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Is There Any Association Between Health Literacy Level, Periodontal Status, and Adverse Pregnancy Outcomes in Pregnant Women?

Hamilelerin Sağlık Okuryazarlığı Seviyeleri ile Periodontal Durumları ve İstenmeyen Hamilelik Sonuçları Arasında İlişki Var mı?

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ABSTRACT

Objective: As a part of general health, the periodontal health status of the pregnant women is not only important for pregnancy but also utmost for antenatal and postnatal life of a fetus. This study aimed to determine the health literacy level of pregnant women and to demonstrate the association between health literacy level, periodontal status, and adverse pregnancy outcomes compared to nonpregnant women.

Methods: A total of 216 participants (pregnant/nonpregnant=104/112) were included in this cross-sectional study. Health literacy level was determined using a self-completed Turkish Health Literacy Scale, 32-item questionnaire. Plaque index, gingival index, bleeding on probing, probing depth, and clinical attachment level were recorded. The records of pregnant women were evaluated for preeclampsia, preterm delivery, and low birthweight. Statistical significance was set at $P < .05$.

Results: The health literacy level, plaque index, gingival index, and bleeding on probing values were higher in pregnant women ($P=.022$, $P=.007$, and $P=.034$ respectively). While a positive correlation was observed between health literacy level and birthweight, a negative one was found between periodontal parameters, either birthweight or birth week ($P<.05$). Nevertheless, there was not any association between health literacy level and periodontal parameters ($P>.05$).

Conclusion: Our results showed that health literacy level was higher in pregnant women without any effects on periodontal status. Given the unique conditions of pregnancy, our study provides remarkable data that may help establish oral health care during pregnancy routinely for both pregnant women and caregivers.

Keywords: Health literacy, maternal health, periodontal status, periodontal indices, pregnancy outcomes

ÖZ

Amaç: Genel sağlığın bir parçası olan periodontal sağlık, gebelerde sadece gebeler için değil, fetüsün antenatal ve postnatal yaşamı için de son derece önemlidir. Bu çalışmanın amacı, gebe kadınların sağlık okuryazarlık (SOY) düzeyini belirlemek ve gebenin SOY düzeyi ile periodontal durumu ve istenmeyen gebelik sonuçları arasındaki ilişkiyi araştırmaktır.

Gereç ve Yöntem: Bu kesitsel çalışmaya toplam 216 katılımcı (gebe/gebe olmayan=104/112) dahil edildi. SOY düzeyleri, katılımcılar tarafından doldurulan Türkiye SOY Ölçeği-32 kullanılarak belirlendi. Katılımcılardan plak indeks (PI), gingival indeks (GI), sondalamada kanama (SK), sondalama derinliği (SD) ve klinik ataşman seviyesi (KAS) klinik parametreleri kayıt altına alındı. Gebelerin rutin jinekolojik kayıtları preeklampsi, erken doğum ve düşük doğum ağırlığı açısından değerlendirildi. İstatistiksel anlamlılık p<.05 olarak belirlendi.

Bulgular: Gebelerde SOY, GI ve SK değerleri daha yüksekti (sırasıyla, $P=.022$, $P=.007$, $P=.034$). SOY ile doğum ağırlığı arasında pozitif bir korelasyon gözlenirken, periodontal parametreler ile

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hem bebeğin doğum ağırlığı hem de doğum haftası arasında negatif yönlü bir ilişki bulundu (P <.05). Bununla birlikte, SOY ile periodontal parametreler arasında herhangi bir ilişki yoktu (P >.05).

Sonuç: Bulgularımız, SOY'un gebelerde daha yüksek olduğunu ancak bu yüksekliğin periodontal duruma herhangi bir etkisinin olmadığını göstermiştir. Gebeliğin kendine özgü koşulları göz önüne alındığında, çalışmamız hem gebeler hem de bakıcılar için gebelikte ağız sağlığı bakımının rutin olarak oluşturulmasına yardımcı olabilecek dikkate değer veriler sunmaktadır.

Anahtar Kelimeler: Anne sağlığı, hamilelik sonuçları, sağlık okur yazarlığı, periodontal durum, periodontal indeksler

INTRODUCTION

Health literacy (HL) can be described as "the ability of people to use, process, and understand basic health-related information and services to make educated medical decisions."[1] According to the comprehensive definition, "HL is linked to literacy and requires people's knowledge, motivation, and skills. Similarly, they can access, understand, evaluate, and act on this information to make daily decisions. As a result, people can help prevent disease and promote health to maintain or improve quality of life throughout their life."[2] Low level of HL is a global problem that requires attention, as the World Health Organization presents HL as one of the most critical determinants of health.

