

ORIGINAL ARTICLE

Oral health of pregnant women; Dentition and periodontal status at antenatal care clinic in Moshi Municipal, Tanzania.

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ABSTRACT... **Objective:** To evaluate dentition and periodontal status in pregnant women. **Study Design:** Cross-sectional study. **Setting:** Moshi Municipal, Tanzania. **Period:** July 2024 to October 2025. **Methods:** A multistage sampling was carried out among pregnant women attending antenatal clinics at public health facilities. Data collected was based on World Health Organization recommended methods. SPSS package version 26 was used for processing and analysis of the data. Kappa test evaluated reproducibility. Mann Whitney U-tests and Kruskal Wallis H-tests used to determine the differences in specific socio-demographic characteristics of pregnant women by median DMFT scores and its components. Chi-square and Fisher's Exact tests were used to evaluate the relationship between socio-demographic characteristics of pregnant women and gingival bleeding as well as periodontal pockets. Odds ratio and 95% confidence intervals were used to assess odds of developing periodontal diseases. A p-value <0.05 was considered significant. **Results:** Mean DMFT score of the sample was 1.78 with a decay component of 50.4%. Overall caries prevalence was 58.7%. Prevalence of unhealthy periodontal conditions was 28.6%. Periodontal pockets occurrence was 7.7% and loss of attachment according to the highest score was 1.6%. **Conclusion:** Caries prevalence than periodontal diseases were present in this community.

Key words: Caries, DMFT, Periodontitis, Pregnancy, Prevalence.

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INTRODUCTION

Oral health should be regarded as an integral part and essential component of the general health for pregnant women. This is important because it brings functional efficiency of the oral cavity in pregnant women especially for allowing smooth ingestion of food for the needed nutrition of mother and the developing pregnancy.¹ Hormonal changes in pregnancy are systemic including changes in the oral cavity tissues. These changes in the oral cavity in the presence of poor oral health promotes inflammatory responses leading to chronic periodontal diseases which in turn may bring detrimental effects to a pregnant woman.² These effects have been reported to include an increased risk of preterm birth and delivery of low birth weight.² It has also been demonstrated that pregnant women are more susceptible to dental caries due to confirmed positive association between salivary steroid hormones and cariogenic pathogens in the oral cavity.³

Two commonly seen dental diseases are dental caries and chronic periodontal diseases.^{4,6} Considerable recent research work on dental caries and periodontal diseases in pregnant women have been reported worldwide.⁷⁻¹² However, there is scanty recent objective oral health examination reports in Tanzanian pregnant women with regard to dental caries and chronic periodontal diseases.^{13,14} Few of the remaining oral health reports done in Tanzanian pregnant women were mostly based on self-reported oral health status with lack of objective oral examination for registration of the commonly occurring oral diseases.¹⁵⁻¹⁷

National comprehensive pre- and post-natal oral healthcare should depend on evidence-based assessment of oral health in pregnant women especially for the commonly occurring oral diseases in the country. Therefore, our study aimed at objective assessment of dental caries and chronic periodontal diseases among pregnant women

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attending antenatal care (ANC) clinics in public health facilities in Moshi Municipal, Tanzania.

METHODS

A cross-sectional study was conducted among pregnant women who attended at public health facilities in Moshi Municipal during the period of July 2024 to October 2025. The study evaluated dental and periodontal status of the pregnant women. The sample size was obtained through a formula stated in a previous study.¹⁸ The estimated prevalence was 15% from a similar study in Tanzania.¹⁵ The study participants were obtained through multistage cluster sampling strategy. The first stage involved clustering into two available divisions in Moshi Municipal (East and West). Through the second stage five wards were randomly selected from each division. In the third stage, three health facilities providing ANC services were randomly selected from the 5 selected wards. Consecutively, approximately equal number of pregnant women from each division were recruited for the study until the estimated sample size was reached. Ethical clearance was sought from the Kilimanjaro Christian Medical University Ethical Committee vide Certificate number 2698. Consent was obtained from each of the pregnant woman involved for oral examination. Inclusion considered pregnant women who consented to participate in the study, who were physically and mentally fit and were registering or had registered with antenatal card at the clinic.

Data were collected in two stages; firstly, by administration of a questionnaire probing for specific socio-demographic characteristics and secondly, by examination of dentition and periodontal status. Pregnant women were examined for dentition and periodontal status based on the World Health Organization (WHO) 5th version recommended method.¹⁹ Data collection for all clinical examinations were carried out under natural daylight by one dentist (GYM).

