

Influence of oral health literacy on knowledge and attitude towards children's oral health among pregnant women in Malaysia

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ABSTRACT

Introduction: Health literacy is an independent predictor of health outcomes, including health knowledge and behavior. This study determined the influence of oral health literacy on knowledge and attitude towards children's oral health among pregnant women.

Materials and Methods: A total of 130 pregnant women (65 nulliparous and 65 primiparous or multiparous) attending Hospital Universiti Sains Malaysia for antenatal care who did not have any diagnosed cognitive disorders and could read and write in the Malay language participated in this cross-sectional study. A structured self-administered questionnaire was used to measure knowledge and attitude towards children's oral health, and the Malay version of the Oral Health Literacy Instrument (OHLI-M) was used to assess the oral health literacy of the participants.

Results: Multivariable linear regression analysis showed that older women and women with higher OHLI-M scores had higher mean knowledge scores than younger women ($p=0.007$) and women with lower OHLI-M scores ($p=0.001$), respectively. In addition, women with higher OHLI-M scores, women with higher mean knowledge scores, and women who had attended a talk about children's oral health were more likely to have higher mean attitude scores than women with lower OHLI-M scores ($p=0.019$), women with lower mean knowledge scores ($p=0.006$), and women who had never attended a talk about children's oral health ($p=0.001$).

Conclusion: Pregnant women's oral health literacy was positively associated with their oral health knowledge and attitude towards children's oral health. Strategies to improve the oral health literacy of pregnant women are indicated.

KEYWORDS:

Oral health; health literacy; knowledge; attitude; pregnant women

INTRODUCTION

Dental caries is one of the most prevalent chronic childhood diseases.¹ The Global Burden of Disease Study 2017 estimated that dental caries affect the deciduous teeth of more than 530 million children worldwide.² The global burden of dental caries has remained relatively unchanged over the past 30 years, although many countries have reported declining

prevalence.³ In Malaysia, caries prevalence in 12-year-old children and 5-year-old children is relatively high, despite the decline from 41.5% in 2007 to 33.3% in 2017 and from 76.2% in 2005 to 71.3% in 2015, respectively.⁴⁻⁷

Dental caries is largely preventable, and oral health literacy is a critical concept in oral disease prevention. Oral health literacy is the 'degree to which individuals have the capacity to obtain, process, and understand basic oral health information and services needed to make appropriate health decisions'.⁸ Low or inadequate oral health literacy has been associated with poor oral health awareness and knowledge,^{9,10} which may contribute to compromised oral health behavior and outcomes.^{11,12}

Young children are incapable of taking care of their oral health. Hence, the responsibility lies with their parents or guardians. Parental oral health literacy has been demonstrated to be an important determinant of children's oral health.¹³ The proposed explanation for this association is that parents with low oral health literacy may have limited knowledge about children's oral health or have difficulty understanding oral health care instructions, leading to poor adherence to preventive oral health behavior.¹⁴ Nevertheless, the evidence was inconclusive due to the limited number of studies and methodological issues inherent in epidemiologic research,¹⁵ indicating the need for further studies to strengthen the evidence.

Mothers play an important role in their children's health and development. A mother is also a child's first teacher and has the responsibility of passing health-related knowledge to her child and modelling appropriate health behaviors to the family.¹⁶ Recognizing these roles, many health authorities worldwide, including Malaysia, developed specific oral health care programs for antenatal mothers to optimize their potential roles in improving the oral health status of their families.^{17,18} The potential link between oral health literacy and oral health knowledge underlined the need to investigate this association in pregnant women. The findings will provide baseline information that can help restructure the oral health care program for antenatal mothers aimed at improving the oral health status of children. In this study, we investigated the influence of oral health literacy on the knowledge and attitude of pregnant women towards children's oral health.

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MATERIALS AND METHODS

Study design and study population

This was a cross-sectional study of pregnant women attending the Obstetrics & Gynecology (O&G) Clinic at the Hospital Universiti Sains Malaysia (USM). Located in the state of Kelantan, northeast of Peninsular Malaysia, Hospital USM is a teaching hospital that supports the role of the Ministry of Health Malaysia to provide basic and specialized medical and health care services, including antenatal care, without charge to the public. Pregnant women at any gestational age, without any diagnosed cognitive disorders, who were able to read and write in the Malay language, were eligible to participate.

