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Oral Health Status on among Pregnant Attending at Health Centers in Savannakhet Province, Lao PDR: A Cross Sectional Study

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Abstract

Background: Oral health behavior and attitudes of pregnant women in Lao PDR are rarely examined, yet should be considered when designing preventative or therapeutic studies to reduce burden of oral diseases we aimed to understand dental care-seeking behavior, as well as oral heath knowledge and attitudes of oral health among pregnant women in Savannakhet Province, Lao PDR.

Methods: In this cross-sectional study, was conducted in 3 District Health centers Savannakhet Province Lao PDR lasting for 12 months by using a simple random sampling for select participants, we Included criteria: Pregnant women who attending at the Health centers and without underlying medical disease, we excluded criteria: Private cases and women who seropositive for human immunodeficiency virus, Pregnant women who have diabetes or underlying medical disease, Who do not give consent or uncooperative. Data was collected using interviewer administered questionnaires and a clinical oral examination Patient's decayed, missing and filled tooth (DMFT) index, plaque index (PI) and community periodontal index (CPI) was determined by using STATA version 12 is used for statistical analysis.

Results: A total of the 323 pregnant women invited to participate in the study. The age ranged from 15 to 45 year, with a mean age of 27.7 years (SD±5.6). The prevalence of dental disease in pregnant women such as tooth decayed, tooth missing and tooth filling. The tooth decayed of pregnant women was (69.9%), tooth missing was (30%) and tooth filling was (6.5%). The mean DMFT were (3.4±3.5), with (2.6±3) decayed teeth, (0.6±1.1) missing teeth, and (0.1±0.5) filled teeth. The oral hygiene status in pregnant women assessed with plaque index (PI). The PI of 270 participants that had plaque on the tooth surface (83.6%). The mean of their PI was (4.44±2.33). The periodontal disease in pregnant women assessed with community periodontal index. Almost (47.7%) of pregnant women presented with calculus, healthy gum was (32.8%). While this was (13%) found that calculus & bleeding. The prevalence of periodontal pockets >6mm was (1.9%), and periodontal pockets 4-5mm was (0.6%). The mean SD of CPI was (1.74±1.59) for the pregnancy.

Conclusion: The study points to need for preventive programmes, including oral health education during prenatal care, to increase awareness of oral health among pregnant women and improve oral health practice.

Keywords: Periodontal Disease, Oral Health Knowledge, Oral Health Behaviors, Dental Care Seeking Behavior, Pregnancy.

Introduction

Pregnancy is an important milestone in the life course of a female with the dual factors of pregnancy affecting oral health and oral health affecting the pregnancy outcome. Pregnant women are vulnerable to common oral diseases such as periodontal disease and dental caries; if oral health is not well maintained during this period there are implications for oral health in the woman's subsequent life[1]. Changes in dietary habits and oral hygiene practices can increase the risk of tooth decay during pregnancy[2]. A woman's knowledge of and action on her own oral health are important for the oral health of her children[3]. Children whose mothers have poor oral health are 5 times more likely to have oral health problems than children whose mothers have good oral health[4]. Pregnant women are readily accessible as most of them have regular antenatal check-ups. Furthermore, their key position in the family enables them to have a great influence over the behavior of family members and they play very important role in educating the young generation[5]. Thus, educating pregnant women on oral health can be an affective way of conveying dental health education to the general public, starting at the individual level, then to the family and finally to the community level[6].

Objective

The Objective of this study therefore want to assess the oral health status, knowledge, and practices among a sample of pregnant Lao women in order to obtain the base line data needed to establish an oral health preventive programme during pregnancy.

Methodology

In this cross-sectional study, was conducted in 3 District Health centers Savannakhet Province such as Outhoumphone district, Kaisone district, Champhone district, Savannakhet Province Lao PDR. Started from January to December 2023 lasting for 12 months by using a simple random sampling for select participants.

