



www.bioinformation.net
Volume 22(8)



Research Article

Received August 1, 2026; Revised August 31, 2026; Accepted August 31, 2026, Published August 31, 2026

DOI: 10.6026/973206300225008

SJIF 2026 (Scientific Journal Impact Factor for 2026) = 8.478

2022 Impact Factor (2023 Clarivate Inc. release) is 1.9

Declaration on Publication Ethics:

The author's state that they adhere with COPE guidelines on publishing ethics as described elsewhere at <https://publicationethics.org/>. The authors also undertake that they are not associated with any other third party (governmental or non-governmental agencies) linking with any form of unethical issues connecting to this publication. The authors also declare that they are not withholding any information that is misleading to the publisher in regard to this article.

Declaration on official E-mail:

The corresponding author declares that lifetime official e-mail from their institution is not available for all authors

License statement:

This is an Open Access article which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly credited. This is distributed under the terms of the Creative Commons Attribution License

Comments from readers:

Articles published in BIOINFORMATION are open for relevant post publication comments and criticisms, which will be published immediately linking to the original article without open access charges. Comments should be concise, coherent and critical in less than 1000 words.

Disclaimer:

Bioinformation provides a platform for scholarly communication of data and information to create knowledge in the Biological/Biomedical domain after adequate peer/editorial reviews and editing entertaining revisions where required. The views and opinions expressed are those of the author(s) and do not reflect the views or opinions of Bioinformation and (or) its publisher Biomedical Informatics. Biomedical Informatics remains neutral and allows authors to specify their address and affiliation details including territory where required.

Edited by P Kanguane

Citation: Kumar *et al.* Bioinformation 22(8): 5008-5011 (2026)

Oral health assessment in pregnant women: An observational study

Shailesh Kumar¹, Anuradha Kar Khongsit¹, Dipanshu Kumar¹, Srinivasa T.S¹, Preeti Priyadarshani², Anshul Rai³, Kamini Kiran^{1,*}, Padmanidhi Agarwal⁴, Shailendra Dwivedi⁵ & Anil Koparkar⁶

¹Department of Dentistry, All India Institute of Medical Sciences (AIIMS), Gorakhpur, Uttar Pradesh, India; ²Department of Dentistry, All India Institute of Medical Sciences (AIIMS), Bhopal, Madhya Pradesh, India; ³Department of Obstetrics & Gynaecology, All India Institute of Medical Sciences (AIIMS), Gorakhpur, Uttar Pradesh, India; ⁴Department of Dentistry, Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow, India; ⁵Department of Biochemistry, All India Institute of Medical Sciences (AIIMS), Gorakhpur, Uttar Pradesh, India; ⁶Department of Community Family Medicine, All India Institute of Medical Sciences (AIIMS), Gorakhpur, Uttar Pradesh, India; *Corresponding author

Affiliation URL:

<https://aiimsgorakhpur.edu.in/>

<https://aiimsbhopal.edu.in/>
<https://www.drrmlims.ac.in/>

Author contact:

Shailesh Kumar - E-mail: way2shailesh@gmail.com
Anuradha Kar Khongsit - E-mail: anuradhakk21@gmail.com
Dipanshu Kumar - E-mail: drdipanshukumar@gmail.com
T.S Srinivasa - E-mail: seen79@rediffmail.com
Anshul Rai - E-mail: anshul.dentalsurgery@aiimsbhopal.edu.in
Preeti Priyadarshani - E-mail: drpreeti.priyadarshani@gmail.com
Kamini Kiran - E-mail: dr.kaminijha@gmail.com
Padmanidhi Agarwal - E-mail: padmanidhi.agarwal@gmail.com
Shailendra Dwivedi - E-mail: tarang2016@gmail.com
Anil Koparkar - E-mail: dranilk@aiimsgorakhpur.edu.in

Abstract:

Oral hygiene and its negative impact on pregnancy are often ignored in underdeveloped countries. Maintaining oral health throughout pregnancy is crucial because failing to do so may result in low birth weight and preterm birth. Therefore, it is of interest to evaluate the dental hygiene of expectant mothers throughout a six-month period. The most common dental problems in our study were bleeding gums (20.5%) and toothache (35.4%). Thus, data shows a significant effort should be made to improve the knowledge and attitude of pregnant women towards dental health.