The sample sizes for all specific objectives of this study were calculated, and the largest affordable sample size was obtained from the objective of determining the oral health literacy of pregnant women using the formula to estimate a single mean with a 95% confidence interval (CI). The standard deviation of the mean oral health literacy score was estimated at 15.64 based on a study by Ramlay et al.¹⁹ At a precision of 3.0, the largest affordable sample size of 104 was yielded. Anticipating a 25% non-response rate, a sample size of 130 was selected. Ethical approval for this study was obtained from the Universiti Sains Malaysia Human Research and Ethics Committee (USM/JEPeM/18110744).

Research tools

A new self-administered questionnaire was developed to measure knowledge and attitude towards children's oral health. The questionnaire was developed in Malay. The knowledge domain consists of 30 items to assess knowledge of the following: tooth development and eruption (two items), dental plaque (one item), dental caries and its risk factors (six items), foods and drinks with a high potential to cause dental caries (14 items), oral hygiene practice (four items), and fluoride in caries prevention (three items). The response format for the knowledge domain was close-ended options of 'true', 'false', and 'do not know'. Correct answers were given one mark, while the incorrect and 'do not know' responses received no mark. The total knowledge score can range from 0 to 30, with higher scores indicating better knowledge.

The attitude domain has 12 items to assess the following: importance of primary/permanent teeth (five items), oral hygiene practice (four items), feeding/dietary practice (two items), and dental visit (one item). Each item was ranked on a 5-point Likert scale of 1 (strongly disagree), 2 (disagree), 3 (neither agree nor disagree), 4 (agree), and 5 (strongly agree). Marks of 1 to 5 were given accordingly, except for the negatively worded attitude statements that were re-coded in the reverse direction so that a higher mark on each item indicated a better attitude. Thus, the total attitude scores can range from 12 to 60, with higher scores indicating a better attitude.

The pre-final draft of the questionnaire was tested on a convenience sample of 30 parents who brought their children to the Hospital USM Dental Clinic for treatment. Feedback was generally favorable and only minor technical editing was indicated. The time taken to complete the questionnaire

was between 10 and 15 minutes. The questionnaire had a good internal consistency reliability coefficient, with a Cronbach's alpha of 0.795. The knowledge domain had an excellent internal consistency reliability coefficient, with a Cronbach's alpha of 0.943. However, Cronbach's alpha for the attitude domain was lower at 0.609, most probably due to the small number of items in the domain and the effect of three negatively directed items.

A validated Malay version of the Oral Health Literacy Instrument (OHLI-M)¹⁹ was used to assess the oral health literacy of the participants, a factor hypothesized to be associated with knowledge and attitude of the pregnant women towards children's oral health. The instrument consists of two sections: a self-administered reading comprehension section and an interviewer-administered numeracy section. The reading comprehension section includes two passages, one on dental caries with 18 words omitted from the sentences and the other on periodontal disease with 20 omitted words. These 38 omitted words were the test items, and participants had to choose the correct answer from four possible choices given.

The numeracy section consists of a series of prompts: five prescription labels of medications frequently prescribed by dentists, one dental appointment card, and one printed post-extraction instructions. There were 19 test items in this section. Each correct answer was given one mark, and incorrect or missing answers were given no mark. The total score for the reading comprehension section was multiplied by 1.316 (50/38) and the total score for the numeracy section was multiplied by 2.632 (50/19). The total OHLI-M scores can range from 0 to 100. The score was categorized into three levels of oral health literacy: inadequate (0–59), marginal (60–74), and adequate (75–100), as recommended by Sabbahi et al.²⁰ who developed the original English version of the Oral Health Literacy Instrument (OHLI).

Additionally, a structured self-administered sociodemographic form was used to collect information on the demographic profile of the participants (age, highest education level, employment status, and monthly household income), number of children, last dental visit, and experience of attending a talk about children's oral health.

Data collection

To minimize selection bias, we stratified the study population by parity status and used non-proportionate stratified random sampling to obtain equal numbers of samples from the strata: 1) 65 pregnant women who had never given birth (nulliparous) or were pregnant for the first time (primigravida), and 2) 65 pregnant women who had given birth at least once (primiparous or multiparous). Potential participants who came for antenatal care appointment at the O&G Clinic were individually approached by the main author. Following the establishment of eligibility, systematic random sampling was used to select participants from each stratum. Women were informed of the importance, objectives, procedures, and other essential information regarding this study. Written informed consent was obtained from all women who agreed to participate. Further

instructions on how to complete the questionnaires were provided prior to the administration, which began with the self-administered questionnaires including the reading comprehension section of the OHLI-M, followed by the interviewer-administered numeracy section of the OHLI-M.

