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Comparative assessment of oral hygiene index parameters of Polish perinatal patients in relation to women who have never been pregnant

Justyna Klepacz-Szewczyk DMD, PhD[1], *Agata Koprowicz DMD, PhD*[2]

Original Article

Abstract

BACKGROUND AND AIM: Pregnant women should take special care of the oral cavity and perform additional hygiene procedures. In this study, the oral health status of perinatal patients was compared to that of women who have never been pregnant by analyzing the Simplified Oral Hygiene Index (OHI-S).

METHODS: The study group consisted of 125 patients in the perinatal period, hospitalized at the Institute of the Polish Mother's Health Center in Lodz, Poland. The control (comparison) group included 100 women. Patients from both groups underwent clinical examination of the teeth and periodontium condition and a survey was conducted as well. The epidemiological indicators were used to compare and interpret the results. The OHI-S was used to determine the state of hygiene.

RESULTS: There was no statistically significant difference in the mean values of OHI-S, Simplified Debris Index (DI-S), and Simplified Calculus Index (CI-S) between the two study groups. It was shown that respondents maintained oral hygiene at a similar level. Most of the respondents revealed high therapeutic needs. Statistical relationships appeared in the analysis of environmental factors.

CONCLUSION: Pregnant women do not attempt to improve hygienic condition of the oral cavity. Despite their hormonal and behavioral predispositions, pregnant women maintain hygiene at a similarly low level as non-pregnant women. Pregnancy itself does not worsen hygienic condition of the oral cavity. Dentists should pay attention to the oral health of pregnant women.

KEYWORDS: Dental Care; Gingivitis; Oral Hygiene Index; Oral Hygiene; Pregnancy

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A woman expecting a baby should be aware of the need for taking special care of her oral hygiene. However, numerous studies show that oral health condition of pregnant women is not satisfactory.[1-4]

Pregnancy is a physiological condition in which a woman's body undergoes many specific alterations that can affect the state of oral cavity and lead to the development of pathological diseases. Some pregnant women find out that brushing their teeth, particularly the molars, provokes retching. Thus, they avoid proper cleaning of their teeth. Besides, future mothers sometimes experience unusual food cravings. A regular desire for snacks and fewer brushing may increase plaque and calculus levels.

Hormonal changes during pregnancy could cause swelling and tenderness of the gums.[3,4] Gum bleeding and pain in pregnant women may increase the risk of improper cleaning of teeth, which in many cases, leads to gingivitis. Any chronic inflammatory process in the mouth can be a source of bacterial contamination on the organism. Undiagnosed and untreated gingivitis aggravates severe periodontium inflammation.

1- Department of Conservative Dentistry and Endodontics, Medical University of Lodz, Lodz, Poland
2- Assistant Professor, Department of Conservative Dentistry and Endodontics, Medical University of Lodz, Poland
Address for correspondence: Justyna Klepacz-Szewczyk PhD, DMD; Department of Conservative Dentistry and Endodontics, Medical University of Lodz, Lodz, Poland; Email: justynaklepacz@gmail.com

In some studies, the deterioration of oral cavity hygiene was observed in the group of pregnant women compared to the control group of non-pregnant female patients.[4,5] A study by Ambardar et al. showed a statistically significant increase in the scores of OHI-S in pregnant participants compared to non-pregnant ones.[2] However, another study also showed that the amount of plaque and calculus remains unchanged in pregnant women.[6]

In view of the conflicting reports, this study was conducted to compare the perinatal patients with women who have never been pregnant regarding oral health status by analyzing the Simplified Oral Hygiene Index (OHI-S).

