

Original Research



Burden of oral health issues and its association with the participation in 'Health care for Newly Wedded Programme' among reproductive aged pre-conceptive married women before their first pregnancy in Kalutara district, Sri Lanka

Hewage Dona Vindya Gayathri^{1,2*} & Nilantha Ratnayake²

¹Postgraduate Institute of Medicine, University of Colombo, Sri Lanka; ²Institute of Oral Health, Maharagama, Sri Lanka

*Correspondence: vindyagayathrihewage@gmail.com

<https://orcid.org/0009-0004-4063-3547>

DOI: <https://doi.org/10.4038/jccpsl.v30i3.8711>

Received on 25 Mar 2024

Accepted on 25 Aug 2024

Abstract

Introduction: Oral diseases are major public health problem among reproductive aged pre-conceptive married women. 'Healthcare for Newly Wedded Programme' (HNWP) addresses the oral health issues among them. Therefore, it is crucial to assess the association of the participation in the HNWP with the oral health issues.

Objectives: To assess the burden of oral health issues and its association with participation in the HNWP among reproductive aged pre-conceptive married women before their first pregnancy in Kalutara District, Sri Lanka

Methods: A community-based descriptive cross-sectional study was conducted among 820 married women before their first pregnancy in Kalutara District. The sample (n=820) was obtained using a two-stage cluster sampling method based on probability-proportionate-to-size method. Interviewer-administered questionnaires collected socio-demographic and economic, attendance of HNWP and utilization of oral health services data. Dentition status and periodontal status were assessed by clinical oral examinations. Bivariate analysis was performed for comparisons and multivariate analysis to adjust for confounders.

Results: Preconceived married women carried a considerable burden of oral diseases (dental caries 46.7%, calculus 46.0%, gingival bleeding 31.6%). In the sample, 48.9% (n=401) had participated in the HNWP after getting married. Among those who participated, 32.4% (n=130) were referred to a dental clinic, of whom 46.9% (n=61) had attended dental clinics. The percentage of active dental caries was significantly lower among those referred to a dental clinic (28.5%) than those who were not (51.7%). This is reflected by a significant reduction in the presence of active dental caries with referral to dental clinic under the HNWP (OR=0.44; 95% CI=0.28, 0.71; p=0.001).

Conclusions & Recommendations: Considering the significant reduction in active dental caries, referral to a dental clinic in the HNWP should be improved to reduce the burden of this target group.

Keywords: reproductive age, female, women, oral health, dental diseases

Introduction

Reproductive aged females in the worldwide have high prevalence of oral diseases (1-2). Maintaining better oral health during pregnancy is essential since it affects to the women, their foetus and newborn babies. Adverse pregnancy outcomes such as preterm births, low birth weight babies and gestational diabetic mellitus can result from periodontal diseases. Babies of mothers with dental caries are more prone for developing dental caries (3-5).

Oral health of a women can be affected by changes in the levels of reproductive hormones (oestrogen and progesterone) at different stages of their life cycle (puberty, menstrual cycle, preconception, pregnancy and menopause) and contraceptive usage. Increase in bacterial colonization, changes in saliva composition, decrease in saliva amount and exaggeration of pre-existing inflammation can occur as a result of high levels of oestrogen and progesterone. This will lead to aggressive periodontitis, activation of herpes labialis, aphthous ulcers, swollen salivary glands, dry socket following extraction and prolonged haemorrhage after oral surgery (6-7).