Keywords: Dental caries, DMFT index, international caries detection and assessment system (ICDAS), gingival index

Background:

Mothers and caregivers influence their children's diet and oral hygiene. Awareness among pregnant women about healthy dietary habits and general oral hygiene helps to prevent early childhood caries in their children. Poor nutrition in pregnant women may result in developmental anomalies (Enamel Hypoplasia) in the infants' teeth [1]. Contributors such as dietary changes, poor cleanliness and variations in saliva composition were noted by Minozzi *et al.* (2008) [2]. Smaller, more frequent meals are necessary during pregnancy due to the increased calorie requirement for baby growth. This helps to prevent symptoms like nausea and hypoglycemia and promotes overall health. It's essential to practice good oral hygiene after meals to avoid dental problems. Frequent dental examinations are necessary for the early diagnosis of problems [3, 4]. Hormonal alterations during pregnancy increase the risk of oral diseases in pregnant women [5]. Early identification of dental problems during pregnancy is essential for improving fetal and maternal health and minimising discomfort, as dental diseases have been related to low-birth-weight newborns [6, 7]. Fetal growth and maternal health are significantly impacted by early diagnosis of oral health problems. Oral evaluations as part of prenatal care can improve general health and proactively prevent negative effects [8-10]. Risks associated with dental treatment during pregnancy include physiological changes such as nausea, dyspnea and increased acidity as well as psychological issues [9]. Organogenesis concerns suggest avoiding dental treatments in the first trimester, with judicious use of invasive procedures in emergency situations to reduce risks [10, 11]. Dental procedures are safer in the second trimester post-organogenesis, but proper patient positioning is still necessary to avoid complications [11]. To reduce the chance of early labour in the third trimester, it is essential to prioritise pain control during treatments, with the

option to postpone until full term if needed. In this study for assessment of dental caries along with DMFT Index (WHO, 1997), we also evaluated the International Caries Detection and Assessment System (ICDAS) score in pregnant women. It is a clinical scoring system for use in dental education, clinical practice, research and epidemiology and provides a framework to support and enable personalised total caries management for improved long-term health outcomes. Since the DMFT index does not record non-cavitated lesions, there is a strong need to consider recording non-cavitated lesions as a relevant dental health indicator [10]. The International Caries Detection and Assessment System (ICDAS) can be used to understand initiation and progression in epidemiological and clinical research [12]. Therefore, it is of interest to report the dental problems of pregnant women visiting a tertiary care centre during different trimesters.

Methodology:

This prospective observational study was conducted over 6 months. All pregnant women visiting the Dental Outpatients Department (OPD) and Obstetrics and Gynaecology Department were screened. This study was approved by the Institutional Ethical Committee and conducted according to STROBE guidelines. The sample size was determined by convenience sampling. Pregnant females with 18 years of age or older, willing to give written informed consent for the study, were included and pregnant females with systemic diseases were excluded from the study. Assessment of dental caries status using the International Caries Detection and Assessment System (ICDAS) criteria (2005) and the DMFT index was performed [13]. A mouth mirror and explorer on a dental chair with standard illumination were used by a single observer. Assessment of the gingival index (GI) was performed using the Loe and Silness

gingival index [14]. Statistical analysis will be performed using SPSS version 25 (IBM, Armonk, NY). Descriptive statistics will be expressed in frequencies and percentages. Results of the regression analysis will be presented as adjusted ORs with corresponding 95% CIs. Statistical significance test level will be set at 0.05 (two tailed). In the present study, the majority of the women were in the age group of 25-35 years (74.1%) and most of the women were primigravida (50.3%). Tooth ache (35.4%) and bleeding gums (20.5%) were the most common complaints. GI was mild in 39.7% and severe was in 5.4%. In the present study 25.4% had very high DMFT and 12.1% had high DMFT. The mean GI value was increasing with increase in trimester and it was found to be statistically significant ($p=0.019$). The mean ICDAS was decreasing with increase in trimester and it was statistically significant ($p=0.040$). No significant difference was detected for DMFT as shown in (Table 1). There is no significant association between gravida status and GI (p -value 0.754). There is no significant association between gravida status and DMFT (p -value 0.33). There is no significant association between gravida status and bleeding gums (p -value 0.36). The GI value is more among > 35 years of age compared to younger age groups and it was statistically significant ($p=0.020$). There was no significant difference noted for ICDAS and DMFT between the age groups as shown in (Table 2).

