

Research Article

Changes in Oral Health Knowledge Baseline DMFT Status Among Pregnant Women at a Primary Healthcare Center

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ABSTRACT

Introduction: Oral health education may improve maternal knowledge, while baseline oral health status reflects existing treatment needs. This study evaluated changes in oral health knowledge following oral health education according to educational level and described baseline Decayed, Missing, and Filled Teeth (DMFT) status among pregnant women.

Materials and Methods: A pre-experimental one-group pretest-posttest study was conducted among 15 pregnant women attending Puskesmas IV South Denpasar, Bali, Indonesia, in November 2025. Oral health knowledge was assessed using a researcher-developed 15-item multiple-choice questionnaire administered before and immediately after the intervention. The Shapiro–Wilk test was used to assess normality, and differences between pretest and posttest knowledge scores were analyzed using the Wilcoxon signed-rank test. Effect size was calculated using $r = Z/\sqrt{N}$.

Results and Discussion: The median knowledge score increased from 73.3 before the intervention to 80.0 after oral health education. The improvement was statistically significant ($Z = -2.81$; $p = 0.005$) with a large effect size ($r = 0.73$). Participants with higher educational attainment achieved higher posttest knowledge scores. The mean DMFT score was 4.4 ± 1.7 , with untreated decayed teeth representing the predominant component.

Conclusion: Oral health education significantly improved pregnant women's oral health knowledge. However, untreated dental caries remained prevalent, highlighting the importance of integrating oral health education with routine oral screening and preventive dental care within antenatal healthcare services.

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INTRODUCTION

Pregnancy is a physiological condition characterized by hormonal, immunological, and behavioral changes that increase women's susceptibility to oral diseases, particularly dental caries and periodontal disease.^{3,4} Elevated levels of estrogen and progesterone alter the inflammatory response of periodontal tissues, resulting in increased gingival vascular permeability and a greater tendency toward plaque-induced gingivitis.⁴ In addition, pregnancy-related nausea and vomiting may increase acid exposure in the oral cavity and reduce the frequency and effectiveness of toothbrushing, thereby increasing the risk of dental caries and other oral health problems.^{3,4} Maintaining good oral health during pregnancy is essential because maternal oral diseases may negatively affect quality of life and have been associated with adverse pregnancy outcomes.^{3,12}

Oral diseases remain one of the most prevalent non-communicable diseases worldwide. According to the World Health Organization (WHO), approximately 3.5 billion people are affected by oral diseases, with untreated dental caries being the most common condition globally.¹ In Bali Province, the prevalence of dental and oral health problems reached 58.8%, indicating that the burden of oral disease remains substantial. Furthermore, the 2023 Survey Kesehatan Indonesia (SKI) reaffirmed that oral health remains a national public health priority and emphasized the need to strengthen promotive, preventive, and early detection strategies within primary healthcare services.²

Pregnant women are particularly vulnerable to oral health problems because physiological changes are often accompanied by limited oral health knowledge, inadequate oral hygiene practices, frequent consumption of cariogenic foods, misconceptions regarding the safety of dental treatment

during pregnancy, and low utilization of dental care services.^{5,6,14} Inadequate oral health knowledge may reduce women's ability to maintain proper oral hygiene and delay seeking professional dental care during pregnancy. Consequently, oral health education has become one of the most feasible promotive interventions implemented in primary healthcare settings to improve maternal oral health literacy and encourage preventive oral health behaviors. Previous studies have consistently demonstrated that oral health education significantly improves pregnant women's oral health knowledge and promotes healthier oral hygiene practices.^{7,9,15}

Although educational interventions have been shown to improve oral health knowledge, knowledge improvement alone does not provide information regarding participants' existing oral health conditions or treatment needs. Assessment of baseline oral health status using the Decayed, Missing, and Filled Teeth (DMFT) index complements educational outcomes by describing dental caries experience and identifying unmet treatment needs among pregnant women.^{1,16} Furthermore, educational attainment may influence the effectiveness of oral health education because individuals with higher educational backgrounds generally demonstrate better health literacy and greater ability to understand health information.^{10,11} Despite these considerations, studies simultaneously evaluating changes in oral health knowledge following oral health education while describing baseline DMFT status among pregnant women attending primary healthcare centers in Indonesia remain limited.

Therefore, this study aimed to evaluate changes in pregnant women's oral health knowledge following oral health education according to educational level and to describe baseline DMFT status. The findings are expected to provide evidence

supporting the integration of oral health education, routine oral screening, and preventive dental care into antenatal healthcare services to improve maternal oral health.