Oral health care during preconception period is beneficial throughout the life cycle of a mother and newborn. Therefore, such care is important for preparing females for the pregnancy and to reduce oral health complications during their pregnancy. The Healthcare for Newly Wedded Programme (HNWP) for newly married couples is a national level health promotion programme in Sri Lanka (8). It has been introduced in an organized manner in November 2011 to the Family Health Programme in Sri Lanka to extend the maternal health continuum before pregnancy occurs (8). The HNWP is delivered by the health team of medical officer of health (MOH) office. Newly married couples undergo health education sessions, identifying and preventing risk behaviours, evidence-based risk screening, and getting their health problems detected and treated

through HNWP. Additionally, there is a separate oral health component that includes oral health education and referral of newly married couples to dental clinics by the MOH staff. At the dental clinics, screening for oral diseases, oral health education, curative dental treatments such as restorations, extractions, scaling and minor oral surgery methods are delivered for them. Furthermore, oral health is included in the screening tool, the guide for health workers and the booklet for new couples.

Even though oral health is addressed through the HNWP, oral diseases continue to be a major public health problem among pregnant women in Sri Lanka (9-10). According to the Annual Report of Family Health Bureau 2017, the percentage of eligible families registered by public health midwives (PHM) in Kalutara District was 92.9%, however, only about half of primi mothers registered by the PHM have participated in the HNWP (11). Therefore, there is a need to assess the effect of HNWP on oral health status of the target women. However, to date, there have not been any attempt in Sri Lanka to assess the burden of oral health issues and its association with the HNWP among them. Therefore, the purpose of this study was to assess the burden of oral health issues and its association with the participation in HNWP among reproductive aged pre-conceptive married women before their first pregnancy in Kalutara District, Sri Lanka.

Methods

A community-based descriptive cross-sectional study was conducted in Kalutara District from April 2019 to August 2020. The study population included married women in reproductive age (15-49 years) before their first pregnancy. All of them had been married 6-24 months before data collection and had not undergone any oral health programme. Those who were residing in Kalutara district less than 3 months before the data collection were excluded.

The sample size (n=820) was calculated (12) by

considering an estimated percentage of pre-conceptive women having oral health issues of 50%, desired level of precision of 0.05, desired level of confidence of 95%, rate of homogeneity of 0.1, cluster size of 10 and non-response rate of 10%. The sample was selected using a two-stage cluster sampling technique. A public health midwife (PHM) area was considered as cluster with a cluster size of 10. A total of 82 PHM areas were selected (stratified as 7 urban, 72 rural and 3 estate) based on probability-proportionate-to-size technique. The location of participants was selected randomly within the PHM area from the list of roads. Next, a house was selected randomly within this road as the first house to commence the study. Subsequent houses were selected by a predetermined order, starting from the selected first house. This procedure continued until the required cluster size was completed.

Data were collected at households using an oral health assessment form and an interviewer-administered questionnaire. Pre-testing and a pilot study were done prior to the data collection. Dentition status was assessed by the Decayed, Missing & Filled Teeth (DMFT) Index. Oral hygiene and periodontal status were assessed by modified Community Periodontal Index (CPI) (gingival bleeding and periodontal pockets), calculus and clinical loss of attachment (LOA) (13).

Data analysis

Data were processed and analysed using Statistical Package for the Social Sciences (SPSS) version 22. Categorical data were presented as percentages with 95% confidence interval (CI). Continuous data were presented as mean, standard deviation (SD), median and interquartile range (IQR). Oral health status was compared between those who participated and not participated in the HNWP. Furthermore, bivariate analysis was performed to compare oral health status between those referred to a dental clinic and those not referred. Other variables considered were socio-demographic, socio-economic factors and time since marriage. Binary logistic regression analysis was

performed to adjust for confounders, with inclusion of control variables that were significant in the bivariate analysis. Significance level was 0.1.

Results

This study included 820 participants, with a response rate of 100.0%. Majority (53.4%) were aged 25-31 years (34.3% in 18-24-year age group and 12.3% in 32-38-year age group) and Sinhalese in ethnicity (86.6%). Nearly half of the study sample (52.7%) were married for 13-18 months, 35.6% for 6-12 months and 11.7% for 19-24 months. More than half (59.1%) were currently employed; 80.3% have educated up to or above General Certificate of Education (GCE) Advanced Level; and 49.1% had an average monthly household income more than LKR 50,000. Of the study sample, 48.9% (n=401) participated in HNWP after getting married, of whom 32.4% (n=130) were referred to a dental clinic. Of those referred to a dental clinic, 46.9% (n=61) had attended dental clinics.