Statistical analysis

Data analysis was conducted using IBM SPSS software, version 24.0. Descriptive statistical analysis was performed to obtain the frequency and percentage of categorical variables and the mean and standard deviation of numerical variables. Factors associated with participants' oral health knowledge (mean knowledge score) and oral health attitude (mean attitude score) were determined at univariable and multivariable levels using simple and multiple linear regression analyses, respectively. The following independent variables were tested: age, highest education level, employment status, monthly household income, number of children, last dental visit, experience of attending a talk about children's oral health, and oral health literacy (OHLI-M score). In addition, the participants' mean knowledge score was tested as a potential factor associated with their oral health attitude (mean attitude score).

In multiple linear regression analysis, variables were selected using forward selection, backward elimination, and stepwise selection methods. Following the fit of the preliminary main effect model, the independent variables were examined for two-way interactions using the LR test and multicollinearity issues using the variance inflation factor (VIF) test. A VIF value of more than 10 indicated the presence of multicollinearity.²¹ Residual plots were examined for linearity, normality, and equal variance to validate the regression model. Outliers were also identified; data points beyond +3.0 and -3.0 of standardized residuals were considered outliers.²² The final model was presented with adjusted regression coefficients and 95% CIs, t-statistics, and p values. The level of significance was set at p value of less than 0.05.

RESULTS

Characteristics of participants

A total of 130 women (65 from each stratum) participated and completed the questionnaires, with a response rate of 100%. Table I shows the characteristics of the study participants. The ages of the participants ranged from 19 to 44 years, with a mean age of 30.3 years (SD=5.37). Most participants received at least post-secondary education (73.1%) and more than half (54.6%) were employed. Parity status of the women corresponded to the number of children. More than half (63.8%) had visited dentists within the past year, and slightly more than half (53.8%) had attended a talk about children's oral health. Slightly more than half of the participants had adequate oral health literacy (56.9%), followed by marginal (30.8%), and inadequate oral health literacy (12.3%). The mean OHLI-M score was 75.1 (SD=13.74), with the lowest score of 34 and the highest score of 97.

Knowledge towards children's oral health

Table II shows the knowledge towards children's oral health among the participants. Most women knew that a baby's

mouth should be cleaned even though the teeth have not yet erupted (85.4%), that dental plaque can cause dental caries (93.1%), and that a child's teeth should be brushed twice daily (93.8%), particularly before bedtime (90.0%). Most participants also knew that a white spot on the tooth surface is an early sign of dental caries (86.9%), which can be prevented using fluoride toothpaste (87.7%), and they were aware of the appropriate amount of fluoride toothpaste to be used. With regard to caries risk, less than one-third of the women knew that children of mothers with caries are at risk of developing caries themselves (28.5%).

Most women knew that frequent intake of sugary foods (95.4%) and pooling of milk in the mouth (84.6%) could cause dental caries. However, most did not know that fruit juice (56.9%), white bread (60.8%), baby biscuits (44.6%), bananas (64.7%), and dried fruits such as dates (66.9%) and raisins (60.8%) have a high potential to cause dental caries. In addition, some (19.2%) erroneously thought that breast milk was highly cariogenic.

Attitude towards children's oral health

Table III shows the attitude of the participants towards their children's oral health. While more than half of the women agreed (strongly agree=23.1%, agree=34.6%) that permanent teeth will not last a lifetime, most participants had favorable attitude and agreed on the importance of baby teeth (strongly agree=40.0%, agree=53.1%) and the need to brush the newly erupted teeth (strongly agree=38.5%, agree=53.1%) at least twice daily (strongly agree=58.5%, agree=38.4%). Most women also agreed that they needed to bring their child for dental check-up before 1 year of age (strongly agree=30.8%, agree=43.1%).

