

A Study to Assess the Impact of a Nurse-Led Educational Intervention on Knowledge Regarding Oral Health Among Primigravida in Selected Hospitals of Navi Mumbai

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ABSTRACT

Pregnancy produces hormonal changes that heighten susceptibility to gingivitis, periodontal disease, and other oral conditions, which have been associated with adverse pregnancy outcomes such as preterm birth, low birth weight, and pre-eclampsia. Despite this, oral health is rarely prioritized within routine antenatal care, particularly in low- and middle-income settings such as India, and nurses are well positioned to close this gap through structured education.

Objectives: To assess knowledge regarding oral health among primigravida before and after a nurse-led educational intervention, to evaluate the impact of the intervention, and to determine the association between pre-intervention knowledge and selected demographic variables.

Methods: A pre-experimental one-group pretest-posttest design was used. Two hundred and twenty primigravida in the first trimester of pregnancy were recruited from five private hospitals in Navi Mumbai using non-probability convenient sampling. Oral health knowledge was measured using a self-structured, expert-validated 35-item questionnaire (content validated by 21 experts; test-retest reliability, $r = 0.85$) administered before and eight days after a nurse-led educational session delivered through a presentation, charts, and flashcards. Data were analyzed using descriptive statistics, the paired t-test, and the chi-square test of association.

Results: Mean knowledge scores increased significantly from 13.10 (SD = 2.21) before the intervention to 26.04 (SD = 2.35) afterward ($t(219) = -74.129$, $p < .001$). Before the intervention, 80.0% of participants had poor knowledge and none had good knowledge; afterward, 84.5% had good knowledge and 11.8% had very good knowledge. Pre-intervention knowledge was significantly associated with age ($\chi^2 = 19.23$, $p = .023$) and occupation ($\chi^2 = 18.43$, $p = .031$) but not with education, family income, religion, or prior dental visits (all $p > .05$).

Conclusion: A brief, nurse-led educational intervention produced a substantial and statistically significant improvement in oral health knowledge among primigravida. Embedding such interventions in routine antenatal nursing care may help address a widely neglected component of maternal health in India.

Keywords: oral health; primigravida; nurse-led education; antenatal care; knowledge; pregnancy

INTRODUCTION

Pregnancy is not an illness but a physiological state accompanied by wide-ranging hormonal, metabolic, and psychosocial adaptations. Among the more overlooked of these adaptations are changes in oral health. Elevated levels of circulating estrogen and progesterone increase vascular permeability and gingival reactivity, predisposing pregnant women to gingivitis, periodontal disease, gingival hyperplasia, pyogenic granuloma, dental erosion from morning sickness, and xerostomia (Laine, 2015; Taani et al., 2015). These changes typically become apparent by the second trimester and peak around the eighth month, with anterior teeth affected more than posterior teeth.

The consequences of poor maternal oral health extend beyond the mother. A substantial body of literature has linked periodontal disease during pregnancy to adverse obstetric outcomes, including preterm birth, low birth weight, and pre-eclampsia, although findings across studies have not been entirely consistent (Offenbacher et al., 2001; Xiong et al., 2016; López et al., 2016; Michalowicz et al., 2016). Maternal oral flora may also be transmitted to the newborn, increasing the infant's later risk of dental caries (Bogges & Edelstein, 2006).

Despite this evidence, dental care remains one of the most under-utilized components of antenatal services. Multi-state surveys have found that roughly half of pregnant women report a dental problem, yet most do not seek care, partly because of misconceptions about the safety of dental treatment during pregnancy and partly because oral health screening is not embedded in routine antenatal protocols (Lydon-Rochelle et al., 2014; Thomas et al., 2018). In India specifically, oral health checks are not considered a mandatory part of antenatal care, and studies of pregnant women's knowledge and practice have repeatedly documented low awareness of the links between oral health and pregnancy outcomes, particularly among rural, less-educated, and lower-income women (Osman, 2018; Wagh, 2018; Leelavati, 2018).

Nurses, by virtue of their continuous contact with women through antenatal outpatient services, are uniquely positioned to deliver oral health education as part of routine care. A nurse-led educational intervention — a structured, time-limited teaching session using visual aids such as presentations, charts, and flashcards — offers a low-cost, scalable strategy for improving maternal knowledge without requiring additional dental infrastructure. Several intervention studies in India and elsewhere have reported meaningful gains in oral health knowledge following such teaching sessions, though most have been conducted in small or single-site samples (Bansal et al., 2015; Martinez Abreu, 2015).