Of the participants (Table 1), 68.4% (95% CI=65.2, 71.5) had experienced dental caries during lifetime (DMFT>0) and 46.7% (95% CI=43.3, 50.1) had untreated active dental caries. Mean DMFT was 2.17 (SD=2.239). Further, prevalence of participants with healthy periodontium, calculus, gingival bleeding and LOA were 50.4% (95% CI=47.0, 53.8), 46.0% (95% CI=42.6, 49.4), 31.6% (95% CI=28.5, 34.8) and 2.9% (95% CI=2.0, 4.3), respectively. Further, 89.3% (95% CI=87.0, 91.2) did not have periodontal pockets.

After adjusting for the control variables, 'participation in HNWP' was not significantly associated with the presence of active dental caries, tooth wear, calculus, gingival bleeding and periodontal pockets (Table 2). After adjusting for control variables, 'referral to a dental clinic' was significantly associated with the presence of active dental caries (adjusted OR=0.44; 95% CI=0.28, 0.71; p=0.001). However, 'referral to a dental clinic' was

not significantly associated with the presence of calculus, gingival bleeding and periodontal pockets (Table 3).

Table 1: Distribution of the study sample by dentition status, oral hygiene status and periodontal status (N=820)

Dental condition	No. (%)	95% CI
Dentition status		
Lifetime caries experience (DMFT>0)	561 (68.4)	65.2, 71.5
Untreated active dental caries	383 (46.7)	43.3, 50.1
Filled teeth	331 (40.4)	37.1, 43.8
Missing teeth due to caries	199 (26.5)	21.5, 27.3
Septic roots	84 (10.2)	8.4, 11.3
Tooth wear	152 (18.5)	16.0, 21.3
Dentate / Edentulousness		
Fully dentate	606 (73.9)	70.8, 76.8
Partially dentate	214 (26.1)	23.2, 29.2
Edentulous	0 (0.0)	0.0
Periodontal status		
Healthy periodontium	413 (50.4)	47.0, 53.8
Gingival bleeding	259 (31.6)	28.5, 34.8
Calculus	377 (46.0)	42.6, 49.4
Clinical loss of attachment	24 (2.9)	2.0, 4.3
Periodontal pockets		
No pockets	732 (89.3)	87.0, 91.2
Only 4 - 5 mm pockets	71 (8.7)	7.0, 10.8
6 mm or more pockets	17 (2.1)	1.3, 3.3
Severity of dental caries		
D (Decayed)	Mean (SD) 0.95 (1.331)	Median (IQR) 0.0 (2.0)
M (Missing)	0.45 (0.89)	0.0 (1.0)
F (Filled)	0.77 (1.16)	0.0 (1.0)
DMFT	2.17 (2.24)	2.0 (3.0)

¹Standard Deviation; ²Interquartile range

Discussion

This study was the first study in Sri Lanka done to assess the burden of oral health issues and its association with HNWP among pre-conceptive married women before their first pregnancy. This target group has not undergone any organized preventive oral health programme, after the school oral health programme. Furthermore, some dental treatments are restricted during the pregnancy period and some oral treatments are difficult to perform

during this period as pregnant mothers are suffering from nausea, vomiting and postural difficulties. Therefore, pre-conceptive oral care is important for preparing females for the pregnancy and to reduce oral health complications during pregnancy.

Dentition status was assessed by the DMFT index in the present study similar to several previous studies in literature. A hospital-based study conducted in South India (3.62; SD=2.99) (2) and clinic-based studies done in western region of Saudi Arabia (9.2;

SD=5.1) (14) and Turkey (5.7; SD=3.26) (15) presented higher DMFT values among reproductive aged non-pregnant women than in the present study (2.17; SD=2.239). A community-based cohort study conducted in Hong Kong (1.6; SD=1.8) (16) and clinic- or institution-based cross-sectional studies in Agra (1.79; SD=1.9) (17) and Karnataka (1.82;

SD=2.09) (18) from India indicated lower mean DMFT values than the present study. Differences in results could be due to the differences in health systems of the countries, socio-economic status, patterns of utilization of oral health services, and knowledge and attitudes of the populations.