Factors associated with knowledge towards children's oral health

The mean knowledge score was 19.9 (SD=4.18), with the lowest score of 7.0 and the highest score of 28.0. Table IV shows the results of the linear regression analysis of the factors associated with knowledge towards children's oral health among the participants. Multiple linear regression analysis showed a significant positive relationship between the OHLI-M score and mean knowledge score ($p=0.001$). A one-unit increase in OHLI-M score resulted in 0.09 unit increase in knowledge score (95% CI:0.04-0.14). In addition, older women had higher mean knowledge scores than younger women ($p=0.007$). A 1-year increase in age resulted in 0.18 unit increase in knowledge score (95% CI:0.05-0.30). With these two significant variables, the model explained 14.9% of the variance in knowledge score ($R^2=0.149$). The possible two-way interactions between the independent variables were not significant, and there was no multicollinearity issue. All model assumptions were met, and no outliers were detected.

Factors associated with attitude towards children's oral health

The mean attitude score was 48.1 (SD=4.99) with the lowest score of 34.0 and the highest score of 59.0. Table V shows the results of the linear regression analysis of factors associated with attitude towards children's oral health among the participants. Multiple linear regression analysis showed a significant positive relationship between mean OHLI-M and attitude scores ($p=0.019$). A one-unit increase in the OHLI-M score resulted in 0.07-unit increase in the attitude score (95%

Table I: Characteristics of participants (n=130)

Variable	Frequency (%)
Age (year)	30.3 (5.37) ^a
Highest education level	
No formal education/primary/secondary	35 (26.9)
Post-secondary	51 (39.2)
Tertiary	44 (33.9)
Employment status	
No	59 (45.4)
Yes	71 (54.6)
Monthly household income (MYR)	2500.00 (2650.00) ^b
Number of children	
None	65 (50.0)
At least one child	65 (50.0)
Last dental visit	
Never visited dentist	3 (2.3)
>2 years	20 (15.4)
1-2 years	24 (18.5)
<1 year	83 (63.8)
Ever attended oral health talk	
No	60 (46.2)
Yes	70 (53.8)
Oral health literacy level	
Inadequate	16 (12.3)
Marginal	40 (30.8)
Adequate	74 (56.9)

^a Mean (SD)

^b Median (IQR)

Table II: Knowledge towards children's oral health (n=130)

Variable	Frequency (%)		
	Correct	Incorrect	Do not know
Calcium intake during pregnancy helps in the formation of strong teeth	126 (96.9)	1 (0.8)	3 (2.3)
The first baby tooth will erupt at the age of 6–9 months	106 (81.5)	6 (4.6)	18 (13.9)
Plaque is a white layer containing bacteria that accumulates on tooth surface	121 (93.1)	2 (1.5)	7 (5.4)
Plaque can cause dental caries	121 (93.1)	0 (0.0)	9 (6.9)
Frequent intake of sugary foods can cause dental caries	124 (95.4)	0 (0.0)	6 (4.6)
Children are at risk of dental caries if they fall asleep with milk pooling in the mouth	110 (84.6)	5 (3.9)	15 (11.5)
Tooth decay can affect children below 2 years of age	84 (64.6)	12 (9.2)	34 (26.2)
Early sign of caries can be seen as a white spot on the tooth surface	113 (86.9)	3 (2.3)	14 (10.8)
Children of mothers with caries are at risk of developing caries themselves	37 (28.5)	44 (33.8)	49 (37.7)
Foods or drinks with high potential to cause dental caries:			
Formula milk	97 (74.6)	16 (12.3)	17 (13.1)
Breast milk	77 (59.2)	25 (19.2)	28 (21.6)
Fruit juice	56 (43.1)	39 (30.0)	35 (26.9)
Fortified drink	101 (77.7)	8 (6.2)	21 (16.1)
White bread	51 (39.2)	43 (33.1)	36 (27.7)
Chocolate	113 (86.9)	7 (5.4)	10 (7.7)
Baby biscuits	72 (55.4)	29 (22.3)	29 (22.3)
Bananas	46 (35.3)	50 (38.5)	34 (26.2)
Dates	43 (33.1)	54 (41.5)	33 (25.4)
Peanuts	31 (23.9)	58 (44.6)	41 (31.5)
Sweets	119 (91.5)	7 (5.4)	4 (3.1)
Cheese	18 (13.8)	87 (66.9)	25 (19.2)
Raisins	51 (39.2)	44 (33.9)	35 (26.9)
Sticky dessert	105 (80.8)	7 (5.4)	18 (13.8)
A baby's mouth should be cleaned even though the teeth have not yet erupted	111 (85.4)	12 (9.2)	7 (5.4)
Dental plaque can be removed with toothbrushing	88 (67.7)	27 (20.8)	15 (11.5)
A child's teeth should be brushed twice daily	122 (93.8)	4 (3.1)	4 (3.1)
Brushing before bedtime is essential	117 (90.0)	9 (6.9)	4 (3.1)
Fluoride toothpaste can be used to prevent dental caries	114 (87.7)	5 (3.8)	11 (8.5)
Only a smear of fluoride toothpaste is needed to brush teeth of children below 3 years old	99 (76.2)	7 (5.4)	24 (18.4)
Only a pea size of fluoride toothpaste is needed to brush teeth of children above 3 years old	97 (74.6)	7 (5.4)	26 (20.0)