Considering the well-documented outcomes that HL affects individual's accessibility to healthcare services/providers and overall health status; it can be anticipated that low levels of HL is associated with both insufficient self-care habits and mortality. Low levels of HL lead to an increased incidence of disease and thus a global burden on the economy.[2,3] The first survey on HL in 8 European countries showed that approximately 47% of the population in these countries had low levels of HL.[4] Inadequate or limited HL is a widespread problem also in Turkey, with studies reporting that 52%-82% of adults have basic or below-average HL skills.[5,6] In Greece and Bulgaria, which border Turkey, inadequate and problematic levels of HL are 45% and 62%, respectively.[4]

HL is essential in several target populations, such as pregnant women. This term is considered a critical component that allows women to participate in self-care and childcare activities.[7] Before, during, and after pregnancy, a mother's medical conditions and health knowledge significantly affect her child.[8] Research has shown that women with suboptimal HL have a poor understanding of medical instructions and medication labels and do not take their medications properly.[9] In addition, previous studies have shown that low levels of HL is associated with unplanned pregnancies and negatively affects women's health care and child care.[3,10] Research on HL during pregnancy is limited in the literature.[11,12] A recent large-scale study of HL conducted in 775 pregnant women found that 15.5% of the participants had inadequate, 41.7% had borderline, and 42.8% had adequate HL.[13]

Pregnancy-related immunological changes increase the mother's susceptibility to infections, including periodontal disease. Periodontal diseases can increase the risk of adverse pregnancy outcomes such as preeclampsia, preterm birth, and low birthweight (LBW).[13] Thanks to this bidirectional relationship between periodontal disease and pregnancy, periodontal health is paramount for overall health. Moreover, based on the fact that the mother is a role model for the baby in terms of oral hygiene requirements, it can be stated that pregnant women have an important place in the establishment of the concept of periodontally healthy society.

In this study, it was assumed that HL in pregnant women has a positive effect on decision-making regarding both maternal and child health care. Therefore, this research evaluated HL levels (HLLs) in pregnant women, outlined the relationship between HL, periodontal status, and adverse pregnancy outcomes, and compared the results with nonpregnant individuals.

MATERIAL AND METHODS

The Ethics Committee for Non-Interventional Clinical Research of İstanbul Aydın University (Date: 14.02.2019, Number: 2019/40) approved this descriptive, cross-sectional study design according to the principles outlined in the World Medical Association Declaration of Helsinki. Also, all participants were informed about the study and informed consent forms were obtained before the baseline.

Study Population and Sample Size

The sample size was calculated based on the clinical outcome of a similarly designed study.[14] Gingival index (GI), described below as a variable, was evaluated as the primary outcome of the study. Seventy-two subjects per group would provide 85% power to detect a true difference of 0.99 in mean GI between groups with a 0.32 mean SD. The study included 104 pregnant women (aged 23-37 years) in their second trimester and 112 nonpregnant (aged 21-40 years) participants between July 2020 and December 2020. The participants in the both study groups were fulfilled the inclusion criteria were as follows: (1) being native Turkish speakers; (2) being systemically healthy; (3) having no previous pregnancies, also, no miscarriage, dilatation and curettage; (4) having a total of ≥20 teeth, except the third molars; (5) having no disability affecting daily self-performed oral care; (6) having no periodontal treatment within the last 6 months; (7) no use of antibiotics, anti-inflammatory drugs, or other drugs affecting the periodontium within the last 6 months; and (8) consent to participate in the study. Pregnancy status is the only inclusion criterion that differentiates the groups. A history of systemic disease or the use of medications that could affect periodontal status was considered as an exclusion criterion.

Data Collection Form and Evaluation of the TSOY-32 Questionnaire

All participants received a 2-part form with questions on age, education level (primary/middle/high/college or university/post graduate), monthly income (low/middle/upper), frequency of brushing (at least once a week/once a day/twice a day), and flossing (yes/no) as the first part.

All patients completed the Turkey Health Literacy Scale, 32-Item Questionnaire (TSOY-32) as the second part of the form. The TSOY-32 was developed by Okyay et al based on the theoretical structure of the European Health Literacy Survey Questionnaire study.[6] This self-report scale with 32 items was developed to

measure the HL of individuals over 15 years of age. Participants' responses were recorded on a 5-point Likert scale ranging from 1 (extremely difficult) to 4 (extremely easy). Code 5 was used for the response "I have no idea." The overall HLL score was calculated using the following formula:

HLL = [(Questionnaire mean − 1) × (50/3)]

The HLL scores, ranging between 0 and 50, were classified according to cutoff points as inadequate (0 < HLL ≤25), problematic limited (25 < HLL ≤33), adequate (33 < HLL ≤42), and excellent (42 < HLL ≤50). Four dimensions of HL in health care, disease prevention, and health promotion were assessed: access/obtain information relevant to health, understand information relevant to health, process information relevant to health, and apply/use information relevant to health.