Table 1: Correlation between GI, DMFT and ICDAS and gestation period

Variable	Gestation	Number	Mean	SD	ANOVA test P value
GI	1st trimester	116	0.7888	0.80708	0.019
	2nd trimester	146	0.8116	0.69846	
	3rd Trimester	128	1.0352	0.80017	
	Total	390	0.8782	0.77175	
ICDA	1st trimester	116	8.448	8.9718	0.04
	2nd trimester	146	7.932	7.7537	
	3rd Trimester	128	6.031	7.0162	
	Total	390	7.462	7.9576	
DMFT	1st trimester	116	3.845	4.0596	0.23
	2nd trimester	146	4.582	4.3132	
	3rd Trimester	128	3.852	3.821	
	Total	390	4.123	4.0865	

Table 2: Correlation between GI, ICDAS and DMFT and Age

Variable	Age	Number	Mean	SD	ANOVA test P value
GI	<25	82	0.9512	0.80708	0.02
	25-35	289	0.8293	0.69846	
	>35	19	1.307	0.80017	
	Total	390	0.8782	0.77175	
ICDA	<25	82	7.173	8.9718	0.411
	25-35	289	9.211	7.7537	
	>35	19	7.462	7.0162	
	Total	390	7.173	7.9576	
DMFT	<25	82	4.5	4.0596	0.585
	25-35	289	3.997	4.3132	
	>35	19	4.421	3.821	
	Total	390	4.123	4.0865	

Discussion:

Pregnancy, or gestation, is a dynamic physiological state characterised by numerous transient systemic changes. It can lead to local, microbiological and immunological changes in the oral environment, increasing susceptibility to oral problems that can even result in tooth loss. In a developing country like India,

access to healthcare during pregnancy, especially related to dental or oral problems, is limited by various psychosocial, economic and cultural factors. The main purpose of this cross-sectional observational study is to evaluate the caries index and the gingival status of pregnant patients. In the present study, the majority of the women were aged 25-35 years and in the 2nd trimester. Toothache and bleeding gums were the common problems. Moderate to severe inflammation was more common in the third trimester than in the other two trimesters and the difference in the incidence of severe GI was statistically significant ($p=0.031$). The mean GI value increases with advancing trimester and is statistically significant ($p=0.019$). A similar finding was seen in the study of [15] Kashetty *et al.* observed an increase in the severity of gingivitis from the 2nd month of pregnancy, peaking during the 8th month [15-17]. The gradual increase in severity of gingivitis toward the end of pregnancy has also been reported by many authors. Gingivitis in pregnancy might be considered as a tissue reaction in which estrogen and progesterone have acted on the local tissue and its microvascular system to lower the threshold level for tissue injury, causing endothelial damage, increased vascular permeability and reduction in corpuscular flow rate. The mean ICDAS decreased with an increase in trimester and it was statistically significant ($p=0.040$). No significant difference was detected for DMFT [18]. A similar finding was observed in the study by Rio *et al.* and Lingstrom and Birkhed and low salivary pH is the factor associated with this, which ultimately leads to increased retention of carbohydrates on the tooth surface [18, 19]. An increase in the DMFT index was observed in the second trimester of pregnancy, as several salivary factors associated with caries undergo changes, which can heighten the likelihood of future caries development and the finding was not in accordance with the study of Velosa-Porras and Rodríguez Malagón and Yousef *et al.* where the DMFT score was higher in third trimester [20, 21]. The increase in the DMFT index can also be attributed to the stress experienced during pregnancy. Existing literature suggests that stress during this period affects cortisol production, leading to decreased immunoglobulin levels and saliva flow. Consequently, these changes results in a decline in the oral immune system, dental plaque formation and an increase in bacterial activity [22]. The elevated DMFT level during the monitoring period of this study is a cause for concern, especially considering that the participants were experiencing their first pregnancy. This is because untreated caries increases bacterial load in saliva, potentially leading to transmission to infants and influencing the development of early childhood caries. Hence, in order to mitigate this risk, it is recommended that pregnant women receive appropriate dental care, including the adoption of preventive measures such as reducing carbohydrate intake, regular dental plaque examinations performed by a dentist, as well as utilising oral rinses that lower the acidity levels in saliva [23]. However, in the study of Azab *et al.* a lack of knowledge about the safety of dental care during pregnancy is the main obstacle to seeking dental care in women [24].