Included Criteria

we Included criteria pregnant women who attending at the Health centers and without underlying medical disease.

Excluded Criteria

we excluded criteria private cases and women who seropositive for human immunodeficiency virus, Pregnant women who have diabetes or underlying

medical disease, Who do not give consent or uncooperative.

Sample size calculation

The sample size calculation is based on a formula for estimation of single proportion. The prevalence of oral disease in pregnant women consider to be 65%, based on study conducted in Laos[7]. Therefore it is used for calculation of sample size.

$$n = \frac{z^2 p(1-p)}{e^2}$$

n= Sample size

z= Standard normal deviate of 1.96 for a confidence level set as 95%

p= Anticipated proportion for oral disease

e= Absolute precision required of the proportion.

$$n = \frac{1.96^2 \times 0.65(1-0.65)}{0.05^2} = 349.52$$

$$n \approx 350$$

To compensate 10% non respondents, Sample size = 350+10% n= 385.

Data Collection process

The participants were approached via their respective HC with the prior approval of the relevant. Wrote inform consent from the selected participants. After gave inform consent, all eligible pregnant women were sent to the location provided. The research is composed of two parts: face to face interview and clinical examination.

Face to face interview: A structure questionnaire was use to assess their knowledge of oral health and appropriate behaviors. To conduct interviews using the structure questionnaire, which include queries about personal history, oral health knowledge and oral health behaviors.

Clinical examination: DMFT (decay, missing, filling, tooth) index was use to evaluate dental caries, the dentists determine according to World Health Organization (WHO) criteria by using disposable plane mouth mirrors and probes. The results were recorded in oral health assessment forms designed by WHO 2013[8].

To evaluate oral hygiene, the dentists determine the PI (Plaque index) introduced by Loe and Silness by using disposable plane mouth mirrors and dental explorers[9]. Examine four gingival areas such as disto-buccal, buccal, mesio-buccal and lingual of the teeth number 16, 12, 24, 36, 32 and 44. If one of the mentioned teeth is not present all the teeth will be examined. Then determine the score of each gingival area of the tooth base on the presence of plaque on the cervical third of the tooth as below: Score 0: No plaque, Score 1: A layer of plaque adhered to the free margin of gingiva and adjacent area of the tooth that could be seen only by probing, Score 2: Moderate accumulation of soft deposits within the gingival pocket, or on the tooth or gingival margin that could be seen with the naked eye, Score 3: Large amount of soft material with the gingival pocket, or on tooth or gingival margin. The mean of the scores given to the four gingival area of the examined tooth is consider as the PI of the tooth. The PI of each patient is determine by calculating the mean of the PI of all examine teeth. CPI (Community Periodontal index) was use to evaluate the patient gingival health status. The dentist determined the index after probing the teeth number 11, 16, 17, 26, 27, 31, 36, 37, 46 and 47. Dentist used a WHO probe to measure the depth of gingival sulcus of the index tooth. If one of the teeth is not present were examined the depth of gingival sulcus of all teeth presenting in that sextant of the mouth. After probing, give score the gingiva of each index tooth as follow Score 0: Healthy gingiva, Score 1: Gingival bleeding, Score 2: Calculus and gingival bleeding, Score 3: Shallow periodontal pockets (4 to 5 mm), Score 4: Deep periodontal pockets (6 mm or more). The patients CPI were determined as the highest score given to their gingiva[10].

Data Analysis

STATA version 12 is used for statistical analysis. The data presentations consist of computation of frequency and percentages of variables, descriptive statistics such as mean, SD and 95% CI. A percentage is used to describe the prevalence of oral disease mean, SD are determined for DMFT, PI and CPI. Statistical significance is set at $P<0.05$.