Clinical Examination Measures

All clinical examinations were performed by a single calibrated examiner (SEM). To assess intraexaminer reliability, whole-mouth probing depth (PD) scores were measured twice 5 days apart in 5 subjects who did not participate in the study. The first and second measurements were 96.80% compatible with each other, and the Cohen's kappa value was 0.95, which means that the strength of agreement is "almost perfect."

Clinical periodontal parameters were recorded at the mesiobuccal, mid-buccal, distobuccal, mesiopalatal, mid-palatal, and distopalatal sites of all teeth present, except the third molars. The parameters consisting of plaque index (PI),[15] GI,[16] bleeding on probing (BoP), PD, and clinical attachment level (CAL) were recorded using a University of North Carolina periodontal probe (PCPUNC15, HuFriedyGroup, Chicago, Ill, USA).

PI, ranging between 0 and 3, ascertains the thickness of microbial dental plaque along the gingival margin. The 6 aforesaid sites were scored for PI. The PI level of a patient is defined as the mean value of the sum of given scores.[15] The interpretation of the PI scores is as follows:

0: No plaque

1: A thin plaque layer at the gingival margin, only detectable by scraping with probe. Undetectable with naked eyes.

2: Moderate layer of plaque detectable with naked eyes.

3: Abundant plaque along gingival margin and interdental areas.

The GI records gingival inflammation, and similar to PI, 6 sites of each tooth were scored. The mean value of the sum of given scores ranges between 0 and 3 and gives the patient's GI level.[16] The scores of the GI and their clinical meanings are as follows:

0: Healthy gingiva, no inflammation and bleeding, no discoloration.

1: Mild inflammation, slight erythema without bleeding.

2: Moderate inflammation, erythema with bleeding.

3: Severe inflammation with a tendency for spontaneous bleeding, severe swelling.

BoP was calculated with the ratio of the number the sites with bleeding following probing to the number of all sites and showed as a percentage. The distance from the gingival margin to the base of the gingival sulcus/periodontal pocket is defined as PD, while the distance from the cementoenamel junction to the base of the gingival sulcus/periodontal pocket is described as CAL.

Follow-Up and Evaluation of Adverse Pregnancy Outcomes

The following information on pregnant women and their babies who participated in the study was obtained from obstetricians through consultation:

- To determine whether the mother was diagnosed with preeclampsia during pregnancy,
- In which week of pregnancy the birth took place,
- Birthweight of the newborn.

The following clinical data were considered in conjunction with the above information when evaluating adverse pregnancy outcomes.

In a normotensive patient, an increase in systolic blood pressure to ≥ 140 mmHg or diastolic pressure to ≥90 mmHg with any following occasions after 20 weeks of gestation is defined as preeclampsia. These occasions are listed as proteinuria; platelet count <100 000/μL; impaired liver function, as evidenced by abnormally elevated liver enzymes up to twice the normal concentration or persistent severe right upper quadrant or epigastric pain; renal failure with a serum creatinine level >1.1 mg/dL (97.2 μmol/L) or double serum creatinine; pulmonary edema; or new-onset cerebral or visual disturbances.[17]

The preterm birth is defined as babies born alive before 37 weeks of gestation are completed. According to the WHO, LBW is described as a birthweight of less than 2500 g (up to and including 2499 g).

Statistical Analysis

The data obtained from the participants were transferred to the Statistical Package for the Social Sciences, version 24.0 (IBM Corp.; Armonk, NY, USA) program for statistical analysis. Descriptive analyses were performed on the transferred data and obtained descriptive values were displayed as minimum and maximum values, mean, SD, frequencies, and percentages. The Shapiro–Wilk test was used to check whether the quantitative variables had a normal distribution, and since P <.05, the distribution was accepted as not normal. For this reason, nonparametric statistical tests were used in data analysis. Means of non-normally distributed numerical variables and categorical variables of the participants in the abovementioned 2 study groups were calculated with the Mann–Whitney U-test and chi-square test, respectively. Bivariate relationships among HLL, periodontal parameters, and adverse pregnancy outcomes were evaluated using Spearman's correlation. Statistical significance was established at the P <.05 level.

RESULTS

Table 1 shows an intergroup comparison of pregnant and nonpregnant participants' demographic characteristics and oral health behaviors. As shown in Table 1, the mean age of participants in both groups was similar (P >.05). The results showed that the majority of participants in both groups had a college/university or higher education degree and a middle income, with no statistically significant differences between groups (P >.05). Moreover, the intergroup comparisons showed that the frequency of toothbrushing and daily flossing were statistically similar (P >.05). About 61.5% of pregnant women and 57.1% of nonpregnant women brush their teeth twice daily. However, it

Table 1. Demographic Characteristics and Oral Health Care Habits of the Participants