Methods

This study was positively assessed by the Bioethical Committee of the Medical University of Lodz, Poland (RNN/101/11/KE). The study group consisted of 125 patients in the perinatal period (from 35 weeks of gestation to 3 days after delivery) hospitalized at the Institute of the Polish Mother's Health Center in Lodz. The control (comparison) group consisted of 100 women of reproductive age (patients at the Central Clinical Hospital of the Institute of Dentistry in Lodz and final-year students of the Faculty of Medicine at the Medical University of Lodz, aged 21 to 40 years) who had not been pregnant before. The informed consent was orally obtained from all participants. In the first stage of the study, patients from both groups underwent clinical examination of teeth and periodontium. Dental examinations of pregnant patients were carried out at the patients' bedside in a convenient position. Disposable dental kits and additional artificial lighting were used. The women had the opportunity to obtain comprehensive information on their teeth's condition. Patients in the control group were examined on a dental chair in Central Clinical Hospital of the Institute of Dentistry or Institute of Dentistry. In the next step of the study, a survey was conducted. The questions included information about age, education, place of residence, income, number of pregnancies, and hygiene habits like tooth brushing frequency.

Oral health status indicators: Greene and Vermillion's Simplified Oral Hygiene Index (OHI-S) was used to determine the state of hygiene.[1,2] The OHI is one of the most commonly used epidemiological indicators for assessing oral hygiene status.[1,3,4] This index determines both the amount and type of dental deposits because it has two components: Debris Index (DI) and Calculus index (CI). The assignment of given values to numerical intervals allowed the study group to be divided into subgroups with very good, good, sufficient, or poor oral hygiene status. Descriptive and inferential statistics were used to analyze the collected data and the ratios were expressed in percentage. For measurable features, the following statistical parameters were calculated: arithmetic mean (x) and median (Me) (as mean measures as well as measures of differentiation) and standard deviation (SD). There was also a minimum and maximum value. The chi-square test of independence was used to compare the occurrence frequency of particular varieties of features in the studied groups and subgroups and to test the relationships between non-measurable (qualitative) features. In the case of small numbers, in some fields of the table, when calculating the value of the chi-square test, the Yates correction was applied. To calculate the odds ratio (OR) and 95% confidence interval (CI) of risk factors for dental caries and gingivitis, the logistical model was applied. Statistically significant level was considered at $P < 0.050$. The statistical analysis was performed using STATISTICA 9.1 Software.

Results

Characteristics of the study and control groups: The mean age of the participants was 27.9 and 27.0 years in the study group and in the control group, respectively; the difference between the two groups in terms of the mean

age was not significant (P > 0.050). The participants in both groups mostly had higher education or were still students (respectively 68 and 87% of the study group and control group). About 28% of the participants in the study group and 11% in the control group had high school diploma. In both groups, urban women predominated, however in the study group, their percentage was significantly smaller (61.6% to 87.0% in the control group; P < 0.001). Participants in the analyzed groups did not differ significantly in terms of their material situation (P > 0.050). The material situation described as moderate dominated (64% of the study group and 57% of the control group) and the material situation defined as good or very good stated 34.4% of the study group and 43% of the control group. In the study group, most of the participants were in their first pregnancy (54.4%), about one-third (30.4%) of the women expected the second pregnancy, 9.6% experienced the third pregnancy, and 5.6% of the women were in their fourth or subsequent pregnancies. About 34% of the participants in the control group had plans to conceive within the next two years.

OHI-S: The participants were assessed using the OHI-S and its components including dental plaque (DI-S; Debris Index) and calculus (CI-S; Calculus Index). Higher OHI-S values concerned the DI-S component of both the study and control groups. There was no statistically significant difference in the mean values of OHI-S, DI-S, and CI-S between the study and control groups (P > 0.050) (Figure 1).

The participants maintained oral hygiene at a similar level. Given the adopted division (very good, good, sufficient, and poor oral hygiene), the women's hygiene measured with the OHI-S was assessed mostly as sufficient. In the study and control groups, more than half of the women represented this subgroup (study group: 56.8%, control group: 57.0%). It is also worth noting that oral hygiene of one-fourth of all participants in both groups was evaluated as poor. A small percentage (4% of the study group and 3% of the control group) exhibited very good oral hygiene (Chi-square = 0.394; P > 0.050).