Conclusion:

A large proportion of participants reported toothache and bleeding gums during their pregnancy. Oral health during pregnancy is important to minimise possible adverse perinatal outcomes. Increasing women's awareness and maintenance of oral health and related habits by dentists and prenatal care providers will promote better health outcomes for the mother as well as the baby both before and after its birth.

Limitation of study:

A limitation of the study was the lack of data on oral hygiene practices, including toothbrushing frequency and regular visits to dental care professionals. These variables have the potential to influence DMFT. Additionally, the study did not account for the current condition of the periodontium, the levels of estrogen and progesterone hormones in the participants which influence GI. A longitudinal study of large number of participants is always desirable.

Recommendations during pregnancy to maintain oral hygiene:

- [1] Following the healthy eating pyramid.
- [2] Reduce the consumption of cariogenic food, particularly between meals.
- [3] Taking prenatal supplements containing vitamins and minerals as prescribed by their general physician
- [4] Brushing and following other oral hygiene instructions regularly
- [5] Physicians and caregivers should advise regular dental checkups

Acknowledgement:

Our sincere thanks to the Department of Obstetrics & Gynaecology and Ex- Junior Resident Sanjana M and Senior Nursing Officer Ms Lalita Rani (Department of Dentistry) for their valuable contribution and for completing this research.

References:

- [1] <https://www.ncbi.nlm.nih.gov/books/NBK534248/>
- [2] Minozzi F *et al.* *Eur Rev Med Pharmacol Sci.* 2008 **12**:397 [PMID: 19146202]
- [3] Lindhe J & Brånemark PI. *Journal of Periodontal Research.* 1968 **3**:6 [PMID: 4232337]
- [4] Lindhe J & Brånemark PI. *J Periodontal Res.* 1967 **2**:259 [PMID: 4249980]
- [5] Al Agili DE & Khalaf ZI. *BMC Pregnancy and Childbirth.* 2023 **23**:313. [PMID: 37138232]
- [6] Águeda A *et al.* *Med Oral Patol Oral Cir Bucal.* 2008 **13**:609 [PMID: 18758408]
- [7] Freeman RK *et al.* *The Journal of thoracic and cardiovascular surgery.* 2000 **119**:260 [PMID: 10649201]
- [8] Ebinghaus M *et al.* *BMC Pregnancy Childbirth.* 2024 **24**:471. [PMID: 38992618]
- [9] Pucci R *et al.* *Tropical Medicine and Infectious Disease.* 2021 **6**:106 [PMID: 34205661]
- [10] Hemalatha VT *et al.* *Journal of clinical and diagnostic research: JCDR.* 2013 **7**:948 [PMID: 23814753]
- [11] <https://pubmed.ncbi.nlm.nih.gov/11217599/>
- [12] Pitts NB & Ekstrand KR. *Community dentistry and oral epidemiology.* 2013 **41**:1 [PMID: 24916677]
- [13] <https://iccms-web.com/uploads/asset/592848be55d87564970232.pdf>
- [14] Loe H & Silness J. *Acta Odontol Scand* 1963 **21**:533 [PMID: 14121956]
- [15] Kashetty M *et al.* *Journal of Indian Society of Periodontology.* 2018 **22**:164 [PMID: 29769772]
- [16] Loe H. *J Periodontol.* 1965 **36**:209 [PMID: 14300227].
- [17] Silness J & Loe H. *Acta Odontol Scand.* 1964 **22**:121 [PMID: 14158464]
- [18] Rio R *et al.* *Oral Health Prev Dent.* 2020 **18**:387 [PMID: 32618461]
- [19] Lingstrom P & Birkhed D. *Acta Odontol Scand.* 1993 **51**:379 [PMID: 8304015]
- [20] Velosa-Porras J & Rodríguez Malagón N. *BMC Oral Health* 2023 **23**:793 [PMID: 37875831]
- [21] Yousefi M *et al.* *J Am Dent Assoc* 2020 **151**:576 [PMID: 32718487]
- [22] Sundararajan A *et al.* *Horm Metab Res* 2021 **53**:602 [PMID: 34496410]
- [23] Azevedo MJ *et al.* *J Dent Sci Rev* 2023 **59**:191. [PMID: 37415593]
- [24] Azab RY *et al.* *Cureus.* 2024 **16**:e56900. [PMID: 38659538]

Caveat Emptor is applicable among the literate community where required and possible. The publisher, its journal, editors and the internal/external reviewers take adequate steps to check, evaluate, correct, edit, revise and improve content where possible and required.