		Pregnant Women	Nonpregnant Women	P*	P**
Age	Mean ± SD (minimum–maximum)	30.23 ± 4.07 (23-37)	30.43 ± 5.50 (21-40)	.685	
Education level, N (%)	Primary school	20 (18.9)	24 (21.4)		.372
	High school	31 (30.8)	38 (34.3)		
	College/University	33 (31.5)	34 (30.0)		
	Postgraduate degree	20 (18.8)	16 (14.3)		
Monthly income, N (%)	Low	5 (5.0)	16 (4.3)		.648
	Middle	80 (76.9)	80 (71.4)		
	Upper	19 (18.1)	16 (14.3)		
Brushing, N (%)	Once/twice a week	8 (7.7)	10 (8.9)		.695
	Once a day	32 (30.8)	39 (34.0)		
	Twice a day	64 (61.5)	63 (57.1)		
Interdental cleaning, N (%)	No	72 (69.2)	88 (78.6)		.678
	Yes	32 (30.8)	24 (21.4)		

*Mann–Whitney *U*-test, $P < .05$.**Chi-square test, $P < .05$.

must be noted that these frequencies are not ideal. In addition, a considerable number of pregnant and nonpregnant participants did not floss daily (Table 1).

The periodontal status of the patients included in the study is shown in Figure 1A. Based on these data, periodontally healthy individuals in the total population are 3.7%. When we examine the patients in the groups in terms of their periodontal status, it can be seen that about 85% of pregnant women and about 43% of nonpregnant women suffered from gingivitis. Regarding periodontal parameters, as the objective indicators of gingival inflammation, the GI and BoP values of pregnant participants were significantly higher than those of nonpregnant women ($P = .007$ and $P = .034$, respectively). In contrast, no significant differences were found for other clinical periodontal parameters (Figure 1B).

As shown in Table 2, pregnant women had higher HLL than nonpregnant individuals ($P = .022$). The results of pregnant women showed that 23.1% had problematic-limited, 30.8% had adequate, and 46.1% had excellent HLL. In comparison, 50% of the nonpregnant group showed problematic-limited, 35.7% adequate, and 14.3% excellent HLL. Intergroup comparisons of the mean scores for the 4 subdomains of HL were also presented in Table 2. The mean scores for accessing, understanding, and using information relevant to health were higher in pregnant women in the general HL subdomain and in the disease prevention and health promotion subdomain. However, all dimensions of the health-care subdomain were similar between the groups ($P > .05$).

Obstetricians assessed the pregnant participants to determine the adverse outcomes, and the according to these data, only 3 in 104 pregnant women were diagnosed with preeclampsia. Twenty-four of the 104 babies were preterm and LBW, born at an average of 35 weeks and weighting 2166.66 ± 208.16 g at birth.

Correlation analysis between HLL and periodontal parameters showed no significant bivariate correlations in all participants ($P > .05$) (Table 3). Similar to this, the results of the correlation analysis performed only in pregnant participants showed no statistically significant correlation between HLL and any periodontal parameter in this group ($P > .05$) (Table 3). On the contrary, a significant positive correlation was found between HLL and the infant birthweight ($r = .465$, $P < .01$). Furthermore, there were significant negative correlations between maternal periodontal parameters and infant birthweight and also birth week ($P < .05$).

DISCUSSION

To our knowledge, few studies are investigating the relationship between HLL and periodontal status in pregnant women.[18,19]

