the result shows no significant association between

occupation of the respondent with the level of knowledge at a 95% confidence level.

Respondents' Practice Regarding Brushing

Majority of the respondents 85.8% brushed their teeth once a day regularly whereas only 40.8% respondents brushed twice everyday. More than half of the respondents 57.5% brushed their teeth regularly after having meals. The results indicated that 71.7% of the respondents brushed the teeth up and down regularly; 61.7% of them changed their toothbrush twice a year. Only 23.3% of the respondents regularly look for fluoride in toothpaste whenever they buy. It was also observed that 36.7% of the respondents were using toothpaste containing fluoride while 51.7% rinsed their mouth immediately after eating. Almost all of

the respondents 85.0% had never rinsed their mouth with antiseptic mouth wash and only 0.8% used it regularly. The results showed that 99.2% of the pregnant women in the study used a toothbrush to clean their teeth, followed by toothpaste 96.7%. Some of the respondents indicated use of incorrect or risky tools and habits for cleaning their teeth, i.e. wooden toothpick (27.5%), fingers (24.2%), salt (21.7%) and datiwani (Neem Plant wood)5.8%.

Of the pregnant women surveyed, 56.7% ate more than two times a day on a regular basis. Similarly, 14.2% eat sweet items regularly mostly for snacks and a high volume of respondents 75.8% used to eat sweet items sometimes for snacks. Half of the respondents 50.8% take sweet drinks sometimes along with their snacks.

Table 3 Respondents' Practice Regarding Dental Visit during the Pregnancy

Dental Visit During the Pregnancy	Frequency	Percentage
Yes	14	11.7
Reason for visiting the dentist during this pregnancy		
Gum bleeding	8	57.1
Gum swelling	2	14.2
Gum bleeding and swelling	4	28.5

It was observed that only 11.7% had visited a dentist among which majority of the respondents

57.1% cited gum bleeding as the reason for seeking dental care followed by gum bleeding and swelling 28.5% during pregnancy as depicted in table 3.

Table 4 Association of Level of Practice with Selected Demographic Variables

Selected Socio-demographic Variables	Level of Practice		P-value	
	Insufficient	Sufficient		
Education level of respondents	Illiterate	6	2	0.117*
	Literate	8	3	
	Primary Level	21	13	
	Secondary level	20	20	
	Bachelor	11	12	

	Post graduate	0	4	
Number of Pregnancy	Primigravida	27	29	0.199**
	Multigravida	39	25	
Occupation of respondents	Daily wage	8	1	0.082**
	Household Worker	31	28	
	Farmer	10	6	
	Service	8	14	
	Business	9	5	

P value \leq 0.05 * Fisher's Exact Test, **Chi Square Test

The association of level of practice with selected demographic variables has been illustrated in Table 4. Most of the educated pregnant women, multigravida respondents have insufficient practice on maintaining oral hygiene as there is no

significant association between education levels of respondents ($p=0.117$), number of pregnancy ($p=0.199$) and occupation of respondents (0.082) with the level of practice at a 95% confidence level.

Table 5 Association between Level of Knowledge and Level of Practice

		Level of Knowledge			Total	P-value
		Inadequate	Moderate	Adequate		(Test Statistic)
Level of practice	Insufficient	22	42	2	66 (55%)	0.001*
	Sufficient	6	37	11	54 (45%)	
Total		28 (23.3%)	79(65.8%)	13(10.8%)	120	

P value \leq 0.05 *Spearman Correlation (r): 0.341

Table 5 illustrates the level of knowledge and level of practice and association between them. Most pregnant women 65.8% had moderate level of knowledge, followed by inadequate level of knowledge 23.3% whereas only 10.8% had adequate knowledge on good oral hygiene practice. Likewise, most of the respondents 55% had insufficient practice regarding maintaining oral hygiene during pregnancy. The result indicates that there is a high significant association($r=0.341$, $p=0.001$) at 95% confidence level between inadequate knowledge on

good practices leading to insufficient practice. Out of the 28 respondents having inadequate knowledge, 22(78.57%) had insufficient practice whereas out of 13 having adequate knowledge, 11(84.62%) had sufficient practice.