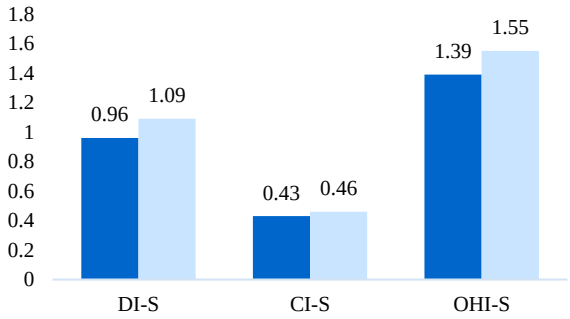

Figure 1. Comparison of Simplified Debris Index (DI-S), Simplified Calculus Index (CI-S), and Simplified Oral Hygiene Index (OHI-S) distribution (P > 0.050)

In this study, the impact of environmental factors such as age, education, and place of residence on mean values of oral hygiene indicators was analyzed. Higher mean values of OHI-S and its components were observed with an increase in the age of the participants in the study group. However, the difference was not statistically significant (P > 0.050). In this group, there was also no statistically significant difference in the DI-S, CI-S, and OHI-S mean values, depending on the participants' level of education (P > 0.050). However, for urban participants, significantly higher values of the DI-S were reported compared to the participants from villages/small towns (Table 1).

Table 1. Comparison of mean values of Simplified Debris Index (DI-S), Simplified Calculus Index (CI-S), and Simplified Oral Hygiene Index (OHI-S) in the study group by place of residence

Place of residence	DI-S parameters					CI-S parameters					OHI-S parameters				
	Min	Max	x	Me	SD	Min	Max	x	Me	SD	Min	Max	x	Me	SD
Village	0	2.33	0.83	0.83	0.55	0	1.33	0.34	0.33	0.34	0	3.67	1.18	1.08	0.82
City	0	2.17	1.04	1.00	0.48	0	1.50	0.48	0.50	0.34	0	3,67	1.52	1.33	0.76
Comparison	Z = 1.959; P < 0.050					Z = 2.396; P < 0.050					Z = 2.363; P < 0.050				

Min: Minimum; Max: Maximum; Me: Median; x: Arithmetic mean; SD: Standard deviation

Table 2. Comparison of mean values of Simplified Debris Index (DI-S), Simplified Calculus Index (CI-S), and Simplified Oral Hygiene Index (OHI-S) in the control group by education

Place of residence	DI-S parameters					CI-S parameters					OHI-S parameters				
	Min	Max	x	Me	SD	Min	Max	x	Me	SD	Min	Max	x	Me	SD
Primary	2.33	2.33	2.33	2.33	0	2.00	2.00	2.00	2.00	0	4.33	4.33	4.33	4.33	0
Secondary	0	1.80	0.78	0.83	0.53	0	0.80	0.16	0	0.25	0	2.60	0.95	1.00	0.73
Incomplete higher	0	2.33	1.08	1.00	0.51	0	1.83	0.50	0.50	0.45	0	4.17	1.59	1.42	0.89
Higher	0.50	2.67	1.12	1.00	0.53	0	1.67	0.40	0.17	0.53	0.50	4.33	1.52	1.33	1.00
Comparison	H = 8.328; P < 0.050					H = 15.070; P < 0.010					H = 11.890; P < 0.010				

Min: Minimum; Max: Maximum; Me: Median; x: Arithmetic mean; SD: Standard deviation

In the control group, significantly higher results of hygiene indicators were represented by women with primary education (P < 0.050), while no significant relationship was found between the value of hygiene indicators and the place of residence or age (P > 0.050) (Table 2).

The effect of tooth brushing frequency and the number of pregnancies carried out on the mean OHI-S values was also analyzed. The tooth brushing frequency did not have a statistically significant effect on the mean value of hygiene indicators in the pregnant participants (P > 0.050). In the control group, however, a statistically significant difference was found depending on the tooth brushing frequency (P < 0.050 for DI-S; P < 0.010 for CI-S and OHI-S). Women who brushed their teeth only once a day had the highest mean value of this indicator (Table 3). Analyzing the effect of the number of pregnancies on the mean value of hygiene indicators showed that there was an increase in the values of CI-S, DI-S, and OHI-S indicators in the fourth and subsequent pregnancies. However, this difference was not statistically significant (P > 0.050). Based on the results, worse hygiene status was observed in pregnant women over age 30 who were urban residents and in the fourth or subsequent pregnancy.