Given the scarcity of India-specific evidence on nurse-delivered oral health education for first-time pregnant women (primigravida), the present study was undertaken to assess the impact of a nurse-led educational intervention on oral health knowledge among primigravida attending private hospitals in Navi Mumbai.

Objectives

1. To assess the knowledge regarding oral health among primigravida before the nurse-led educational intervention.
2. To assess the knowledge regarding oral health among primigravida after the nurse-led educational intervention.
3. To evaluate the impact of the nurse-led educational intervention on knowledge regarding oral health among primigravida.
4. To determine the association between pre-intervention knowledge scores and selected demographic variables.

Hypotheses

H1: There is a difference between pre- and post-intervention knowledge scores regarding oral health among primigravida, at the 0.05 level of significance.

H2: There is a association between pre-interventional knowledge scores and selected demographic variables, at the 0.05 level of significance.

METHODS

Research Design and Setting

A quantitative, pre-experimental one-group pretest-posttest design was employed (O1 – X – O2), in which each participant served as her own control. The study was conducted at five private hospitals in Navi Mumbai, Maharashtra: Ornate Hospital (Kharghar), New Life Maternity & Children's Hospital (Koparkhairane), Umbarkar Maternity & Nursing Home (Koparkhairane), Archana Maternity & Nursing Home (Koparkhairane), and Satyam Multi-Specialty Hospital (Koparkhairane).

Population and Sample

The target population comprised primigravida attending antenatal outpatient services at the selected hospitals. A sample of 220 primigravida in the first trimester of pregnancy was recruited using non-probability convenient sampling. The sample size was estimated a priori using power analysis, assuming a baseline oral-health-knowledge prevalence of 20%; the originally planned sample of 246 was reduced to 220 because of constraints imposed by the COVID-19 pandemic.

Inclusion criteria: Primigravida in the first trimester of pregnancy who were available at the time of the study and able to read and write in English or Marathi.

Exclusion criteria: Primigravida who declined participation or who had complications of pregnancy.

Instrument

Data were collected using a self-structured knowledge questionnaire developed by the investigator after a review of relevant literature and consultation with subject experts in obstetrics, gynecology, and dentistry. The tool comprised two sections. Section I collected demographic data (age, education, occupation, family income, religion, and prior dental visits during the first trimester) using ten items. Section II consisted of 35 knowledge items covering the physiological changes, complications, and preventive practices related to oral health in pregnancy, distributed across three cognitive domains (60% knowledge, 30% understanding, and 10% application). Each correct response scored 1 point and each incorrect response scored 0, yielding a possible range of 0–35. Total scores were categorized as very poor (0–7), poor (8–14), average (15–21), good (22–28), and very good (29–35).

Validity and Reliability

Content validity was established by submitting the tool to 21 subject experts across obstetrics and gynecology, dentistry, nursing, and biostatistics; 19 experts returned feedback, which was incorporated into the final version. The tool was translated from English into Marathi and back-translated to confirm equivalence. Reliability was established using the test-retest method with 30 participants (not included in the main sample), administered four hours apart, and yielded a Cronbach's alpha coefficient of 0.85, indicating good internal consistency.

Pilot Study

A pilot study was conducted with 10 primigravida among the selected hospitals of Navi Mumbai, to test the feasibility of the tool, the intervention protocol, and the planned statistical analysis. The pilot findings confirmed that the main study was feasible.

Intervention and Procedure

After obtaining institutional ethical approval, permission from hospital authorities, and written informed consent from each participant, the investigator administered the pretest questionnaire (approximately 20 minutes). Participants then received a nurse-led educational intervention lasting 15–20 minutes, delivered through a structured presentation supplemented by charts and flashcards, covering physiological oral changes in pregnancy, associated complications, and preventive oral hygiene practices. The post-test was administered on the eighth day following the intervention using the same knowledge questionnaire.

Ethical Considerations

Approval was obtained from the institutional ethics committee, along with formal permission from the medical authorities of the participating hospitals. Written informed consent was obtained from each participant, and confidentiality of responses was maintained throughout the study.