Results

Descriptive data

A total of the 323 pregnant women invited to participate in the study. The age ranged from 15 to 45 year, with a mean age of 27.7 years (SD±5.6). The majority of the participants were in the age range of 18-35 years (89.5%). Of the 323 participants were low land ethic group (96.9%). Most participants had 1st, 2nd or 3rd pregnancy, which was equal distribution (52.3%, 29.4%, and 10.2%). About (8%) of the participants had no schooling, (11.1%) had up to primary school, (46.7%) had high school and (34%) had higher education. Most participants (53.6%) were house wife, and (25.4%) were employed. About (42.4%) of the women were in their second trimester of pregnancy.

Oral health knowledge

Oral health knowledge of the participants, the majority of the women (40.2%) agreed that tooth brushing prevents bad smell, (35.9%) thought that the routines, (20.4%) prevents tooth decay and only (3.4%) thought that brushing was prevents gum disease and. Most of the women (58.5%) believed that the main cause of tooth decay was sugar and carbohydrate consumption, (24.5%) thought that was another cause and (17%) cause was bacteria. Just over haft (55.1%) of the women thought that tooth decay could be prevented by tooth cleaning and brushing, while (25.4%) thought it could be prevented by tooth brushing and regular checkups. A majority of the women (53.3%) thought that the cause of gum disease was tooth debris and unclean teeth and (40.2%) thought that gum disease could be prevented by tooth cleaning and brushing. The main sources of oral health knowledge were outdoor advertising (27.9%), television (25.7%), Dentist (15.2%) and family (12.7%).

Oral health practices

Oral health practices of the participants, the majority of the women (71.8%) reported that they brushed their teeth twice a day, while (26%) brushed more than twice a day and only (7%) brushed once a day. The most other oral hygiene method (40.6%) was used mouth wash and (24.1%) used toothpicks. A large proportion of the women (69%) had never visited a dentist in their life and (31%) they had visited a dentist before pregnancy, their main reason was scaling (8.7%). Only (13.6%) of the pregnant women had visited a dentist during pregnancy, the main reason for the visit was check-up. Of the 279 women who had not visited the dentist during pregnancy, (38.8%) had not time to visit the dentist, and (14.9%) they did not think that they needed dental care.

Clinical examinations

The prevalence of dental disease in pregnant women such as tooth decayed, tooth missing and tooth filling. The tooth decayed of pregnant women was (69.9%), tooth missing was (30%) and tooth filling was (6.5%). The mean DMFT were (3.4±3.5), with (2.6±3) decayed teeth, (0.6±1.1) missing teeth, and (0.1±0.5) filled teeth. The oral hygiene status in pregnant women assessed with plaque index (PI). The PI of 270 participants that had plaque on the tooth surface (83.6%). The mean of their PI was (4.44±2.33). The periodontal disease in pregnant women assessed with community periodontal index. Almost (47.7%) of pregnant women presented with calculus, healthy gum was (32.8%). While this was (13%) found that calculus & bleeding. The prevalence of

periodontal pockets >6mm was (1.9%), and periodontal pockets 4-5mm was (0.6%). The mean SD of CPI was (1.74±1.59) for the pregnancy.

Table 1: Demographic data of the participants (n=323)

Variable	No	%
Age (Years)		
<18	6	1.9
18-35	289	89.5
>35	28	8.7
Mean (SD)	27.7 (5.6)	
Ethnic group		
High land	8	2.5
Middle land	2	0.6
Low land	313	96.9
Number of Pregnancy		
1st	169	52.3
2nd	95	29.4
3rd	33	10.2
4th	18	5.6
5th	4	1.2
6th	3	0.9
7th	1	0.3
Educational level		
No schooling	26	8.0
Primary school	36	11.1
Secondary	63	19.5
High school	88	27.2
College	53	16.4
Bachelor's degree & higher	57	17.6
Occupation		
House wife	173	53.6
Factory employee	11	3.4
Government employee	43	13.3
Private employee	28	8.7
other	68	21.1

Trimester of pregnancy		
1st	52	16.1
2nd	137	42.4
3rd	134	41.5

Table 2. Oral health knowledge of pregnant women in Savannakhet province (n=323)