MATERIAL AND METHODS

This study employed a pre-experimental one-group pretest–posttest design to evaluate changes in oral health knowledge among pregnant women following oral health education and to describe their baseline oral health status using the Decayed, Missing, and Filled Teeth (DMFT) index. The study was conducted on November 1, 2025, at Puskesmas IV South Denpasar, Bali, Indonesia. The study population consisted of pregnant women residing in the working area of the primary healthcare center. Participants were recruited using purposive sampling. Eligible participants were pregnant women who attended the oral health education session, agreed to participate, completed both the pretest and posttest questionnaires, and were willing to undergo an oral examination. A total of 15 pregnant women met the inclusion criteria and were included in the final analysis. Ethical approval was obtained from the Ethics Committee of the Faculty of Dentistry, Universitas Mahasarakawati Denpasar (No. 03.0050/KEP-Unmas/X/2025). Written informed consent was obtained from all participants before data collection.

The intervention consisted of a single-session oral health education program delivered by the research team using interactive lectures, toothbrushing demonstrations, and guided discussion. The educational session lasted approximately 45 minutes and covered oral changes during pregnancy, pregnancy gingivitis, dental caries prevention, recommended toothbrushing practices, toothbrush and fluoride toothpaste selection,

healthy dietary practices, and the safety of dental treatment during pregnancy. Participants were encouraged to actively participate throughout the session and were allowed to ask questions related to oral health during pregnancy. Baseline oral health status was assessed using the DMFT index according to the World Health Organization (WHO) Oral Health Surveys: Basic Methods (5th edition). Clinical examinations were performed using a mouth mirror and explorer under adequate lighting.

Oral health knowledge was assessed using a researcher-developed 15-item multiple-choice questionnaire administered immediately before (pretest) and immediately after (posttest) the educational intervention. The questionnaire was developed based on recommendations from the World Health Organization (WHO) and the Indonesian Ministry of Health guidelines. Prior to administration, the questionnaire was reviewed for content relevance and clarity before being administered to the participants. Each correct answer received a score of 1, whereas each incorrect answer received a score of 0, resulting in a total score ranging from 0 to 15, which was subsequently converted into percentages (0–100%). Knowledge levels were categorized as good (≥ 80), adequate (60–79), and poor (< 60). Educational level was classified into basic (elementary/junior high school), secondary (senior high school), and higher education (diploma/bachelor/master).

Data were analyzed using IBM SPSS Statistics version 20. Descriptive statistics were used to summarize respondents' characteristics, educational level, knowledge scores, and DMFT values. Continuous variables were presented as mean $\pm$ standard deviation (SD) or median (minimum–maximum) according to the type of data, whereas categorical variables were presented as frequencies and

percentages. The normality of pretest and posttest knowledge scores was assessed using the Shapiro–Wilk test because the sample size was fewer than 50 participants. Since the posttest scores were not normally distributed, differences between pretest and posttest knowledge scores were analyzed using the Wilcoxon signed-rank test. The magnitude of the intervention effect was evaluated by calculating the

effect size ($r = Z/\sqrt{N}$). A two-tailed p-value <0.05 was considered statistically significant.

RESULTS AND DISCUSSION

A total of 15 pregnant women completed the study protocol, including the pretest, oral health education intervention, posttest, and clinical oral examination. All participants met the inclusion criteria and were included in the final analysis.

Table 1. Characteristics of respondents

Characteristic	Category	n	%
Age (years)	20–25	6	40.0
	26–30	4	26.7
	31–35	4	26.7
	>35	1	6.6
Educational level	Basic (elementary/junior high school)	2	13.3
	Secondary (senior high school)	8	53.3
	Higher (diploma/bachelor/master)	5	33.3
Occupation	Housewife	8	53.3
	Private employee/self-employed	7	46.7
Gravidity	Primigravida	7	46.7
	Multigravida	8	53.3

Table 1 shows that most respondents were aged 20–25 years (40.0%). Based on educational level, most respondents had secondary education (53.3%), followed by higher education (33.3%)

and basic education (13.3%). More than half of respondents were housewives (53.3%), and slightly more than half were multigravida (53.3%).

Table 2. Results of the Shapiro–Wilk normality test

Variable	Shapiro–Wilk (W)	p-value	Distribution
Pretest	0.945	0.445	Normal
Posttest	0.867	0.030	Not normal

Based on Table 2, since the assumption of normality was not satisfied for the posttest scores, the non-parametric Wilcoxon signed-rank test was

selected to compare knowledge scores before and after the intervention.

Table 3. Comparison of pretest and posttest knowledge scores

Variable	Pretest	Posttest	Statistical test	Z	p-value	Effect size (r)
Median score	73.3	80.0	Wilcoxon signed-rank	–2.81	0.005	0.73

Table 3 shows that the median knowledge score increased from 73.3 before the intervention to 80.0 after oral health education. The Wilcoxon signed-rank test demonstrated that this increase was

statistically significant ($Z = -2.81, p = 0.005$). Furthermore, the large effect size ($r = 0.73$) indicates that the educational intervention produced a substantial improvement in participants' oral health knowledge.