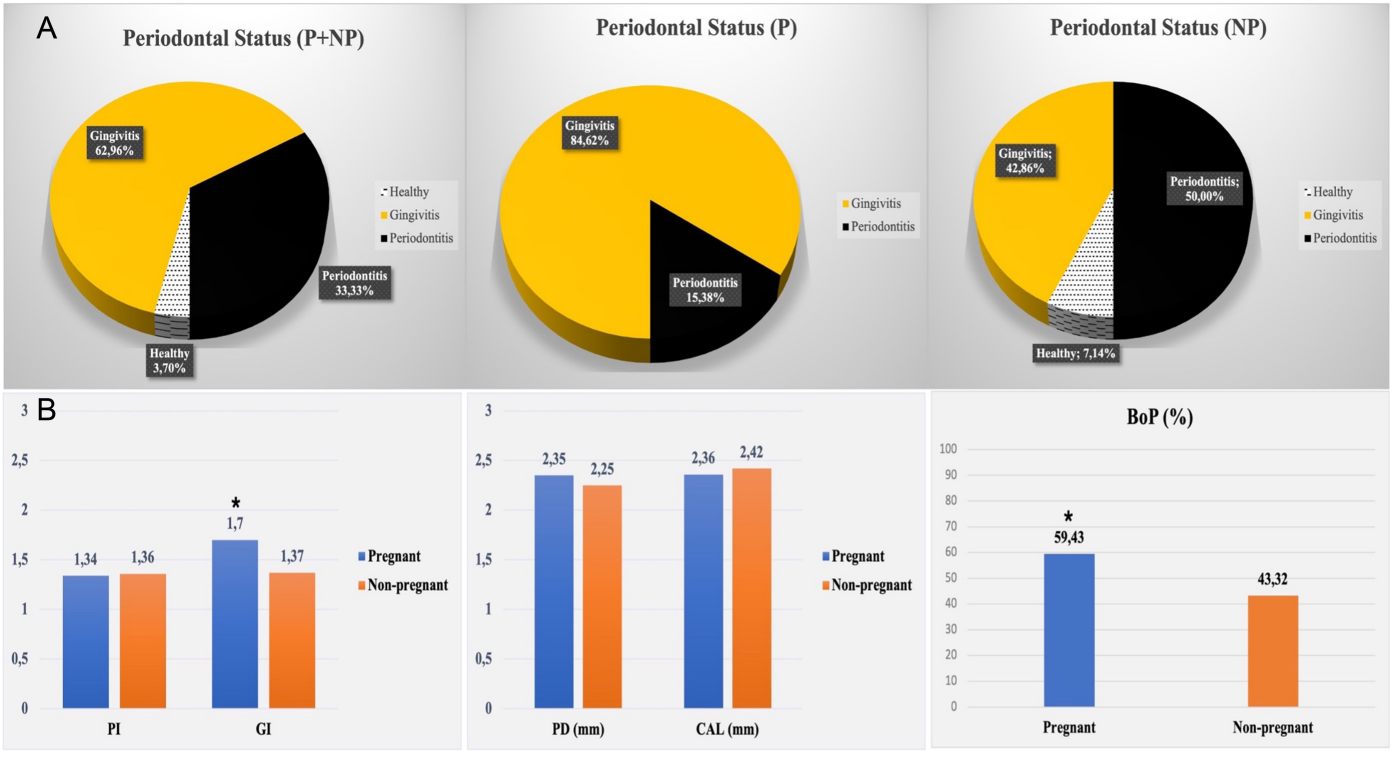

Figure 1. (A). Periodontal status of pregnant (P) and nonpregnant women (NP). (B) Comparison of periodontal parameters between groups (*Mann–Whitney *U*-test, $P < .05$.)

Table 2. Data of Health Literacy Levels and Its Subdomains

Dimensions	Pregnant Mean ± SD (Minimum–Maximum)	Nonpregnant Mean ± SD (Minimum–Maximum)	*P**
General	39.67 ± 6.18 (30.67-48.00)	33.44 ± 5.87 (26.00-47.33)	**.022**
Access/obtain information relevant to health	41.99 ± 7.06 (31.25-50.00)	35.71 ± 6.27 (27.08-47.92)	**.038**
Understand information relevant to health	42.31 ± 5.85 (33.33-50.00)	35.57 ± 6.96 (20.83-50.00)	**.012**
Process information relevant to health	33.81 ± 7.52 (22.92-45.83)	31.70 ± 7.13 (22.92-50.00)	.519
Apply/use information relevant to health	40.22 ± 6.27 (29.17-50.00)	31.25 ± 8.25 (18.75-45.83)	**.008**
Health Care			
Access/obtain information	42.63 ± 7.64 (29.17-50.00)	38.10 ± 7.10 (29.17-50.00)	.116
Understand information	42.31 ± 6.33 (33.33-50.00)	36.01 ± 8.89 (20.83-50.00)	.068
Process information	32.37 ± 7.64 (25.00-45.83)	31.55 ± 8.91 (20.83-50.00)	.720
Apply/use information	43.27 ± 8.08 (25.00-50.00)	36.90 ± 8.93 (25.00-50.00)	.068
Disease prevention and health promotion			
Access/obtain information	41.35 ± 7.88 (25.00-50.00)	33.33 ± 06.93 (20.83-50.00)	**.009**
Understand information	42.31 ± 5.85 (33.33-50.00)	35.12 ± 07.07 (20.83-50.00)	**.015**
Process information	35.26 ± 7.91 (20.83-45.83)	31.85 ± 08.59 (12.50-50.00)	.325
Apply/use information	37.18 ± 7.31 (25.00-50.00)	25.60 ± 12.21 (08.33-45.83)	**.011**

*Mann–Whitney *U*-test*P* <0.05.* Bold values shown presented on table are significant

The findings of this preliminary study, conducted in pregnant and nonpregnant Turkish women, included data on HLL, periodontal status, and adverse pregnancy outcomes.