Data Analysis

Data were analyzed using descriptive statistics (frequency, percentage, mean, and standard deviation) and inferential statistics. The paired t-test was used to compare pre- and post-intervention knowledge scores, and the chi-square test was used to examine associations between pre-intervention knowledge levels and demographic variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Demographic Characteristics of the Sample

Of the 220 primigravida enrolled, the majority (58.2%) were aged 22–26 years, and most (51.8%) had completed graduate-level education. Housewives constituted the largest occupational group (36.4%), and 41.8% of families reported a monthly income of ₹20,001–30,000. Most participants were Hindu (84.1%). Notably, only 2.3% of participants reported having visited a dentist during the first trimester of pregnancy, and among these, information about visiting a dentist had come primarily from social media (60%) and friends (40%), with no participants citing television, magazines, books, or other formal sources.

Table 1. Demographic Characteristics of Participants (N = 220)

Variable	Category	n	%
Age	18–20 years	2	0.9
	20–22 years	52	23.6
	22–26 years	128	58.2
	26 years and above	38	17.3
Education	Professional degree	6	2.7
	Graduate	114	51.8
	Intermediate / diploma	47	21.4
	High school	39	17.7
	Primary school	14	6.4
Occupation	Business	27	12.3
	Private sector	73	33.2
	Government sector	40	18.2
	Housewife	80	36.4
Family income (₹/month)	< 10,000	33	15.0
	10,001–20,000	52	23.6
	20,001–30,000	92	41.8
	> 30,000	43	19.5
Religion	Hindu	185	84.1
	Muslim	16	7.3
	Christian	6	2.7

	Sikh	13	5.9
Dentist visit in 1st trimester	Yes	5	2.3
	No	215	97.7

Knowledge Regarding Oral Health Before and After the Intervention

Before the intervention, most participants demonstrated poor knowledge of oral health during pregnancy: 0.5% had very poor knowledge, 80.0% had poor knowledge, 19.1% had average knowledge, and 0.5% had very good knowledge, with none scoring in the "good" category. Following the intervention, knowledge levels shifted markedly: 3.6% had average knowledge, 84.5% had good knowledge, and 11.8% had very good knowledge, with no participants remaining in the very poor or poor categories.

Table 2. Distribution of Oral Health Knowledge Levels Before and After the Intervention

(N = 220)

Knowledge Level	Score Range	Before, n (%)	After, n (%)
Very poor	0–7	1 (0.5)	0 (0.0)
Poor	8–14	176 (80.0)	0 (0.0)
Average	15–21	42 (19.1)	8 (3.6)
Good	22–28	0 (0.0)	186 (84.5)
Very good	29–35	1 (0.5)	26 (11.8)

The mean knowledge score increased from 13.10 (SD = 2.21) before the intervention to 26.04 (SD = 2.35) afterward, an improvement of nearly 13 points on the 35-point scale.

Impact of the Nurse-Led Educational Intervention

A paired t-test was used to test the hypothesis that the intervention would produce a significant change in knowledge scores. As shown in Table 3, the difference between pre- and post-intervention mean scores was statistically significant, leading to rejection of the null hypothesis and acceptance of the alternative hypothesis that the nurse-led educational intervention was effective in improving oral health knowledge among primigravida.

Table 3. Paired Comparison of Pre- and Post-Intervention Knowledge Scores (N = 220)

Test	Mean	SD	SE	t	df	p
Pretest	13.10	2.21	0.15			
Posttest	26.04	2.36	0.16	-74.13	219	< .001

Association Between Pre-Intervention Knowledge and Demographic Variables

Chi-square tests examined associations between pre-intervention knowledge level and each demographic variable. Significant associations were found for age ($\chi^2 = 19.23$, $p = .023$) and occupation ($\chi^2 = 18.43$, $p = .031$), indicating that pre-intervention knowledge varied meaningfully across these groups. No significant associations

were found for education ($\chi^2 = 11.48$, $p = .489$), family income ($\chi^2 = 8.65$, $p = .471$), religion ($\chi^2 = 1.03$, $p = .999$), prior dentist visit ($\chi^2 = 1.47$, $p = .688$), or source of dental information ($\chi^2 = 1.70$, $p = 1.923$).