Table 4. Posttest oral health knowledge scores according to educational level

Educational level	n	Median	Minimum–Maximum
Basic (elementary/junior high school)	2	66.7	66.7–73.3
Secondary (senior high school)	8	80.0	66.7–86.7
Higher (diploma/bachelor/master)	5	86.7	80.0–93.3

Table 4 presents posttest knowledge scores according to participants' educational level. Respondents with higher education achieved the highest median posttest score (86.7), followed by those with secondary education (80.0), whereas respondents with basic education obtained the lowest median score (66.7). These findings suggest that pregnant women with higher educational attainment tended to achieve better oral health knowledge following the educational intervention. Because of the small number of participants in each educational category, the results are presented descriptively without inferential statistical comparison.

Table 5. Baseline DMFT status among pregnant women

Variable	Mean $\pm$ SD
Decayed (D)	3.7 $\pm$ 1.4
Missing (M)	0.5 $\pm$ 0.6
Filled (F)	0.2 $\pm$ 0.4
DMFT	4.4 $\pm$ 1.7

Table 5 shows that the mean DMFT score among pregnant women was 4.4 $\pm$ 1.7, indicating a moderate level of caries experience. The decayed component was the largest contributor to the total DMFT score (3.7 $\pm$ 1.4), followed by the missing component (0.5 $\pm$ 0.6), while the filled component showed the lowest mean value (0.2 $\pm$ 0.4). These findings indicate that untreated dental caries remained the predominant oral health problem among the participants, whereas the low filled component suggests limited utilization of restorative dental treatment services.

This study demonstrated that oral health education significantly improved pregnant women's oral health knowledge. The median knowledge score increased from 73.3 before the intervention to 80.0 after the educational session. The Wilcoxon signed-rank test confirmed that this improvement was statistically significant ($Z = -2.81$, $p = 0.005$), while the large effect size ($r = 0.73$) indicated that the intervention produced a substantial educational impact. These findings suggest that a structured oral health education session delivered through interactive lectures, demonstrations, and discussion effectively enhances pregnant women's understanding of oral health during pregnancy. This finding is biologically and behaviorally plausible because educational interventions increase awareness, correct misconceptions, and strengthen participants' ability to recognize the importance of preventive oral healthcare during pregnancy.^{9,15}

The findings of this study are consistent with previous reports demonstrating that oral health education effectively improves oral health knowledge among pregnant women. Cartes-Velásquez et al. reported that educational interventions significantly increased knowledge regarding oral diseases and preventive oral health practices during pregnancy.⁹ Similarly, Silk et al. found that interactive educational approaches were more effective than passive information delivery because they encouraged participants to actively engage in the learning process, thereby improving comprehension and information retention.¹⁵ The significant improvement observed in this study may also be attributed to the

combination of verbal explanations, visual demonstrations, and opportunities for discussion, allowing participants to clarify misconceptions and better understand the educational materials.

Although all participants demonstrated improvement following the intervention, respondents with higher educational attainment achieved higher posttest knowledge scores than those with secondary or basic education. While statistical comparison among educational groups was not performed because of the limited sample size, the descriptive findings suggest that educational level may influence individuals' ability to receive, understand, and apply health information. Similar observations have been reported by previous studies indicating that individuals with higher educational backgrounds generally possess better health literacy, enabling them to interpret health messages more effectively and adopt healthier behaviors.^{10,11,13} These findings emphasize the importance of adapting educational materials to participants' educational backgrounds so that oral health promotion programs can be delivered more effectively across different population groups.

Despite the significant improvement in knowledge, baseline clinical examination showed that the participants had a moderate mean DMFT score (4.4 ± 1.7), with untreated decayed teeth representing the largest component of the index. This finding indicates that increased knowledge alone may not immediately translate into improved oral health status because dental caries is influenced by multiple factors, including oral hygiene practices, dietary habits, socioeconomic conditions, access to dental services, and health-seeking behavior.¹⁶ The predominance of untreated caries together with the low filled component suggests that utilization of restorative dental services during pregnancy remains limited.¹⁴ Therefore, oral health education should

be integrated with routine oral examinations, preventive care, and timely referral within antenatal healthcare services to promote both knowledge improvement and better oral health outcomes.^{7,15} The present study has several limitations, including the relatively small sample size, the absence of a control group, and the immediate post-intervention assessment, which did not allow evaluation of long-term knowledge retention or behavioral changes. Future studies involving larger populations, controlled study designs, and longer follow-up periods are recommended to determine the sustainability of educational interventions and their impact on oral health behaviors and clinical outcomes.

CONCLUSION

Oral health education significantly improved pregnant women's oral health knowledge following the intervention. Participants with higher educational attainment tended to achieve better posttest knowledge scores, suggesting that educational background may influence knowledge acquisition. Baseline clinical examination revealed a moderate DMFT score, with untreated decayed teeth representing the predominant component, indicating that unmet dental treatment needs remain common among pregnant women. These findings highlight the importance of integrating oral health education with routine oral screening and timely preventive and restorative dental care within antenatal healthcare services.

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