Variable	n	%
Advantages of tooth brushing		
Prevents bad smell	130	40.2
Prevents tooth decay	66	20.4
Prevents gum disease	11	3.4
Routines	116	35.9
Causes of tooth decay		
Sugar and carbohydrate consumption	189	58.5
Bacteria	55	17
Other	79	24.5
Methods to prevent tooth decay		
Tooth cleaning and brushing	178	55.1
Avoidance of sweet and sugar	22	6.8
Tooth brushing and mouth wash after meals and sweets	41	12.7
Tooth brushing and regular check ups	82	25.4
Causes of gum disease		
Food debris and unclean teeth	172	53.3
Bacteria	18	5.6
I don’t know	108	33.4
Other	25	7.7
Methods to prevent gum disease		
Tooth cleaning and brushing	130	40.2
Tooth-brushing and mouth wash after meals	41	12.7
Tooth cleaning and regular check ups	61	18.9
Mouth wash	11	3.4
I don’t know	65	20.1
Other	15	4.6
Source of knowledge		
Television	83	25.7
Radio	14	4.3

Family	41	12.7
Dentist	49	15.2
Magazine	19	5.9
School curriculum	27	8.4
Outdoor advertising	90	27.9

Table 3. Oral health practice of pregnant women in Savannakhet province (n=323)

Tooth brushing	n	%
Once	7	2.2
Twice	232	71.8
More than twice	84	26
Other oral hygiene method		
None	63	19.5
Dental floss	26	8
Tooth picks	78	24.1
Mouth wash	131	40.6
Miswak	22	6.8
Other	3	0.9
Dentist visit before pregnant		
Yes	100	31
No	223	69
Reasons for visit before pregnancy		
Check-up	8	2.5
Scaling	28	8.7
Toothache	25	7.7
Gum problem	5	1.5
Filling	14	4.3
Prosthetic	20	6.2
Last visit		
In last 3-6 months	32	9.9
In last 6-12 months	19	5.9
More than 1 year	49	15.2
Never	223	69
Dentist visit during pregnancy		
Yes	44	13.6
No	279	86.4
Reasons for visit during pregnancy		

Check up	17	5.3
Scaling	6	1.9
Toothache	7	2.2
Gum problem	0	0
Filling	9	2.8
Prosthesis	0	0
Other	5	1.5
Reasons for not visit dentist during pregnancy		
Afraid of the dentist	5	1.5
No need	48	14.9
My baby or myself may be harmed	15	4.6
No time	119	36.8
Financial reasons	11	3.4
No dentist in my town	11	3.4
Other	70	21.7
Oral health problems during pregnancy		
Decay	38	11.8
Pain	29	9
Bleeding gums	35	10.8
Bad odor	59	18.3
Gums swelling	12	3.7
Sensitivity	31	9.6
Noting	119	36.8
How long to brushing teeth		
1 minute	79	24.5
2 minutes	164	50.8
More than 2 minutes	80	24.8
How often to change toothbrush		
Monthly	181	56
Three monthly	137	42.4
Yearly	2	0.6
More than yearly	3	0.9

Table 4. Dental disease, Oral hygiene status and Periodontal disease of pregnant women in Savannakhet province (n=323)

Dental disease	n	%	mean ± SD
Tooth decayed	200	61.9	2.6 ± 3.0
Tooth missing	97	30	0.6 ± 1.1
Tooth filling	21	6.5	0.1 ± 0.5
DMFT			3.4 ± 3.5
Oral hygiene status			
No plaque on the tooth surface	53	16.4	
Plaque on the tooth surface	270	83.6	
PI (mean ± SD)			4.44±2.33
Periodontal disease			
Healthy gum	106	32.8	
Bleeding gum	13	4	
Calculus	154	47.7	
4-5mm pockets	2	0.6	
>6 mm pockets	6	1.9	
Calculus & bleeding	42	13	
CPI (mean± SD)			1.74±1.59