Table 2: Comparison of the married women before their first pregnancy by their participation in the HNWP

Factor		Participated in the HNWP		Multivariate analysis	
		Yes (n=401)	No (n=419)	Adjusted OR ¹ (95% CI)	p value
Active dental caries	Yes	177 (44.1)	206 (49.2)	0.85 (0.64, 1.12)	0.244
	No	224 (55.9)	213 (50.8)		
Tooth wear	Yes	71 (17.7)	81 (19.3)	0.83 (0.58, 1.19)	0.311
	No	330 (82.3)	338 (80.7)		
Calculus	Yes	175 (43.6)	202 (48.2)	0.82 (0.59, 1.13)	0.227
	No	226 (56.4)	217 (51.8)		
Gingival bleeding	Yes	124 (30.9)	135 (32.2)	1.03 (0.76, 1.39)	0.871
	No	277 (69.1)	284 (67.8)		
Periodontal pockets	Yes	48 (12.0)	40 (9.5)	1.41 (0.89, 2.21)	0.135
	No	353 (88.0)	379 (90.5)		

¹Reference group was 'not participated in the HNWP' group

Table 3: Comparison of the married women before their first pregnancy by their referral to a dental clinic at the HNWP

Factor		Referred to a dental clinic		Multivariate analysis	
		Yes (n=130)	No (n=271)	Adjusted OR ¹ (95% CI)	p value
Active dental caries	Yes	37 (28.5)	140 (51.7)	0.44 (0.28, 0.71)	0.001
	No	93 (71.5)	131 (48.3)		
Tooth wear	Yes	28 (21.5)	43 (15.9)	1.51 (0.85, 2.67)	0.163
	No	102 (78.5)	228 (84.1)		
Calculus	Yes	45 (34.6)	130 (48.0)	0.65 (0.41, 1.02)	0.061
	No	85 (65.4)	141 (52.0)		
Gingival bleeding	Yes	29 (22.3)	95 (35.1)	0.63 (0.38, 1.05)	0.078
	No	101 (77.7)	176 (64.9)		
Periodontal pockets	Yes	20 (15.4)	28 (10.3)	1.69 (0.88, 3.26)	0.113
	No	110 (84.6)	243 (89.7)		

¹Reference group was 'not referred to a dental clinic' group

The prevalence of active dental caries assessed in a cross-sectional study from India (44.5%) (1) and

from Thailand (49.5%) (19) were in conformity with the present study (46.7%). A lower prevalence of

dental caries than in the present study (68.4%) was reported by the NOHS 2015-2016 among 15-year-old females (44.5%) (20), the cohort study done among 18-year-old females in Hong Kong (60.5%) (16) and the study done by Lalithambigai et al. (37.9%) (18). Studies in the literature showed higher prevalence of dental caries than the present study such as NOHS 2015-2016 among 35-44-year females (93.8%) (20) and the cross-sectional study done in western region of Saudi Arabia (85.6%) (14). The NOHS 2015-2016 was a survey which included 15-year-old and 35-44-year-old females (20); Lu et al. (16) was a cohort study; Lalithambigai et al. (18) was an institution-based study; and El-Khateeb et al. (14) was a clinic-based study. Therefore, these methodological differences could be attributed to the differences in results.

Compared to the present study (50.4%), a lower prevalence of healthy periodontal status among was shown in hospital-based studies done in Agra (13.27%) (17) and Rewa (22.5%) (21), and in the cross-sectional study done in Karnataka (35.3%) (18). Since all these studies are from India, methodological, health system and population differences of the two countries could attribute to the differences in results.