As a concept that influences a person's health-care decisions and actions, the HLL can predictably affect oral health, like its potential impact on overall health. There is growing evidence of an association between periodontal status, a key component of oral health, and some systemic diseases/conditions such as diabetes, cardiovascular disease, and more recently, coronavirus disease 2019.[20,21] The potential association between periodontal status and adverse pregnancy outcomes is a topic that continues to be the focus of periodontal medicine.[22]

Advances in the medical treatment of preterm infants have made significant progress, and the survival rate of these infants with LBW (less than 2500 g) has increased.[23] Developmental delays are more likely to occur later in life.[24,25] Motor and cognitive function are 2 critical areas of delay,[26] and several studies have shown cross-sectional links between motor and cognitive deficits in preterm and LBW infants.[27,28] The link between periodontal disease, prematurity, and LBW has been shown in several studies.[29,30] The expecting mother must understand the importance of education and oral health to avoid these negative consequences.

The pregnant women showed higher HLL compared to the nonpregnant individuals. Pregnancy can positively influence the motivation of the mother in health issues to achieve the best results for both the mother and child. From this perspective, maternal HLL is an interesting topic, both for its direct positive contribution to maternal and infant health and for its indirect contribution to the maintenance of periodontal health.

Low HLLs negatively affect women's behavior with regard to contraception, health care, and childcare, highlighting a possible link between HLL and adverse pregnancy outcomes.[31] Research on periodontal disease and its negative repercussions on pregnancy demonstrates the importance of periodontal health for both mother and baby.[20] We expected that an increase in HLL in pregnant women would have a more beneficial effect on periodontal status. However, our study did not show a direct relationship between clinical periodontal parameters and HLL. The negative impact of periodontal/oral diseases on general health is a proven fact. However, this proven fact remains largely unknown to the Turkish public.

Our study also indicates that HLL had no effect on promoting the importance of oral health and the need to maintain it. One of the notable findings of this study was that both education and income level were not associated with HLL and periodontal status. Several studies have indicated that these characteristics are significantly positively correlated with HL.[4,11,12] About 50% of pregnant women in our population had more than higher education, and 70% had a balanced income. While a higher level of education is believed to make people more competent at gathering and processing information in any subject, the small sample size of this pilot study may have contributed to this difference. For this reason, it can be seen as an indication that education alone is not sufficient to gain knowledge in a particular area, such as health, but other aspects are also involved.

As our findings show, HLL did not have an effect on periodontal parameters. Oral health care habits are generally expected to be more common in individuals with a high HLL. However, our study

Table 3. Correlation Analysis Among Health Literacy Levels, Clinical Parameters, and Pregnancy Outcomes

Pregnant women (N = 104)	PI	GI	PD	BoP	CAL	HLL	Birthweight	Birth week
PI	-	.738**	.610**	.672**	.624**	−.271	.441**	.538**
GI	.738**	-	.212	.879**	.218	−.315	.399*	.587**
PD	.610**	.212	-	.173	.999**	.299	.687**	.412**
BoP	.672**	.879**	.173	-	.187	−.243	.415**	.388*
CAL	.624**	.218	.999**	.187	-	.277	.675**	.400*
HLL	−.271	−.315	.299	−.243	.277	-	.465**	.133
Birthweight	−.441**	−.399*	−.687**	−.415**	−.675**	−.465**	-	−.835**
Birth week	−.538**	−.587**	−.412**	−.388*	−.400*	−.133	−.835**	-
All (N = 216)	PI	GI	PD	BoP	CAL	HLL		
PI	-	.620**	.407**	.495**	.512**	.182		
GI	.620**	-	.308**	.876**	.302**	.191		
PD	.407**	.308**	-	.271*	.918**	.174		
BoP	.495**	.876**	.271*	-	.266*	.190		
CAL	.512**	.302**	.918**	.266*	-	.023		
HLL	.182	.191	.174	.190	.023	-		

Correlation coefficient values by Spearman's correlation test.
BoP, bleeding on probing; CAL, clinical attachment level; GI, gingival index; HLL, health literacy level; N, count; PD, probing depth; PI, plaque index.
*P <.05. **P <.001.

showed that high HLL did not influence the oral health care habits of pregnant women.

As an objective indicator of the level of oral hygiene, the PI scores were similar in both groups, which is another finding supporting the above result. Consequently, our findings showed that GI and BoP were higher in pregnant women, reflecting increased periodontal inflammation, although PI scores were similar in both groups. The excessive periodontal inflammatory response to local factors in pregnant women can be explained by physiological hormonal changes specific to this period. These findings suggest that oral health in pregnant women is still considered a separate component of general health. Because oral health is part of overall health, the implementation of oral health programs can increase awareness among pregnant women before and during pregnancy. Close collaboration between health care providers, educators, policymakers, the commercial sector, and women is essential to raise awareness of oral health. In addition to the HLL, additional appropriate scales must be developed to highlight the association between oral health and health literacy.