For data processing and analysis, we used Statistical Package for Social Sciences (SPSS) version 26. The Kappa test was used to evaluate intra-examiner reproducibility of the categorical variables whereby each tenth subject was re-examined on each examination day. Data were summarized using the

measures of central tendency (mean and median with their corresponding measures of dispersion) for numeric variables and proportions were used to summarize categorical variables. Shapiro-Wilk test was used to test for normality of the decayed, missing and filled teeth (DMFT) data. For non-normal data, bivariate associations using Mann Whitney U-tests for more than two independent variables and Kruskal Wallis H-tests for two independent variables were performed to determine the differences in demographic characteristics of pregnant women by median DMFT scores and its components. Chi-square and Fisher's Exact tests were used to evaluate for relationship between socio-demographic characteristics of pregnant women and gingival bleeding as well as periodontal pockets. Odds ratio (OR) and 95% confidence intervals (CI) were determined to assess the odds of developing periodontal diseases. A p-value $p < 0.05$ was considered significant.

RESULTS

A total of 339 pregnant women agreed to participate for clinical examination of dentition and periodontal status. A total of 32 subjects were re-examined at the end of the data collection process. The intra-examiner reproducibility test for categorical variables produced an average Kappa score of 0.91 (0.74 - 1.00) indicating near-perfect reproducibility.

Socio-demographic characteristics of the pregnant women studied in this cohort are displayed in Table-I. Majority of pregnant women were in the age range of 20-34 years, with secondary education or higher, informally employed or unemployed, married or cohabiting and Christians by religion.

The mean DMFT score of the sample was 1.78 ($SD \pm 2.65$) whereby the overall caries prevalence among the sample was 58.7 % (Table-II). Majority of the affected pregnant women (84.0%) had DMFT scores in the range of 0 to 3 (Figure-1). The overall distribution of mean DMFT components is displayed in Table-II. Decay was the major component of the DMFT (50.4%) in this sample.

The relationship between socio-demographic characteristics of pregnant women by median DMFT scores and its components are displayed in Table-

III. Compared to pregnant women younger than 20 years of age, pregnant women 35 years or older were significantly more likely to have missing teeth and to have severe caries experience ($p<0.001$ and $p<0.01$ respectively). Similarly, women with third or more parity were significantly likely to have missing teeth and worse caries experience than women at second or first parity ($p<0.01$). Other socio-demographic characteristics (education level, marital status, religion and occupation) did not significantly differ with respect to caries experience and its components.

TABLE-I**Demographic characteristics of study participants (n=339)**

Variable	Attribute	Frequency (%)
Age (years)	Younger than 20	38 (11.2)
	20 - 34	271 (79.9)
	35 or older	30 (8.8)
Education level	Primary or lower	121 (35.7)
	Secondary or higher	218 (64.3)
Occupation	Formal employment	44 (13.0)
	Informal employment	191 (56.3)
	Unemployed	104 (30.7)
Marital status	Single	28 (9.1)
	Married/co-habiting	311 (90.9)
Religion	Christian	237 (69.9)
	Moslem	102 (30.1)
Parity	First	124 (36.6)
	Second	96 (28.3)
	Third	63 (18.6)
	More than third	56 (16.5)

TABLE-II**Pregnant women's mean DMFT and dental caries experience (n=339)**

Variable	Frequency (%)	Mean (SD)
Decayed teeth	171 (50.4)	1.27 (2.23)
Missing teeth	89 (25.4)	0.49 (1.09)
Filled teeth	4 (1.2)	0.01 (0.11)
Dental caries experience (DMFT)	199 (58.7)	1.78 (2.65)

Unhealthy periodontal conditions were found in few of the pregnant women 97 (28.6%). Among of these 82 (24.2%) of the pregnant women were found with gingival bleeding while the mean of the present

teeth with gingival bleeding was 1.01 (± 2.89). Generally periodontal pockets were found in 26 (7.7%) of the pregnant women. Based on shallow (4 –5 mm) and deep (≥ 6 mm) pockets scores, only 25 (7.4%) and 1 (0.3%) of pregnant women were found to have these pockets respectively. Few, 6 (1.6%) of pregnant women had loss of attachment according to the highest score. Pregnant women at first or second parity were significantly less likely to suffer from gingivitis compared to women with higher than second parity (OR=0.6, 95% CI=0.3-0.9; $p<0.05$). Other socio-demographic factors did not significantly influence development of gingivitis in pregnant women ($p>0.05$) (Table-IV).