DMFT decayed, missing, and filled teeth

PI Plaque Index

CPI Community Periodontal Index

Discussion

This cross-sectional study evaluated the oral health status of pregnant women living in Savannakhet province. The present study revealed that the rates of dental caries, poor oral hygiene, and periodontitis disease these findings were consistent with the study done by George A et al. [11]and others[12,13]. Kornman and Loeshe reported that one - fourth of the women of reproductive age had tooth decayed, a disease in which dietary carbohydrate is fermented by oral bacteria into acid that de-mineralizes enamel[14]. Pregnant women are at a higher risk of tooth decay for several reasons. The possible causes of caries during pregnancy are: changes in saliva and mouth flora, vomiting, neglected oral hygiene and nutritional changes and inadequate attention to oral health[15].

This study shows that the prevalence of tooth decayed, oral hygiene, gingivitis and periodontal disease in pregnant women. The prevalence of dental caries and periodontal disease in pregnant women may vary among different populations. Deghatipour et al. reported mean (SD) DMFT of 10.34 (5.10) in pregnant women in Varamin, Iran[16], and this is substantially higher than in our study. In contrast, a hospital-based study in Sudan reported mean DMFT of 3.49 in pregnant women who were >20 years old[17]. Payal et al.[18] reported mean CPI score of 2.16 in pregnant women in central India, which is similar to our result; however, our study revealed that 2.5% of pregnancy had pockets 4-5mm and pockets >6mm, which is lesser than the 36% reported from the study of Ethiopian immigrants[19]. Ethnics, food culture,

eating habits, socioeconomic status, and healthcare systems may contribute to the differences in the disease prevalence.

Pregnant women brush their teeth once, twice or more often daily, which is compatible with the ADA (American Dental Association) recommendation[20], the ADA also recommends flossing teeth at least once daily, but pregnant women in our study used dental floss only (8%). We emphasize the importance of systematically using fluoride toothpaste and dental floss in antenatal health education, as inadequate knowledge and poor practices may aggravate dental caries and periodontal disease.

In addition, pregnant women they may not seek dental treatment during pregnancy, and this could lead to rapid disease progression. Similar studies conducted in developed countries such as the USA have revealed that most women do not access oral health care during pregnancy despite evidence that poor oral health can have an adverse impact on the health of the pregnant women and her baby[21]. Another study reported low utilization of dental care service by Malaysian antenatal women but that those who were aware of the association between poor maternal oral health and adverse pregnancy outcomes were more likely to use those service[22].

Conclusion

This study was conducted among of pregnant women from some health centers. As such the sample cannot be considered to be representative of all pregnant women in Savannakhet province and the results cannot be generalized to a wider population. Nonetheless, our study points to need for preventive programmes, including oral health education during prenatal care, to increase awareness of oral health among pregnant women and improve oral health practice.

Consent

As per international standards or University standards, patient(s) written consent has been collected and preserved by the author(s).

Ethical Approval

Ethical Approval was approved by the Ethics Committee of the University of Health Sciences Lao PDR no. 486/REC, date 10/Apr/2023.

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Limitations and Recommendation

The limitation of our study was that we can't collected all of simple size. Of the 385 Selected patients there were only 323 (83.8%) participated in the study and six selected patients did not consent to participate in the study, the interviewers frequently commented that participants were reluctant to speak about their oral health for fear of saying something incorrect or because they claimed that they had no knowledge on the subject. Our interviewers found it challenging to effectively probe pregnant woman about oral health. Oral health knowledge there for needs to be enhanced and oral health preventive programmes should be developed for pregnant women. These would encourage good oral practice, pregnant women should be a priority group for oral health education and this should be an integral part of antenatal or postnatal care programmes.