The positive relationship between HLL and birthweight further demonstrates the importance of HLL because, as mentioned above, the motor and cognitive functions of preterm and LBW newborns are slower than those of infants of the same age. As a result, HLL in pregnant women is a phenomenon that affects the postpartum period, as well as the prenatal and perinatal periods. A negative correlation between periodontal parameters and birthweight and week of delivery suggests that maternal periodontal health is essential for an uncomplicated pregnancy.

The most noticeable result of this study was that there were significant positive differences in the access, understanding, and use of relevant information for disease prevention and health promotion among pregnant women. However, this improvement did not change the processing of information. There are many speculative reasons why women may not receive and interpret health information during pregnancy. Since pregnancy only covers the last 9 months of a woman's life, it is reasonable to assume that this is a short period during which detailed medical information can be processed. As pregnant women become more attached to themselves and their unborn child and become more accessible, these educational programs become increasingly crucial. It is important to plan these programs during puberty. Therefore, these assumptions require further research to clarify the process.

A significant limitation of this study is the small sample size of the population. More research should be carried out with a large number of pregnant women. Pregnant women are important role models for their children in forming habits at a certain age. Education, information sessions, and follow-up initiatives to improve oral health awareness among pregnant women are critical for influencing and shaping their children's oral health.

Given the limitations of this study, our findings revealed that pregnancy had a positive impact on HLL. Interestingly, while such beneficial improvements reduced the prevalence of adverse pregnancy outcomes, they still had no impact on the periodontal health of pregnant women. Additionally, findings of this study underscore the importance of educational initiatives to promote awareness of better oral health-care practices and to preserve periodontal health in pregnant women. These findings highlight the significance of developing novel and practical strategies to improve general and oral health care during pregnancy.

Ethics Committee Approval: This study approved by the Ethics Committee for Non-Interventional Clinical Research of İstanbul Aydın University (Date: 14.02.2019, Number: 2019/40).

Informed Consent: Written consent was obtained from all participants who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – S.E.M., D.M.; Design – S.E.M., D.M.; Supervision – S.E.M.; Resources – S.E.M., D.M.; Materials – S.E.M., D.M.; Data Collection and/or Processing – S.E.M.; Analysis and/or Interpretation – D.M.; Literature Search – S.E.M., D.M.; Writing Manuscript – S.E.M., D.M.; Critical Review – S.E.M.

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Etik Komite Onayı: Bu çalışma için İstanbul Aydın Üniversitesi Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu'ndan (Tarih: 14.02.2019, Sayı: 2019/40) onay alınmıştır.

Hasta Onamı: Bu çalışmaya katılan tüm katılımcılardan yazılı onam alınmıştır.

Hakem Değerlendirmesi: Dış bağımsız.

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REFERENCES

1. Nielsen-Bohlman L, Panzer AM, Kindig DA. *Health Literacy: A Prescription to End Confusion*. 1st ed. Washington, DC: National Academies Press; 2004.
2. Sørensen K, Van den Broucke S, Fullam J, et al. Health literacy and public health: a systematic review and integration of definitions and models. *BMC Public Health*. 2012;12:80. [CrossRef]
3. Kilfoyle KA, Vitko M, O'Conor R, Bailey SC. Health literacy and women's reproductive health: a systematic review. *J Womens Health (Larchmt)*. 2016;25(12):1237-1255. [CrossRef]
4. Sørensen K, Pelikan JM, Röthlin F, et al. Health literacy in Europe: comparative results of the European health literacy survey (HLS-EU). *Eur J Public Health*. 2015;25(6):1053-1058. [CrossRef]
5. Berberoğlu U, İnci MB, Ekerbiçer HC. Evaluation of the health literacy status among individuals aged 18-65 registered in a family health center. *Sakarya Med J*. 2018;8:575-581.
6. Okyay P, Abacıgil F. *Turkish Health Literacy Scales Reliability and Validity Study*. 1st ed. Ankara: Turkish Ministry of Health; 2016
7. Nutbeam D, McGill B, Premkumar P. Improving health literacy in community populations: a review of progress. *Health Promot Int*. 2018;33(5):901-911. [CrossRef]
8. Barnes LAJ, Barclay L, McCaffery K, Aslani P. Complementary medicine products: information sources, perceived benefits and maternal health literacy. *Women Birth*. 2019;32(6):493-520. [CrossRef]
9. Ajong AB, Njotang PN, Kenfack B, Yakum MN, Mbu ER. Knowledge of women in family planning and future desire to use contraception: a cross sectional survey in Urban Cameroon. *BMC Res Notes*. 2016;9:347. [CrossRef]