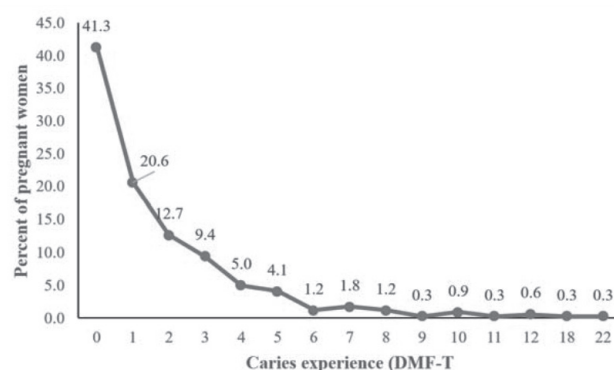
FIGURE-1**Proportion of affected pregnant women by DMFT scores**

Table-V shows the relationship of socio-demographic characteristics with periodontal pockets. Compared to pregnant women younger than 20 years, pregnant women of 35 years or older were significantly less likely to have periodontal pockets (OR=0.4, 95% CI=0.0-4.1; $p=0.024$). Though single pregnant women compared to married/co-habiting were more than twice likely to have periodontal pockets, the difference was not statistically significant (OR=2.6, 95% CI=0.9-7.5; $p=0.063$).

DISCUSSION

This study aimed at assessing the dental caries and chronic periodontal diseases among pregnant women attending antenatal care clinics at the public health facilities in Moshi Municipal, Tanzania. Majority of the pregnant women in the current study were in the range of 20-34 years. This was similar to the regional findings reported previously.^{14,20,21}

TABLE-III

Socio-demographic characteristics of pregnant women by median DMFT scores and its components (n=339) [▲]

Variable	Dental caries components and experience			
	Decayed teeth (D)	Missing teeth (M)	Filled teeth (F)	DMF-T
	Median (IQR)	Median (IQR)	Median (IQR)	Median (IQR)
Age group (years):				
Younger than 20	0.00 (0.00-1.00)	0	0	0
20 - 34	1.00 (0.00-1.00)	0.00 (0.00-1.00)	0	1.00 (0.00-3.00)
35 or older	1.00 (0.00-2.00)	0.00 (0.00-2.00)***	0	2.00 (0.00-3.00)**
Level of education:				
Primary or lower	0.00 (0.00-2.00)	0	0	0.00 (0.00-2.00)
Secondary or higher	1.00 (0.00-2.00)	0.00 (0.00-1.00)	0	1.00 (0.00-2.25)
Marital status:				
Single	1.00 (0.00-1.00)	0	0	1.00 (0.00-2.00)
Married/co-habiting	0.00 (0.00-2.00)	0.00 (0.00-1.00)	0	1.00 (0.00-3.00)
Religion:				
Christian	1.00 (0.00-2.00)	0.00 (0.00-1.00)	0	1.00 (0.00-3.00)
Moslem	0.00 (0.00-2.00)	0.00 (0.00-1.00)	0	1.00 (0.00-2.25)
Parity:				
First or second	0.00 (0.00-1.00)	0	0	1.00 (0.00-2.00)
Third or more	0.00 (0.00-2.00)	0.00 (0.00-1.00)**	0	1.00 (0.003.00)**
Occupation:				
Formal employment	1.00 (0.00-1.75)	0.00 (0.00-1.00)	0	1.00 (0.00-2.75)
Informal employment	1.00 (0.00-2.00)	0.00 (0.00-1.00)	0	1.00 (0.00-3.00)
Unemployed	0.00 (0.00-2.00)	0	0	1.00 (0.00-2.00)

Note: * significant at $p < 0.05$; $p < 0.01$ **; $p < 0.001$ *** [▲] Mann Whitney U-tests for more than two independent variables and Kruskal Wallis H-tests for two independent variables

Indeed, this age range agree with the recommended child bearing age with less risks.²² Majority of the pregnant women were in the informal employment category followed by unemployed category. Since our study involved public health facilities where public Reproductive and Child Health (RCH) care costs are relatively lower compared to private facilities in Tanzania, it is likely that majority of pregnant women in this study could have opted to be attended at these facilities due to services costs relief in relation to their employment status. Overwhelming pregnant women in married/cohabiting marital status were recorded in this study. This has also been observed in Kenya study.²⁰ The reason for this observation in our study could probably be due to ethnic value observed in this regional area where male responsibility to their partner is still very high

such that marriage or cohabitation is guaranteed once pregnancy has occurred. Majority of the pregnant women in this study were in the first parity compared to observation reported in other regions of Tanzanian studies^{17,21} where majority were in the second or third parity. Reason for this observation in our study could probably be due to the low age for pregnancy observed in this sample where appreciable number of below 20 years and probably majority around age 20 years in the categories of 20 to 34.