The prevalence of gingival bleeding in the current study was 31.6%, which was lower compared to the NOHS 2015-2016 (45.3% 15-year-old females; 55.8% 35-44-year females) (20) and the hospital-based studies from Rewa (50%) (21) and Wardha (60.5%) (1) in India and from Thailand (72.8%) (19); almost similar to the hospital-based study in Agra, India (33.42%) (17); and higher than a cross-sectional study among non-pregnant women in Karnataka, India (18.8%) (18). Additionally, the prevalence of calculus (46%) in the present study was almost similar to the prevalence reported among 15-year-old females (48.1% in the NOHS 2015-2016; 68.8% among 35-44-year-old females (20); higher than the hospital-based studies from Agra (39.05%) (17) and Rewa (20%) (21); and lower than

the cross-sectional study from Karnataka (37.8%) in India. As for periodontal pockets, the prevalence in the present study was low (10.7%), similar to the studies from Agra (10.36% periodontal pockets, 4% deep pockets) (17), Karnataka (7.6% 4-5 mm pockets, 0.3% >6 mm pockets) (18), Rewa (5% 4-5 mm pockets, 2.5% >6 mm pockets) (22) and NOHS 2015-2016 (> 4 mm pockets in 4.7% of 15-year-old females and 22.6% of 35-55-year-old females) (20). As for LOA, the present study showed a lower prevalence (2.9%) compared to studies from Agra (10.11%) (17) and Karnataka (4.5%) (18) in India and NOHS 2015-2016 (20) among 35-44-year-old females. However, it was higher than among 15-year-old females in the NOHS 2015-2016 (0.5%) (20). Methodological and health system differences and socio-economical, knowledge and attitude variations of the populations could be reasons for this variation in results.

There was no association between oral health status and participation in the HNWP. However, there was a significant reduction of active dental caries among those referred to a dental clinic ($p=0.001$). According to the findings, dental caries was the most prevalent oral disease among this target group. It highlights the importance of arranging a system to refer all the target women to a dental clinic to improve oral health status among them. However, there was no association of tooth wear, calculus, gingival bleeding and periodontal pockets with referral to a dental clinic. These results could be due to positive and negative factors of HNWP. The availability of oral health component in the HNWP, oral health in booklets, screening tool and referral to a dental clinic may be positive factors, while lack of awareness on the oral health component among health staff, unavailability of proper guideline referral system, review method record based information system and a return system for the oral health component may be the negative factors.

Oral health promotion programmes for reproductive aged married women before their first pregnancy

could not be found in the literature. Therefore, results of the present study were compared with other programmes targeting pregnant women. National Oral Healthcare Programme for Pregnant Mothers (NOHPPM) in Sri Lanka is conducted by the same authority which the HNWP is being conducted. According to a study conducted among pregnant women, those exposed to the NOHPPM had lesser oral diseases than those who were not (22). However, NOHPPM is a well-established programme than HNWP. George et al. (2018) in the multi-centre randomised controlled trial in Sydney, Australia showed significant improvement in oral health status among pregnant mothers who received midwifery and dental interventions including assessment and treatment from cost free local dental services (23). However, this intervention programme was done in a developed country where health system is well developed with higher facilities compared to Sri Lanka.

Confounding bias was minimized through multivariate logistic regression analysis. Information bias that could result due to the PI not being blinded, was minimised by calibrating the assessments made by PI against the gold standard when conducting oral examinations. Furthermore, the oral examination was done according to the pre-determined criteria and prior to the administration of questionnaire.

Conclusions & Recommendations

The prevalence of dental caries and periodontal diseases were high among married women before their first pregnancy in Kalutara District. Furthermore, there was a potential to reduce the presence of active dental caries by referring them to a dental clinic under HNWP. Therefore, it is essential to identify deficient areas in the HNWP. Providing effective, appropriate and accessible oral health services to this important target group is a high priority. The study findings will be useful for the dental service providers and for the policy makers to plan and provide an effective oral health service for

this group in the country. Referral to a dental clinic at HNWP should be made compulsory to improve the oral health status of this target group. Furthermore, the current programme needs modifications according to the existing deficient areas in order to improve the oral health related outcomes among the participants of HNWP.