Table III: Attitude towards children’s oral health (n=130)

Variable	Frequency (%)				
	Strongly agree	Agree	Neither agree nor Disagree	Disagree	Strongly disagree
Baby teeth are important	52 (40.0)	69 (53.1)	3 (2.3)	6 (4.6)	0 (0.0)
Carious baby teeth need not be given attention	8 (6.2)	13 (10.0)	8 (6.2)	66 (50.7)	35 (26.9)
Baby's teeth need not be given a good care as they will be replaced by permanent teeth	10 (7.7)	21 (16.2)	7 (5.4)	66 (50.7)	26 (20.0)
Premature loss of baby teeth due to caries can affect the normal eruption of the permanent teeth	41 (31.6)	61 (46.9)	19 (14.6)	9 (6.9)	0 (0.0)
Permanent teeth will not last a lifetime	30 (23.1)	45 (34.6)	19 (14.6)	34 (26.2)	2 (1.5)
A baby's mouth needs to be cleaned even though the teeth have not yet erupted	68 (52.3)	49 (37.7)	6 (4.6)	7 (5.4)	0 (0.0)
I need to brush my child’s newly erupted teeth	50 (38.5)	69 (53.1)	6 (4.6)	5 (3.8)	0 (0.0)
I need to make sure my child brushes teeth at least twice daily	76 (58.5)	50 (38.4)	4 (3.1)	0 (0.0)	0 (0.0)
I need to supervise my child’s toothbrushing	76 (58.5)	53 (40.7)	1 (0.8)	0 (0.0)	0 (0.0)
I need to encourage my child to drink from a cup by one year of age	27 (20.8)	59 (45.4)	25 (19.2)	19 (14.6)	0 (0.0)
I need to make sure my child does not take sweet and sticky foods	70 (53.8)	50 (38.5)	6 (4.6)	3 (2.3)	1 (0.8)
I need to bring my child for dental check-up before one year of age	40 (30.8)	56 (43.1)	25 (19.2)	9 (6.9)	0 (0.0)

Table IV: Factors associated with knowledge towards children’s oral health (n=130)

Variable	Simple linear regression		Multiple linear regression		
	Crude <i>b</i> (95% CI)	<i>p</i> value	Adjusted <i>b</i> (95% CI)	t-statistics	<i>p</i> value
Age (year)	0.20 (0.07, 0.33)	0.004	0.18 (0.05, 0.30)	2.76	0.007
Highest education level					
No formal education/primary/secondary*					
Post-secondary/tertiary	0.68 (-0.95, 2.32)	0.410	-	-	-
Employment status					
No*					
Yes	1.18 (-0.27, 2.63)	0.109	-	-	-
Monthly household income (MYR)	0.00 (0.00, 0.00)	0.001	-	-	-
Number of children					
None*					
At least one child	1.74 (0.31, 3.16)	0.017	-	-	-
Last dental visit					
>1 year/never*					
≤1 year	-0.32 (-1.84, 1.19)	0.674	-	-	-
Ever attended oral health talk					
No*					
Yes	0.37 (-1.09, 1.83)	0.615	-	-	-
OHLI-M score	0.10 (0.05, 0.15)	<0.001	0.09 (0.04, 0.14)	3.56	0.001

*Reference category

Table V: Factors associated with attitude towards children’s oral health (n=130)