Discussion:

Oral health problems are preventable but they have a relatively high incidence among poor and underserved population. The respondent age category of this study is similar to a study done in

Chandigarh, India which showed that regarding the knowledge on what oral hygiene means, most of the respondents 82.5% took it as preventing from oral disease, followed by cleanliness of teeth 74.2% and cleanliness of gum 60.8%. Most of them 87.5% responded that they maintained oral hygiene by regularly brushing their teeth. The respondents' knowledge on the benefits of oral hygiene ranged from increased salivary flow 14.2% to preventing halitosis 92.5% based on individual opinions [17]. These results agree with Perry *et. al* on the benefits that complete oral hygiene enhances well being and comfort, removes the food particles, plaque and bacteria and prevents halitosis, increases salivary flow, helps in digestion, increases one's appetite, keeps gum and teeth in a healthy state [18].

Most of them 62.5% received the information regarding maintaining oral hygiene during pregnancy from the school and only 12.5% from medical/dental personnel. Similarly, in a study by done in Australia it was reported that most pregnant women 14% were informed about dental health in pregnancy through talking with their midwife or doctors [19]. It could be mainly due to the oral health related topics incorporated in the primary and secondary school curriculum as well as various health program conducted by the government across different schools of Nepal. There is a definite lack of oral health education provided by health care personnel during antenatal and postnatal visits therefore it is necessity to reinforce oral hygiene education and oral health promotion to every antenatal woman during antenatal check up by health personnel.

The highest proportion of the respondents pointed out that the common oral health problems are gum bleeding 59.2%, followed by dental sensitivity 48.3% and tooth decay 26.7%. These findings are found to be similar to a study carried out in Malaysia where mothers reportedly identified dental caries 63.7% and periodontal disease 50.8% as the common oral health problems during pregnancy [20].

The majority of pregnant women surveyed know about the risk factors that cause dental problems during pregnancy, almost all the 91.7% respondents answered about frequent consumption of sugary foods without rinsing mouth, followed by lack of brushing practice 85.8%, lack of awareness regarding oral health 61.7%, lack of fluoride in water /Toothpaste 42.5%, frequent vomiting in early pregnancy 29.2%, hormonal change 26.7% and drinking plenty of fluids daily 6.7%. Similar finding has been seen in another study where it showed that the risk factors for causing dental caries are poor living conditions, unhealthy lifestyles, and limited availability and accessibility of oral health services [21]. Thomas *et al.* also indicated in their study that majority of the women 84% they surveyed in Australia agreed that sweet foods could cause tooth decay; most women had a good understanding of good oral hygiene, with 99% women agreeing to the fact that brushing their teeth would help prevent gum disease [19].

All the respondents agreed that pregnant woman should brush teeth during pregnancy and 65.8% indicated that they had knowledge that soft brush is the best type of tooth brush however it was interesting to note that only 28.3% of the

respondents could say the correct amount of toothpaste required (pea size) which was not satisfactory. Regarding the time for brushing the teeth, the majority of the respondents 64.2% were in favor of doing it after taking main meals. Similarly, the majority of the respondents 85% used tooth brush and tooth paste for brushing the teeth while a further 60.8% of the respondents indicated that one should use the modified Bass technique for toothbrushing. Regarding the use of the tools to remove dental plaque, more than half of the respondents (55%) opted for a tooth brush. This finding is in consistent with the actual recommendation of tooth brushing twice daily in the morning after lunch and at night before going to bed that the toothpaste and toothbrush are the appropriate material for brushing, that brushing is done in small circular movements while keeping the head of the brush at angle of 45 degree to the teeth (modified bass technique), and to use a soft bristle brush and pea size amount of fluoridated toothpaste for brushing the teeth[22]. Only 24.2% of pregnant women said that they knew the meaning of the word ' fluoride', while only 35% respondents gave the correct response in relation to the function of 'fluoride' i.e. to prevent dental caries. Fluoride is a type of mineral which forms fluorappetite crystals in the enamel making it harder to be broken down by the acid produced by the bacteria resulting in prevention of caries [23]. This finding is also similar with the study done in Nigeria where 25.4% pregnant woman correctly identified fluoride as a constituent of toothpaste [14].