Public Health Implications

- Maintaining better oral health is essential during the pre-conceptive period of women since it affects pregnancy and throughout their life cycle. However, preconceived married women carried a considerable burden of oral diseases (dental caries 46.7%, calculus 46.0%, gingival bleeding 31.6%). Therefore, improving oral health status of this target group through the existing HNWP is important since it is an established programme in Sri Lanka and according to the results of the present study it seems to be effective in reduction of dental caries.

Author Declarations

Competing interests: The authors declare that they have no competing interests.

Ethics approval and consent to participate: Ethics clearance was granted by the Ethics Review Committee of the Faculty of Medicine, University of Colombo. Informed written consent was obtained from each participant prior to data collection. The committee's reference number – EC-19-021.

Funding: Self-funded

Acknowledgements: Our sincere thanks and gratitude go to all study participants. Further we are grateful to the Postgraduate Institute of Medicine, University of Colombo.

Author contributions: VG participated in study designing, collected data, performed the statistical analysis, interpreted data and drafted the manuscript. NR participated in study designing, performed the statistical analysis, interpreted data and drafted the manuscript.

References

- Patil S, Ranka R, Chaudhary M, Hande A, Sharma P. Prevalence of dental caries and gingivitis among pregnant and nonpregnant women. *J Datta Meghe Inst Med Sci Univ* 2018; 13: 44-47. https://doi.org/0.4103/jdmimsu.jdmimsu_5_18.
- Pentapati KC, Acharya S, Bhat M, Vidya S, Rao K, Singh S. Oral health among women – a cross-sectional study from South India. *Int J Dent Res* 2015; 3: 17-19. <https://doi.org/10.12691/ijdsr-3-1-5>.
- Kalra M, Tangade P, Punia H, Gupta V, Sharma H, Jain A. Assessment of two-way relationship between periodontal disease and gestational diabetes mellitus: a case-control study. *Indian J Dent Res* 2016; 27: 392-396. <https://doi.org/10.4103/0970-9290.191888>.
- Dhabhai N. Preterm birth and periodontal disease: A medical perspective. *J Int Clin Dent Res Organ* 2016; 8: 98-101. <https://doi.org/10.4103/2231-0754.186421>.
- Chaffee BW, Gansky SA, Weintraub JA, Featherstone JD, Ramos-Gomez FJ. Maternal oral bacterial levels predict early childhood caries development. *J Dent Res* 2014; 93(3): 238-244. <https://doi.org/10.1177/0022034513517713>.
- Souza SPG, Martins MV, Molina GO, Pereira JR, Oliveira MT, Ghizoni JS. Influence of hormonal variation on periodontal tissues during premenstrual and preovulatory periods. *J Res Dent Tubarão* 2014; 2(2): 129-137. <https://doi.org/10.19177/jrd.v2e22014129-37>.
- Thomas KE & Chitra N. Periodontal changes pertaining to women from puberty to postmenopausal stage. *Int J Pharma Bio Sci* 2013; 4(2): 766-771. <https://doi.org/10.22376/ijpbs>.
- Ministry of Health. *Guidelines for Delivery of the Service Package for Newly Married Couples*. Colombo: Family Health Bureau, Ministry of Health, 2009. Available from: <http://fhb.health.gov.lk>.
- Hirimuthugoda LK, Chaminda JLP, Gunasekara NP, Samarapala HJM, Kumari SHM, Pathirana IL, Ramachandra RBBS, De Silva SHP. Determinants on dental caries among pregnant mothers in medical officer of health area, Ambalantota, Sri Lanka. *Int J Dent* 2018; 4(1): 5-8. <https://doi.org/10.11648/j.ijdm.20180401.12>.
- Karunachandra N, Perera I, Fernando G. Oral health status during pregnancy: rural–urban comparisons of oral disease burden among antenatal women in Sri Lanka. *Rural Remote Health* 2012; 12: 1902. <https://doi.org/10.22605/RRH1902>.
- Ministry of Health. *Annual Report of the Family Health Bureau 2017*. Colombo: Family Health Bureau, Ministry of Health, 2019. Available from: <http://fhb.health.gov.lk>.
- Lwanga SK & Lemeshow S. *Sample Size Determination in Health Studies: a Practical Manual*. Geneva: World Health Organization, 1991. Available from: <https://apps.who.int/iris/handle/10665/40062>.
- World Health Organization. *Oral Health Surveys, Basic Methods*. 5th edition, 2013. Geneva (Switzerland): World Health Organization, 2013.
- El-Khateeb SM, Jaber S, Hemdan B, Gafar A, Dar-Odeh N. Prevalence of dental caries among young women in central western region of Saudi Arabia. *Int J Adv Dent Med Sci* 2015; 1(2): 46-49. <https://www.researchgate.net/publication/282156930>.
- Akarslan ZZ, Sadik B, Sadik E, Erten, H. Dietary habits and oral health related behaviours in relation to DMFT indexes of a group of young adult patients attending a dental school. *Med Oral Patol Oral Cir Bucal* 2008; 13(12): 800-807. <http://www.ncbi.nlm.nih.gov/pubmed/19047971>.
- Lu HX, Wong MCM, Lo ECM, McGrath C. Risk indicators of oral health status among young adults aged 18 years analyzed by negative binomial regression. *BMC Oral Health* 2013;