The results of the present study found that the mean DMFT score of the sample was 1.78. This mean DMFT observed in our sample was relatively lower than that reported in the adult population in Tanzania²³ and elsewhere in the East African population.²⁴

TABLE-IV

Relationship between demographic characteristics of pregnant women and gingival bleeding (n=339)

Variable	Total	Gingivitis	No Gingivitis	OR (95% C.I.)	P-Value
		n (%)	n (%)		
Age group (years):					
Younger than 20	38	7 (18.4)	31 (91.6)	Ref	
20 - 34	271	69 (25.5)	202 (74.5)	1.5 (0.6-3.6)	0.346
35 or older	30	6 (20.0)	24 (80.0)	1.1 (0.3-3.7)	0.670
Level of education:					
Primary or lower	121	33 (27.3)	88 (72.7)		
Secondary or higher	218	49 (22.5)	169 (77.5)	1.2 (0.8-2.2)	0.323
Marital status:					
Single	31	7 (22.6)	24 (77.4)		
Married/co-habiting	308	75 (24.4)	233 (75.6)	0.9 (0.4-2.2)	0.826
Religion:					
Christian	237	57 (24.1)	180 (75.9)		
Moslem	102	25 (24.5)	77 (75.5)	1.0 (0.6-1.7)	0.928
Parity:					
First or second	220	45 (20.5)	175 (79.5)		
Third or more	119	37 (31.1)	82 (68.9)	0.6 (0.3-0.9)	0.029*
Occupation:					
Formal employment	44	11 (25.0)	33 (75.0)	Ref	
Informal employment	191	42 (22.0)	149 (78.0)	0.8 (0.4-1.8)	0.667
Unemployed	104	29 (27.9)	75 (72.1)	1.2 (0.5-2.6)	0.719

Note: * significant at $p < 0.05$

DMFT finding in our study was almost lower than half of the WHO recommended DMFT of 3 for a 12-year-old and above individual.¹⁹ Majority (84%) of the DMFT scores ranged from 0 to 3 (Figure 1). This demonstrated that caries experience in this specific population in Moshi Municipal is still lower by WHO standards giving opportunity to lower it even down more through preventive approach in pre- and post-natal oral health activities. Furthermore, DMFT in our current study was relatively lower compared to the recent study done among Tanzanian pregnant women in Dar es Salaam¹⁴ but with similarity for the raised decay component (50.4%) of the DMFT. Looking at this scenario and in addition that a quarter of the sample in our study registered a missing component while the filled component was almost negligible it becomes evident that there is lack of utilization of dental services in this specific

sample of pregnant women in Moshi Municipal. The reason may not be clear but likely to be associated with the dental treatment costs since it is not in the package of free services offered to Tanzanian pregnant women attending at the public antenatal care clinics. It could also be due to individuals' lack of motivation for uptake of dental services during pregnancy since there is a wide distribution of dental services in public and private health facilities in the study area. Comparing the percentage of DMFT components in our study with other reports globally;^{7,11,25} it is clear that there is much to do in terms of improving oral health services in Tanzanian pregnant women through the identification of enabling factors and to promote them in order to effect maximum utilization of dental services in this reproductive age population.

TABLE-V

Relationship between demographic characteristics of pregnant women and periodontal pockets (n=339)

Variable	Total	Periodontal pockets	No periodontal pockets	OR (95% C.I.)	P-Value
		n (%)	n (%)		
Age group (years):					
Younger than 20	38	3 (7.9)	35 (92.1)	Ref	
20 - 34	271	22 (8.1)	249 (91.9)	1.0 (0.3-3.6)	1.000 ^a
35 or older	30	1 (3.3)	29 (96.7)	0.4 (0.0-4.1)	0.024 ^{a*}
Level of education:					
Primary or lower	121	8 (6.6)	113 (93.4)		
Secondary or higher	218	18 (8.3)	200 (91.7)	0.8 (0.3-1.9)	0.585
Marital status:					
Single	31	5 (16.1)	26 (83.9)		
Married/co-habiting	308	21 (6.8)	287 (93.2)	2.6 (0.9-7.5)	0.063
Religion:					
Christian	237	17 (7.2)	220 (92.8)		
Moslem	102	9 (8.8)	93 (91.2)	0.8 (0.3-1.9)	0.600
Parity:					
First or second	220	17 (7.7)	203 (92.3)		
Third or more	119	9 (7.6)	110 (92.4)	1.0 (0.4-2.4)	0.957
Occupation:					
Formal employment	44	4 (9.1)	40 (90.9)	1.4 (0.4-5.0)	0.753 ^a
Informal employment	191	15 (7.9)	176 (92.1)	1.2 (0.5-3.0)	0.726
Unemployed	104	7 (6.7)	97 (93.3)	Ref	