Discussion

The present study attempted to determine whether unsatisfactory oral hygiene was associated with physiological and behavioral changes that occur during pregnancy. The present study compared OHI parameters in perinatal women with a group of women who have never been pregnant. The study sample was selected randomly. The women from the study group were patients admitted to the maternity ward while those of the control group were patients of the dental clinic. The individuals from the study and control groups formed a homogeneous population in terms of age, education, place of residence, and material situation. This gave grounds for comparing the two groups. Representatives of both groups were students or had obtained a diploma recently. Most of the women participating in the study considered their material situation as average, good, or very good. Therefore, it can be assumed that all women participating in the study could afford oral hygiene products.

Dental care is one of the elements of medical care for a pregnant woman and it is necessary to observe oral sanitation before a planned pregnancy.

Table 3. Comparison of the mean values of Simplified Debris Index (DI-S), Simplified Calculus Index (CI-S), and Simplified Oral Hygiene Index (OHI-S) in the study and control groups by tooth brushing

Brushing	DI-S		CI-S		OHI-S	
	Pregnant	Non-pregnant	Pregnant	Non-pregnant	Pregnant	Non-pregnant
Three times a day or more	1.13	1.32	0.46	0.64	1.60	1.95
Twice a day	0.90	0.98	0.39	0.36	1.30	1.34
Once a day	0.94	2.00	0.59	1.44	1.53	3.44
Comparison	H = 3.669; P > 0.050	H = 8.289; P < 0.050	H = 3.498; P > 0.050	H = 9.832; P < 0.01	H = 3.313; P > 0.050	H = 10.027; P < 0.010

Unfortunately, this takes place rarely despite studies showing 64% of planned pregnancy among Polish women.[7,8] When a female patient is expecting a baby, measures should be undertaken to maintain her oral health.[1,9,10] An important element to prevent dental and periodontal diseases is proper plaque removal. An indispensable supplement to everyday tooth brushing is the use of additional care products. The dentists should always conduct a thorough oral examination, and also, pay attention to periodontology diagnosis, including oral hygiene level assessment, gum inflammation, and periodontal tissue destruction.

The results of anonymous surveys might not coincide with the observations during the clinical trial. The high frequency of tooth brushing during the day declared by patients is not always reflected in the actual state and the appropriate level of oral hygiene. The effectiveness of removing deposits does not depend only on the amount of time spent on brushing, but also, on the precision of brushing procedure and the use of additional means. In the group of pregnant women, due to more frequent meals, snacking on sweets, as well as an increase in hormones predisposing to gingivitis, a high level of oral hygiene is of particular importance. In the studied population, the OHI-S value was determined to show the level of pregnant women's hygiene. Comparison of the OHI-S showed no significant differences between the study and control groups (OHI-S equal to 1.39 for the study group and 1.55 for the control group). It was also shown that the studied individuals had more plaque than calculus deposits. In both groups, the hygiene component of the plaque index was higher compared to the component reporting the amount of tartar. The participants maintained hygiene at a similar, unfortunately, quite low, level. The oral hygiene of more than three quarters of women was assessed as satisfactory or poor. Based on the analysis of the results, it can be determined that an urban woman over the age of 30 is more predisposed to poor hygiene. However, pregnant women's education had no effect on the OHI-S value.