Similarly, when the respondents were enquired about their knowledge on frequency of visits to a

dentist or any dental professional during pregnancy, only 15% of them shared that they had visited a dentist once during their pregnancy. The National Oral Health Pathfinder Survey conducted in Nepal in 2004 indicated that 43.8% of the female adults had bleeding gums, calculus and shallow pockets with a higher rate among the rural population which indicates the gravity of the health problem in this group [22]. The respondents even having more dental problem during pregnancy than in a non- pregnant state don't prefer to go for a routine dental visit due to lack of knowledge, less priority and receive home treatment rather than going to health centre for dental treatment with insufficient dental practice. More intensive oral health education in pregnancy highlighting the importance of good oral health in achieving good health can lead to improved oral health and ultimately improved pregnancy outcomes for both mother and child [24].

With regards to the practice on brushing the teeth, majority of the respondents 85.8% brushed their teeth once daily on a regular basis; whereas 40.8% respondents brushed the teeth twice a day sometimes which reflects a satisfactory level of knowledge and practice of oral hygiene maintenance among pregnant woman. Similar findings were shown by a study in Kuwait to describe self-reported oral health, oral hygiene habits, and frequency of visits to a dentist among pregnant women in Kuwait reported that almost two-thirds 64% of the women brushed more than once a day, and almost all 94% at least once a day [25]. Similarly, in Spain it was reported that 45.7% of the pregnant women brushed their teeth twice a day [5]. A Nigerian study on the same cohort

showed only 32.9% of women brushing their teeth twice daily [14]. Nearly half of the respondents 57.5% brush the teeth regularly after having meals. Only 23.3% of the respondents regularly look for fluoride and 36.7% of the respondents were using toothpaste containing fluoride. Almost all of the respondents had never rinsed mouth with antiseptic mouth wash and only 0.8% used to do it regularly which was less than the figure 3% ,55% use of mouth wash reported by similar studies in Denmark and Australia respectively [21,19]. Low use of fluoride containing toothpaste and mouthwash may probably due to low level awareness of importance of oral health and benefit of mouthwash in daily oral hygiene maintenance.

Regarding the practice of eating habits of the respondents, more than half of the respondents snacked frequently, i.e. more than two times a day, with majority of respondents snacking on sweets, sweetened drinks. This reflects the potential risk of tooth decay and gum problems during pregnancy. Proper nutrition and healthy lifestyle also play a vital role in the general well-being of the pregnant women. The need to eat a balanced diet with adequate quantity of fruits cannot be over-emphasized. Unfortunately, the pregnant state may predispose women to practice unhealthy eating habits. These habits may include craving for particular types of food groups to the detriment of other essential food groups and frequent unhealthy snacking habits such as licking sweets to curb nausea. The increased consumption of refined carbohydrate will provide a suitable substrate for cariogenic bacteria and may predispose to increased tooth decay in some individuals [14]. There is a need to inform

pregnant women on the role of good nutrition on oral health in future oral health education sessions.

Regarding the respondent's practice of visiting a dentist during the pregnancy, only 11.7% of the women had dental visits, and among them majority of the respondents 57.1% gave gum bleeding as a reason for visiting the dentist followed by gum bleeding and swelling among 28.5% while only 14.2% pointed out gum swelling as a reason for visiting the dentist during this pregnancy. This finding is similar to the findings of another study done in South Australia which reported that only 14.6% had visited a dentist during pregnancy [26]. Similar findings was reported in a study in Malaysia where women had visited a dental clinic at least for one oral health problem including painful teeth 15.3% and bleeding gum 21.0% [20]. This is further supported by other findings in our study which revealed that reason of dental visit was bleeding gums during toothbrushing 15% was the most frequent symptom, spontaneous bleeding 7%, change in color of the gums 6% and swollen gums 7% were some other reasons for a visit to the dentist [21]. In Nepal many of the pregnant women did not seek dental care due to financial constraints. They used herbal medicine or even underwent surgical extraction which could have been saved by just a restoration [8]. Furthermore, it is observed that majority of women seek curative services for oral health problems very late often leading to complication, higher financial burden and limited option for treatment. This indicates a need for focused preventive strategies in a country like Nepal.