* significant at $p < 0.05$; ^a Fischer's Exact Test

It is remarkable that the prevalence of dental caries (58.7%) was lower compared to the findings in Tanzania adult population survey (76.6%)²³ but within the adult population range of the other report done elsewhere in East Africa.²⁴ The specific sample like ours in this study coupled with age differences could explain this difference since the considered age in Tanzanian adult population study started around 34 years and beyond while 34 years was age limit in majority of pregnant women we studied. This is because caries experience has been stated to increase with age due to accumulation effect.¹⁴ For the same reason this also explains lower DMFT in this sample compared to that in Tanzanian population.²³ Indeed, in the current study, it was revealed that compared to pregnant women younger than 20 years of age, pregnant women 35 years or older were significantly more likely to have missing teeth and to

have severe caries experience ($p < 0.05$). Similarly, women with third or more parity were significantly more likely to have missing teeth and worse caries experience than women at second or first parity ($p < 0.01$). Compounding on these comments, the study involved urban residents as compared to rural residents in the study of Tanzanian adult population where it has been reported that prevalence of dental caries in the rural area has a tendency to be higher than in the urban areas.^{23,24} These significant findings in our study have demonstrated that caries attack in young pregnant women goes unchecked through multiple pregnancies with accumulated effects leading to severe caries experience. It is a call for policymakers to avail a compulsory comprehensive oral health education coupled with free treatment for common dental diseases such as dental caries and chronic periodontal diseases in Tanzanian women

while they are in pregnancy. We suggest this to be part of routine activities in RCH antenatal care clinics.

Surprisingly unhealthy periodontal conditions were found in few of the pregnant women (28.6%). Gingivitis was found only in 24.2% of the pregnant women in the present study compared to 68.2% in the Tanzania adult population study.²³ Furthermore, prevalence of gingivitis in the current study was far lower than that stated globally in pregnant women^{26,27} but comparable to the finding in the Shanghai study.⁷ The reasons for this variation may not be clear but one of the possible reasons for the current study findings could be that self-awareness of oral hygiene in our study sample was high. Furthermore, majority of the participants were young pregnant mothers in the first or second parity. It has been pointed out that chronic gingivitis increases in young age.²⁴ However, despite our sample to be in the young age, gingivitis was low. This truly suggests that oral hygiene observation in this population was good. Indeed, in this study, pregnant women at first or second parity were significantly less likely to suffer from gingivitis compared to women with higher than second parity. Similarly, few pregnant women with periodontal breakdown were observed in the current study. Furthermore, pregnant women with loss of attachment by highest score were also few (1.6%). It has been stated that chronic periodontitis is very rare in young age such that majority of the participants in this study were in the young age.²⁴ All these findings on the aspect of chronic periodontal diseases demonstrated that chronic periodontal diseases with breakdown of periodontal ligament was rare in this specific community. Therefore, it is likely that systemic complications relating to chronic periodontal diseases in pregnancy² are also rare in this community. Efforts to confirm this suspicion is recommended for this community.

Information emanating from this study adds objectively on the magnitude of dental caries and chronic periodontal diseases among the specific group of pregnant women in Tanzania. The information obtained in this study will help the health policy planners and administrators to map out the best way to intervene in such findings through daily antenatal care clinic.

Socio-demographic characteristics of the pregnant women attending at the private health facilities in Moshi Municipal and their status according to the aim of our current study are unknown. This is likely to affect a broader conclusion on the pregnant women in Moshi Municipal in regard to dental caries and periodontal diseases. This brings a call for future studies to include all private and public health facilities providing ANC services.

CONCLUSION

It can be concluded that there is a considerable prevalence of dental caries among the pregnant women in Moshi Municipality with no alarming periodontal conditions.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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