- 13: 40. <https://doi.org/10.1186/1472-6831-13-40>.
17. Ingle NA, Sirohi R, Kaur N, Gupta R. Oral health status among pregnant and nonpregnant women of Agra city: A Hospital-Based Study. *J Adv Oral Res* 2014; 5(2): 6-9. <https://doi.org/10.1177/2229411220140203>.
18. Lalithambigai G, Rao A, Rajesh G, Shenoy R, Pai BM. Oral health status and normative needs of college students in Mangalore, Karnataka. *J Indian Assoc Public Health Dent* 2020; 15(1): 32. <https://doi.org/10.4103/2319-5932.201941>.
19. Rakchanok N, Amporn D, Yoshida Y, Harun-Or-Rashid M, Sakamoto J. Dental caries and gingivitis among pregnant and non-pregnant women in Chiang Mai, Thailand. *Nagoya J Med Sci* 2010; 72(1-2): 43-50. <https://pubmed.ncbi.nlm.nih.gov/20229702/>.
20. Ministry of Health. *National Oral Health Survey 2015-2016*. Colombo: Ministry of Health, 2018. Available from: <http://www.moh.gov.lk>.
21. Sharma D, Mishra A, Kushwah B, Saxena M. A study on awareness and attitude towards maintenance of oral health and hygiene in women of reproductive age group of Rewa (M.P.). *Int J Med Res Rev* 2015; 3(6). <https://doi.org/10.17511/ijmrr.2015.i6.105>.
22. Ranasinghe N. *Evaluation of the National Oral Healthcare Programme for pregnant mothers in the district of Gampaha: coverage, quality, effectiveness and sustainability*. MD Thesis (Community Dentistry). Colombo: Post Graduate Institute of Medicine, 2015.
23. George A, Dahlen HG, Blinkhorn A, Ajwani S, Bhole S, Ellis S, Anthony Y, Elcombe E, Johnson M. Evaluation of a midwifery initiated oral health-dental service program to improve oral health and birth outcomes for pregnant women: A Multi Centre Randomised Controlled Trial. *Int J Nurs Stud* 2018; 82: 49-57. <https://doi.org/10.1016/j.ijnurstu.2018.03.006>.