With regards to the tools used to clean the teeth, majority of the respondents 99.2% used toothbrush to clean their teeth, followed by toothpaste 96.7%. An incorrect selection of tools and practice were seen among women who used wooden toothpick 27.5%, finger 24.2%, salt 21.7% and datiwani (a teeth cleaning twig that serves as both a toothbrush and toothpaste) 5.8% for toothbrushing. These findings are in consonance with the study in pregnant Nigerian women attending a teaching hospital which reported that almost all the women 94.2% used toothbrush for oral cleaning, chewing stick 2.4 % and others 3.6% [14]. Similar finding was reported in a study done in Chennai where 97.4% of pregnant woman used toothbrush and toothpaste to clean their teeth whereas using finger as a tool found to be higher than 0.8% [27].

In relation to the association between selected socio-demographic variables with knowledge regarding maintaining oral hygiene during pregnancy, there is significant association between education, pregnancy number and knowledge on oral hygiene, however, no significant association was linked to occupation. Studies conducted in Nigeria and South Australian pregnant women also revealed a significant association between level of education and oral health knowledge [14,26].

With regards to the level of knowledge and practice, most pregnant women had moderate level of knowledge; likewise most of the respondents had insufficient practice regarding maintaining oral hygiene during pregnancy. Similar finding was reported in a study conducted in Chennai where the knowledge related to oral health of pregnant women during pregnancy was found to be low

which resulted in insufficient oral hygiene practice among study participants of that particular study [27]. Similar habit of poor oral hygiene compliance associated to lack of knowledge was found in the results of a study done in Karnataka [28]. A highly significant association was found between the level of knowledge and level of oral hygiene practice among pregnant women. This suggests that those pregnant women with insufficient knowledge had poor oral hygiene maintenance habits. This finding is in line with the study done in Brunei in which comparison between knowledge and practice of oral and dental healthcare, knowledge about frequency of brushing, flossing and brushing after meals was significantly associated with practice (all $p < 0.001$) [29]. The findings of this study concluded that proper education on oral health care among the pregnant women may lead to correct practice in oral health. More intensive oral health education in pregnancy and dental visit can lead to improved oral health and ultimately improved pregnancy outcomes [30, 31]. It is quite alarming to see that the World Health Organization has not included oral health care as one of the basic components in the new antenatal care model [32]. It is very important to incorporate oral health education and promotion component across various risk groups such as, pregnant women, children and families across various settings including early childhood and development centres and family forums/events [33]. There is an immediate need for researchers, clinicians, and policymakers to develop effective preventive strategies to address this important yet neglected aspect of oral care [34,35]. This study has the limitation of relying on self-reported data and therefore is subject to bias. Furthermore, the

study was carried out in one primary health care centre only, therefore the results may not be sufficient to conclude for the whole pregnant population of Nepal.

Conclusion:

The study findings showed that most pregnant women had moderate level of knowledge and had insufficient practice regarding maintaining oral hygiene among pregnant women. While analyzing the association between different variables, respondents' level of knowledge was associated with education level and number of pregnancy of respondents whereas there is no significant association with occupation of the respondent while level of practice was not associated between the education level of respondents, number of pregnancy and occupation of respondents. There is a highly significant association between level of knowledge and level of practice regarding maintaining oral hygiene among pregnant women. This suggests that women who have inadequate knowledge had poor oral hygiene practices. The study findings conclude that increase in knowledge will enable women to use preventive measures, accept the use of oral health services during pregnancy. This study will contribute to raise eyebrows of policy makers as well as concerned sections under the Ministry of Health to understand the impact of lack of oral hygiene maintenance. Furthermore, this study finding will also open up avenues for further research in a bigger sample size across the country and help generate evidence for policy level advocacy.

List of abbreviations:

Oral Hygiene: OH

Declarations:

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Availability of data and materials

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Authors' contributions

MSA drew up the study protocol in collaboration with KRA. MSA performed data collection. MSA, KRA and BS prepared the Manuscript. MSA, KRA and BS proofread the article. All the authors approved the final version of the article.

Ethics approval and consent to participate

Ethical approval was taken from the Institutional Review Board (IRB) of Institute of Medicine, Tribhuvan University, Kathmandu, Nepal. Written informed consents for participation in the study were obtained for all participants.

Consent for publication

Not applicable.

Competing interests

None

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