References

1. Acharya, S. and P.V. Bhat, Oral-health-related quality of life during pregnancy. Journal of public health dentistry, 2009. 69(2): p. 74-77.
2. Evans, R. and P. Briggs, Tooth-surface loss related to pregnancy-induced vomiting. Primary Dental Care: Journal of the Faculty of General Dental Practitioners (UK), 1994. 1(1): p. 24-26.
3. Boggess, K.A. and S.f.M.F.M.P. Committee, Maternal oral health in pregnancy. Obstetrics & gynecology, 2008. 111(4): p. 976-986.
4. Clothier, B., M. Stringer, and M.K. Jeffcoat, Periodontal disease and pregnancy outcomes: exposure, risk and intervention. Best Practice & Research Clinical Obstetrics & Gynaecology, 2007. 21(3): p. 451-466.
5. Gaffield, M.L., et al., Oral health during pregnancy: an analysis of information collected by the pregnancy risk assessment monitoring system. The Journal of the American Dental Association, 2001. 132(7): p. 1009-1016.
6. Liu, P.P., et al., Dental care-seeking and information acquisition during pregnancy: a qualitative study. International journal of environmental research and public health, 2019. 16(14): p. 2621.
7. Symalavong, M., P. Chanthavilay, and V. Sychareun, Oral Health of Pregnant Women Attending ANC of Central Hospitals, Vientiane Capital, Lao PDR. Lao Medical Journal, 2011: p. 41-46.
8. Organization, W.H., Oral health surveys: basic methods. 2013: World Health Organization.
9. Löe, H., The gingival index, the plaque index and the retention index systems. The Journal of Periodontology, 1967. 38(6): p. 610-616.
10. Cutress, T., J. Ainamo, and J. Sardo-Infirri, The community periodontal index of treatment needs (CPITN) procedure for population groups and individuals. International dental journal, 1987. 37(4): p. 222-233.
11. George, A., et al., The oral health status, practices and knowledge of pregnant women in south-western Sydney. Australian dental journal, 2013. 58(1): p. 26-33.
12. Taani, D., et al., The periodontal status of pregnant women and its relationship with socio-demographic and clinical variables. Journal of oral rehabilitation, 2003. 30(4): p. 440-445.
13. Hugoson, A., Gingivitis in pregnant women. A longitudinal clinical study. Odontologisk Revy, 1971. 22(1): p. 65-84.
14. Kornman, K.S. and W.J. Loesche, The subgingival microbial flora during pregnancy. Journal of periodontal research, 1980. 15(2): p. 111-122.
15. Vadiakas, G. and C. Lianos, Correlation between pregnancy and dental caries. Hellenika Stomatologika chronika. Hellenic Stomatological Annals, 1988. 32(4): p. 267-272.
16. Deghatipour, M., et al., Oral health status in relation to socioeconomic and behavioral factors among pregnant women: a community-based cross-sectional study. BMC oral health, 2019. 19(1): p. 1-10.
17. Musa, F.A.M., Nurses' Knowledge and Performance regarding Infection Control in labor room in Omdurman Military Hospital, Khartoum State, Sudan (2017). 2017, University of Gezira.
18. Payal, S., et al., Oral health of pregnant females in central India: Knowledge, awareness, and present status. Journal of education and health promotion, 2017. 6.1
19. Zini, A., Y. Vered, and H.D. Sgan-Cohen, Are immigrant populations aware about their oral health

status? A study among immigrants from Ethiopia. BMC Public Health, 2009. 9(1): p. 1-6.

20. Steinberg, B.J., et al., Oral health and dental care during pregnancy. Dental Clinics, 2013. 57(2): p. 195-210.
21. Le, M., et al., Barriers to utilization of dental services during pregnancy: a qualitative analysis. Journal of Dentistry for Children, 2009. 76(1): p. 46-52.
22. Saddki, N., A. Yusoff, and Y.L. Hwang, Factors associated with dental visit and barriers to utilisation of oral health care services in a sample of antenatal mothers in Hospital Universiti Sains Malaysia. BMC public health, 2010. 10(1): p. 1-11.