Table 4. Association Between Pre-Intervention Knowledge and Demographic Variables (N = 220)

Demographic Variable	χ^2	p	Significance ($\alpha = .05$)
Age	19.23	.023	Significant
Education	11.48	.489	Not significant
Occupation	18.43	.031	Significant
Family income	8.65	.471	Not significant
Religion	1.03	.999	Not significant
Dentist visit (1st trimester)	1.47	.688	Not significant
Source of dental information	1.70	1.923	Not significant

DISCUSSION

This study assessed the impact of a nurse-led educational intervention on oral health knowledge among 220 primigravida attending antenatal services in Navi Mumbai. Consistent with earlier surveys conducted in India and elsewhere, baseline knowledge was low: 80% of participants scored in the "poor" category before the intervention, and only 2.3% had ever visited a dentist during the first trimester, echoing findings from cross-sectional studies of oral health awareness among pregnant women in Chennai (Leelavati, 2018), Assiut, Egypt (Osman, 2018), and Moradabad, Uttar Pradesh (Wagh, 2018), all of which reported substantial gaps in knowledge and dental care utilization, particularly among less-educated and rural participants.

Following the nurse-led educational intervention, mean knowledge scores rose from 13.10 to 26.04, a statistically significant improvement ($t(219) = -74.13$, $p < .001$) that led to rejection of the null hypothesis. This finding is consistent with other Indian intervention studies. Bansal et al. (2015), for example, found that a semi-structured educational session for 198 pregnant women shifted the proportion with poor knowledge from 82% to 10%, with corresponding increases in the average and good knowledge categories. Similarly, Martinez Abreu (2015) reported that an antenatal oral health education program improved knowledge among 40 pregnant women, with most of the gain retained at four-week follow-up. Comparable structured-teaching-programme studies on antenatal care knowledge in Mehsana district and on oral health knowledge among antenatal women in Tarn Taran, Punjab, likewise reported large, statistically significant pre-post score increases using paired t-tests, as did a study of dental-carries-prevention knowledge among pregnant mothers in Kollam district (Kavungal, 2019), where 93.3% of participants achieved good knowledge post-intervention. Taken together, this body of evidence suggests that brief, structured, nurse- or educator-led sessions are a consistently effective strategy for improving oral health knowledge in pregnant populations across diverse Indian settings.

The association analysis found that pre-intervention knowledge varied significantly by age and occupation but not by education, income, religion, or prior dental visits. The significant association with age is broadly consistent with Sood (2017), who reported a significant relationship between age, education, and oral health knowledge among pregnant women in India. The absence of a significant association with education in the present sample may reflect the relatively narrow educational range of the study population, in which more than half of participants had completed graduate-level education.

Strengths and Limitations

Strengths of this study include its relatively large sample size, use of a content-validated and reliable instrument, and a structured intervention protocol. However, several limitations should be noted. The one-group pretest-posttest design lacks a control group, so improvements cannot be fully attributed to the intervention alone and

may be influenced by testing effects or maturation. Non-probability convenient sampling from five private hospitals in a single urban area limits generalizability to rural populations or public-sector antenatal settings. Knowledge, rather than attitude or practice, was the sole outcome measured, and the eight-day follow-up does not indicate whether gains in knowledge were sustained over the remainder of pregnancy.

Implications for Nursing Practice

These findings support integrating brief, structured oral health education into routine antenatal nursing care. For nursing education, oral health during pregnancy warrants stronger representation in maternal and child health curricula so that future nurses recognize its relevance to both maternal and neonatal outcomes.

For nursing administration, antenatal outpatient departments could incorporate routine oral health counseling and documentation of oral health status within antenatal case records, potentially in collaboration with dental services. For nursing research, the scarcity of India-specific trials in this area, combined with the consistently positive findings reported here and in comparable studies, points to a need for larger, multi-site, and controlled trials to strengthen the evidence base.

CONCLUSION

Oral health remains an under-recognized dimension of antenatal care in India. This study demonstrated that a brief nurse-led educational intervention produced a significant and substantial improvement in oral health knowledge among primigravida, with pre-intervention knowledge also varying significantly by age and occupation. Given its low cost and feasibility within existing antenatal nursing workflows, this type of intervention represents a practical strategy for improving maternal oral health awareness and warrants wider adoption and further controlled evaluation.

Recommendations for Future Research

Future studies could replicate this work with larger and more diverse samples, including rural populations, using a randomized controlled design with a comparison group.

Research is also needed to evaluate the long-term retention of knowledge gains, the translation of knowledge into oral hygiene practices and dental care-seeking behavior, and the feasibility of nurse-dentist collaborative models for antenatal oral health promotion.

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