In dental offices, the practitioners should pay attention not only to caries, but also to whether proper oral hygiene is maintained. Pregnant women, in particular, should have all dental plaque removed and get sufficient hygiene advice. Studies show that low-income women were susceptible to dental problems and consumed acidogenic meals and snacks. Health care professionals should assess low-income pregnant women in early pregnancy for dental problems and acidogenic meal and snack patterns, and in this regard, provide referrals to appropriate health professionals and community health services.[11] Another study underlined the high necessity of educational programs regarding oral care in pregnant and puerperal women.[12] About 93.9% of pregnant women and 89.5% of non-pregnant women ($P > 0.050$) do not go for routine dental check-ups.[3]

Stankiewicz-Szalapska et al. showed worse oral hygiene status in pregnant women. The hygiene index in this study group was 2.26 during physiological pregnancy and 2.36 in patients with a complicated pregnancy.[13]

A study conducted by Kashetty et al.[4] on pregnant and non-pregnant women showed that the OHI-S status in the pregnant group was significantly higher (2.68) compared to the non-pregnant group (2.07) ($P < 0.001$). The majority of women (55%-56%) exhibited fair oral hygiene status in both groups. In pregnant and non-pregnant groups, 35 and 18.33% of women, respectively, had poor oral hygiene, which is consistent with the results of some previous studies. For example, Amin and Shetty observed significantly higher ($P < 0.001$) mean OHI-S (1.031) in pregnant women than in non-pregnant women (0.592).[5] The OHI-S value (2.52) was documented notably superior ($P < 0.001$) in pregnant women than that (1.72) in non-pregnant women in another study.[14]

On the other hand, a study by Emmatty et al. showed no difference in oral hygiene status between the two groups.[6] In this study, over half of the women (54.4%) experienced

their first pregnancy. This distribution made it possible to study the impact of past pregnancies on the participants' oral hygiene. Subsequent pregnancies affect the women's life, mainly for social reasons. The number of children may cause a reduction in the time that a mother can spend for herself and - also importantly - there is a reduction in financial resources in the home budget. Above the fourth pregnancy, the oral hygiene of patients, which was measured by the OHI-S, drastically deteriorated.

Inadequate oral hygiene makes periodontal bacteria accumulate in the gingival margin of the teeth and form a bacterial biofilm. Bacteria present in the oral cavity, in the form of a biofilm, can travel to distant tissues and organs of the body (fetal membranes and placenta) via the hematogenic pathway.[1] Bacterial colonization changes the humoral response of the mother and the fetus, which stimulates the placenta to secrete pro-inflammatory mediators, indirectly affecting the date of delivery. The conducted studies also showed more frequent occurrence of premature delivery and other pregnancy complications like low birth weight.[1,3,15] Women's health providers should understand the importance of protecting oral health during pregnancy and educate their patients accordingly.[10]

Every woman planning a pregnancy or being pregnant should receive comprehensive information on how to care for the oral cavity. The gynecologists and midwives should refer the patients to the dental offices for follow-up visits. According to a study by Odermatt et al., only one fourth of women are informed about the importance of regular dental check-ups during pregnancy by their gynaecologist.[16] Oral health history, oral health education, dental screening, and dental referral - if needed - should be a routine part of prenatal care and annual examinations.[12,17] It seems appropriate for dentists to attempt to assess the risk of gum and periodontal diseases and to take measures in order to reduce their occurrence.[18]

Conclusion

This study analyzed the effect of certain demographic, social, and environmental factors, as well as hygiene habits on OHI-S values. The most differentiating factors affecting pregnant women's oral hygiene were age and place of residence.

There were no statistically significant differences in the measured OHI-S values and their components between the study and control groups. The two groups were similar sociologically and economically. Accordingly, despite the hormonal and behavioral predispositions of pregnant women, they maintained hygiene at a similarly low level as non-pregnant women did. Hygiene measured with the OHI-S was assessed in more than 3/4 of women as satisfactory or poor. The oral hygiene status of the study group was similar to that of the control group with a similar amount of plaque and tartar. Hygienic conditions were not improved by women expecting a baby, and pregnancy itself does not worsen the hygienic condition of the oral cavity. Hygiene is maintained at the same level as before pregnancy.

Most of the participants experienced high therapeutic needs. This particularly applies to professional hygiene procedures in dental offices and counseling in the field of maintaining proper oral hygiene. Women's health providers should understand the importance of protecting oral health during pregnancy and educate their patients accordingly.

Conflict of Interests

Authors have no conflict of interests.

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