Variable	Simple Linear Regression		Multiple Linear Regression		
	Crude <i>b</i> (95% CI)	<i>p</i> value	Adjusted <i>b</i> (95% CI)	t-statistics	<i>p</i> value
Age (year)	0.16 (0.00, 0.32)	0.044	-	-	-
Highest education level					
No formal education/primary/secondary*					
Post-secondary/tertiary	1.90 (-0.03, 3.83)	0.054	-	-	-
Employment status					
No*					
Yes	1.58 (-0.14, 3.30)	0.072	-	-	-
Monthly household income (MYR)	0.00 (0.00, 0.00)	0.004	-	-	-
Number of children					
None*					
At least one child	2.42 (0.73, 4.10)	0.005	-	-	-
Last dental visit					
>1 year/never*					
≤1 year	1.32 (-0.47, 3.12)	0.147	-	-	-
Ever attended oral health talk					
No*					
Yes	2.66 (0.98, 4.34)	0.002	2.75 (1.17, 4.34)	3.44	0.001
OHLI-M score	0.09 (0.03, 0.15)	0.004	0.07 (0.01, 0.13)	2.38	0.019
Knowledge score	0.37 (0.17, 0.57)	<0.001	0.28 (0.08, 0.48)	2.78	0.006

*Reference category

CI:0.01-0.13). Women with higher mean knowledge scores also had higher attitude scores ($p=0.006$). In particular, a one-unit increase in knowledge score resulted in a 0.28-unit increase in attitude score (95% CI:0.08-0.48). Another factor found to be significant was the experience of attending a talk about children's oral health. Women who had attended the talk had a higher mean attitude score than those who had not ($p=0.001$). In particular, the attitude score of women who had attended the talk was 2.75-unit higher than those who did not (95% CI:0.17-4.34). With these three significant variables, the model explained 19.7% of the variance in knowledge score ($R^2=0.197$). The possible two-way interactions between the independent variables were not significant, and there was no multicollinearity issue. All model assumptions were satisfied, and no outliers were detected.

DISCUSSION

Our findings provide evidence supporting the hypothesis that pregnant women with higher oral health literacy are more likely to have better knowledge towards children's oral health. These results are in agreement with those reported by Hom et al.¹⁰ in North Carolina, United States, Vilella et al.^{9,23} in Brazil, and Muralidharan et al.²⁴ in Pune, India. Additionally, we found that older women had higher mean knowledge scores than those who were younger, in agreement with other previous studies among pregnant women and mothers of newborn babies.^{25,26} The positive association between the women's age and their oral health knowledge may be due to greater exposure to oral health information from previous experience attending to personal oral health care needs and problems, as well as others.

In this study, pregnant women with higher oral health literacy levels were also more likely to have favorable attitude towards their children's oral health. Previous studies on oral health literacy among pregnant women have not examined the influence of maternal oral health literacy on attitude towards children's oral health.^{9,10,23,24} Hence, a direct comparison of this finding to previous studies could not be made. Our study also found that women who had attended a talk about children's oral health and had better knowledge about it were more likely to have favorable attitude towards the matter. These findings underline the benefits of oral health education for pregnant women and substantiate the importance of oral health education as an indispensable strategy in antenatal oral health programs to improve attitude, which has been shown to be an important predictor of preventive oral health behavior.²⁷

Prevention of dental caries requires the recognition and reduction of risk factors. Most pregnant women in this study were aware that dental plaque is a white layer of bacteria that can cause dental caries. In addition, most participants could correctly answer most questions about tooth brushing and the use of fluoride in caries prevention and knew that a baby's mouth should be cleaned even though the teeth have not yet erupted. Although there is no evidence that pre-eruptive mouth cleaning can prevent dental caries, this practice is recommended by most professional dental organizations.²⁸

Despite knowing that frequent intake of sugary foods can cause dental caries, a substantial percentage of the participants were not aware that some foods and drinks commonly given to children, including fruit juice, white bread, baby biscuits, bananas, dates, and raisins are cariogenic. In addition, some of the participants in this study incorrectly believed that breast milk has a high potential to cause caries. Breast milk has low cariogenic potential.²⁹ Current evidence indicates that breastfeeding does not increase the risk of dental caries.³⁰ Breast milk is considered the best food for infants due to its ability to provide complete nutrients and bioactive components needed for the first year of life, and the World Health Organization recommends that infants are exclusively breastfed for the first 6 months of life, with continuation of breastfeeding for 1 year or longer as complementary foods are introduced.³¹ Nevertheless, appropriate preventive measures must be taken so that the benefits of breastfeeding are not jeopardized by the increased risk for caries due to improper feeding habit.³² It is good to note that most women in this study were aware that children are at risk of dental caries if they fall asleep while feeding and the milk pools in the mouth.