10. Asadi L, Amiri F, Safinejad H. Investigating the effect of health literacy level on improving the quality of care during pregnancy in pregnant women covered by health centers. *J Educ Health Promot*. 2020;9:286. [CrossRef]
11. Dadipoor S, Ramezankhani A, Alavi A, Aghamolaei T, Safari-Moradabadi A. Pregnant women's health literacy in the south of Iran. *J Family Reprod Health*. 2017;11(4):211-218.
12. Lupattelli A, Picinardi M, Einarson A, Nordeng H. Health literacy and its association with perception of teratogenic risks and health behavior during pregnancy. *Patient Educ Couns*. patient ed. 2014;96(2):171-178. [CrossRef]
13. Armitage GC. Bi-directional relationship between pregnancy and periodontal disease. *Periodontol 2000*. 2013;61(1):160-176. [CrossRef]
14. Wehmeyer MM, Corwin CL, Guthmiller JM, Lee JY. The impact of oral health literacy on periodontal health status. *J Public Health Dent*. 2014;74(1):80-87. [CrossRef]
15. Silness J, Loe H. Periodontal disease in pregnancy. II. correlation between oral hygiene and periodontal condition. *Acta Odontol Scand*. 1964;22:121-135. [CrossRef]
16. Loe H, Silness J. Periodontal disease in pregnancy. I. prevalence and severity. *Acta Odontol Scand*. 1963;21:533-551. [CrossRef]
17. Hypertension in pregnancy. Report of the American college of obstetricians and gynecologists' task force on hypertension in pregnancy. *Obstet Gynecol*. 2013;122(5):1122-1131. [CrossRef]
18. Thakur RK, Yadav BK, Sultana R, Afridi SK, Das D, Sahoo SK. Influence of periodontal infection as a possible risk factor for preterm low birth weight. *J Pharm Bioallied Sci*. 2020;12(suppl 1):S613-S618. [CrossRef]
19. Webb DA, Mathew L, Culhane JF. Lessons learned from the Philadelphia Collaborative Preterm Prevention Project: the prevalence of risk factors and program participation rates among women in the intervention group. *BMC Pregnancy Childbirth*. 2014;14:368. [CrossRef]
20. Marouf N, Cai W, Said KN, et al. Association between periodontitis and severity of COVID-19 infection: A case-control study. *J Clin Periodontol*. 2021;48(4):483-491. [CrossRef]
21. Beck JD, Papapanou PN, Philips KH, Offenbacher S. Periodontal medicine: 100 years of progress. *J Dent Res*. 2019;98(10):1053-1062. [CrossRef]
22. Bobetsis YA, Graziani F, Gürsoy M, Madianos PN. Periodontal disease and adverse pregnancy outcomes. *Periodontol 2000*. 2020;83(1):154-174. [CrossRef]
23. Rüegger C, Hegglin M, Adams M, Bucher HU, Swiss Neonatal Network. Population based trends in mortality, morbidity and treatment for very preterm- and very low birth weight infants over 12 years. *BMC Pediatr*. 2012;12:17. [CrossRef]
24. Ahishakiye A, Abimana MC, Beck K, et al. Developmental outcomes of preterm and low birth weight toddlers and term peers in Rwanda. *Ann Glob Health*. 2019;85(1):147. [CrossRef]
25. Guerra CC, Barros MC, Goulart AL, Fernandes LV, Kopelman BI, Santos AM. Premature infants with birth weights of 1500-1999 g exhibit considerable delays in several developmental areas. *Acta Paediatr*. 2014;103(1):e1-e6. [CrossRef]
26. Oudgenoeg-Paz O, Mulder H, Jongmans MJ, van der Ham IJM, Van der Stigchel S. The link between motor and cognitive development in children born preterm and/or with low birth weight: a review of current evidence. *Neurosci Biobehav Rev*. 2017;80:382-393. [CrossRef]
27. Domellöf E, Johansson AM, Farooqi A, Domellöf M, Rönnqvist L. Relations among upper-limb movement organization and cognitive function at school age in children born preterm. *J Dev Behav Pediatr*. 2013;34(5):344-352. [CrossRef]
28. Van Hus JW, Potharst ES, Jeukens-Visser M, Kok JH, Van Wassenaer-Leemhuis AG. Motor impairment in very preterm-born children: links with other developmental deficits at 5 years of age. *Dev Med Child Neurol*. 2014;56(6):587-594. [CrossRef]
29. Lafaurie GI, Gómez LA, Montenegro DA, et al. Periodontal condition is associated with adverse perinatal outcomes and premature rupture of membranes in low-income pregnant women in Bogota, Colombia: a case-control study. *J Matern Fetal Neonatal Med*. 2020;33(1):16-23. [CrossRef]
30. Weidlich P, Moreira CHC, Fiorini T, et al. Effect of nonsurgical periodontal therapy and strict plaque control on preterm/low birth weight: a randomized controlled clinical trial. *Clin Oral Investig*. 2013;17(1):37-44. [CrossRef]
31. Nawabi F, Krebs F, Vennedey V, Shukri A, Lorenz L, Stock S. Health literacy in pregnant women: a systematic review. *Int J Environ Res Public Health*. 2021;18(7):3847. [CrossRef]