Children whose mothers or primary caregivers have active caries are at high risk of having caries themselves, attributed to poor oral health behavior of the mothers or caregivers.^{33,34} In this study, less than one-third of the participants knew about the link between the mother's caries experience and the child's risk for caries. Pregnant women should be aware that their oral health status is a strong predictor of their children's oral health status. In relation to the roles and protective nature of a mother, this awareness may positively influence women's personal oral health care behavior and how they care for their child's oral health.¹⁶ Studies have shown that mothers or parents with good oral health behavior will transfer appropriate oral health beliefs, values, and habits to their children.^{34,35}

Dental caries can be successfully reversed or treated during its early stages.³⁶ A non-cavitated white spot on the tooth surface is an early sign of caries, indicating loss of minerals from the enamel.³⁷ At this initial stage in the caries process, good plaque control with the use of fluoride dentifrice and topical fluoride application by dental professionals can arrest or reverse the caries progression by remineralization of the enamel surface.³⁶ Regular inspection of the teeth by mothers at home using the lift-the-lip technique to detect the lesion, followed by prompt dental visits for professional evaluation and/or management can prevent unnecessary complications.³⁸ Most women in our study knew that a white spot lesion is an early sign of caries.

Most pregnant women in our study had favorable attitude towards the importance of deciduous teeth and their care. However, it is important to note that more than half of the women agreed that permanent teeth would not last a lifetime. This misperception was common. A study in Iran reported that more than 70% of mothers of 9-year-old primary school children agreed that it is natural for people to lose all their teeth in old age.³⁹ The misperception that losing teeth is a natural consequence of the aging process is a fatalistic attitude. Mothers may communicate this erroneous belief to their children who will take on the values, resulting

in a continual lack of a perceived need for oral healthcare, including efforts to prevent oral diseases.

Our study adds to the growing body of evidence supporting the link between oral health literacy and oral health knowledge. We believe that our study is perhaps the first to report an association between maternal oral health literacy and attitude towards children's oral health, another important health-mediating variable that has not been examined in previous studies among pregnant women.^{9,10,23,24} In this study, we used the OHLI-M, a functional oral health literacy instrument that was able to assess not only the ability of women to read and understand written information, but also to understand instructions requiring basic mathematical operations.^{19,20} Most previous studies assessing the oral health literacy of pregnant women used the Rapid Estimation of Adult Literacy in Dentistry (REALD-30) instrument or its translated versions.^{9,10,23,24} The REALD-30 measures the ability of a person to correctly pronounce a list of 30 oral health-related words arranged in increasing order of reading difficulty. The main drawback of the REALD-30 is that it evaluates only word recognition and reading skills that may not reflect the functional literacy of respondents.⁸ In this study, in addition to controlling for the confounding effect of parity on the knowledge and attitude of the women at the study design stage using stratified sampling, multiple regression analysis was conducted to control the effects of other potential confounding variables including age, highest education level, employment status, monthly household income, last dental visit, and experience of attending a talk about children's oral health.

Nevertheless, this study has a limitation that relates to the inherent issue of using a self-administered questionnaire, which is a subjective outcome depending on the participants' motivation, honesty, memory, and ability to respond.⁴⁰ In addition, we could not establish a cause-and-effect relationship due to the non-temporal nature of the cross-sectional design used. This study was performed at a single hospital, which may compromise the extent to which the study results can be generalized to the larger population.

CONCLUSION

Our findings support the hypothesis that the oral health literacy of pregnant women is positively associated with their oral health knowledge and attitude towards children's oral health. These findings have important implications for strategies aimed at improving the oral health of children. Only slightly more than half of the pregnant women in our study had adequate oral health literacy. Hence, a well-planned program using well-designed and easy-to-understand oral health education materials is recommended. To ensure that women with lower oral health literacy will also benefit from the educational intervention, it is recommended that the readability and suitability of the oral health education materials be assessed accordingly prior to intervention.

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