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ORIGINAL ARTICLE

Comparison of Gingival and Dental Indices in Lactating and Non-Lactating Mothers During First 6 Month After Delivery

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Abstract

Objective: To compare gingival and dental health indices between breastfeeding and non-breastfeeding women during the first 6-month period after childbirth. **Material and Methods:** In this longitudinal study, 25 lactating mothers and 25 non-lactating mothers who had delivered a month ago were examined. The groups were identical in terms of educational level, age, income, and delivery time. Periodontal and dental indices including Pocket Depth (PD), Gingival Index (GI), Clinical Attachment Level (CAL), Bleeding on Probing (BOP) and DMFT were checked initially and after 2-4-6 months. Data were presented with the use of descriptive statistics (means, standard deviations, and frequencies). The gingival health parameters were compared between the two groups with the use of Chi-square, Wilcoxon, and Kruskal-Wallis tests. **Results:** Evaluation of PD showed that in the breastfeeding mothers increased from 1.97 mm at baseline to 2.44 mm after six months, while in the non-breastfeeding mother, the PDs increased from 2.03 mm at baseline to 2.11 mm after six months and at the 6-month interval, the PDs were significantly higher in the breastfeeding mothers ($p>0.001$). In breastfeeding mothers, the rate of dental caries was 12.68, with 11.52 in non-breastfeeding mothers ($p>0.05$). The rates of white spots in breastfeeding and non-breastfeeding mothers were 1.64 and 0.88, respectively. The degree of CAL and the rate of GI were similar between the two groups of mothers. **Conclusion:** Some periodontal indices (Pocket Depth and Bleeding on Probing) in lactating mothers were significantly higher than non-lactating mothers others (Clinical Attachment Level and Gingival Index) were similar. There were no significant differences in dental indices between lactating and non-lactating mothers. However, the rate of the white spot was more in the lactating group. Breastfeeding can be one of the risk factors in gingival inflammation and dental caries.

Keywords: Diet, Food, and Nutrition; Breast Feeding; Periodontal Index; Dental Caries.

Introduction

Women are considered the basic pillars of the family and the most important factors involved in the health, growth, dynamism, and promotion of the family and community. Women's health is one of the criteria for development from the United Nations' point of view because women are more susceptible to injuries due to their physiologic role in reproduction and its complications. Therefore, women's health is much more critical during pregnancy and breastfeeding [1].

Pregnancy and breastfeeding are physiologic states that affect a mother's metabolism, and specific considerations should be taken into account for their adaptation with the new conditions [2,3]. Pregnancy and breastfeeding affect orodental health, too [4-6].

Breastfeeding is the oldest technique for the feeding of newborn babies. In Australia, 96% of newborn babies are breastfed [7], and in New Zealand this percentage reaches 88% [8]. The act of sucking by the infant baby results in the growth and development of facial muscles and bones. In addition, due to the anatomic adaptation of the mother's breast and the baby's mouth, a complete seal is formed during sucking, resulting in the development of nasal breathing, which prevents open bite and excessive growth of the face in the vertical dimension [9].

Pregnant and breastfeeding women are at a higher risk concerning orodental health compared to their peers due to different reasons. The rate of dental caries and gingival problems, including periodontitis, increase due to hormonal changes, changes in dietary habits, and changes in the oral cavity pH. The majority of these risk factors persist even after childbirth; however, a limited number of studies have evaluated the orodental conditions during the breastfeeding period. Nevertheless, a large number of studies have assessed oral manifestations and orodental health problems in pregnant women. These studies have evaluated salivary changes during pregnancy in relation to its rate, pH, buffering capacity, concentrations of immunoglobulins and electrolytes, hormonal changes, among other factors [4,10-12].

Despite the social beliefs concerning an increase in the rate of dental caries during pregnancy, this has not been substantiated by any scientific study. Although the calcium in tooth structure cannot be extracted, some studies have shown significant decreases in the salivary concentration of calcium in breastfeeding mothers after breastfeeding, which might result in a decrease in remineralization rate in cases of incipient caries [13].

In a study developed with Turkish mothers, the saliva of 40 breastfeeding women was evaluated during the first 3-month period of breastfeeding. Based on the results, the saliva of breastfeeding women exhibited significantly lower pH and buffering capacity compared to the control group, which might, in turn, increase the caries risk during the breastfeeding period [14].

There is a positive and significant relationship between hormonal changes during pregnancy and periodontal diseases. During this period, the periodontium is affected by hormones and the epithelial barrier against bacteria, and the rate of collagen synthesis and turnover in the connective tissue undergoes changes, leading the way for further inflammation in the periodontium. During the breastfeeding period, these changes continue, and based on some studies, the gingival health indices

in breastfeeding mothers are different from non-breastfeeding women [4]. Pregnant and breastfeeding women exhibit a higher rate of interest in learning hygienic issues about themselves and their babies; therefore, this period is the best time for providing oral hygiene instructions [15].

Since both dental caries and periodontal diseases are chronic processes, longitudinal studies can better help evaluate changes in this respect. Since no comprehensive longitudinal studies to date have assessed the dental and gingival health indices in breastfeeding mothers, the present study was undertaken to compare gingival and dental health indices between breastfeeding and non-breastfeeding women during the first 6-month period after childbirth.

Material and Methods

Study Design

The present descriptive-analytical and longitudinal study was carried out in 2017-2018 in the Health Centers in Tabriz, Iran, during a 6-month period. The six months was selected, because after childbirth, the babies are solely fed through their mothers' breasts. Besides, it is possible to evaluate the incidence of white spots, and periodontal changes can be evaluated in six months.

The results of a previous study [16] were used to determine the sample size, which was estimated at 25 subjects in each group by considering a mean difference (PD) of 0.7 between the two groups with standard deviations of 0.05 and 0.074, respectively, for the breastfeeding and non-breastfeeding groups and by considering α=0.095 and a study power of 80%. The subjects were selected freely and randomly.

The following inclusion criteria were adopted: an age range of 18-40 years for mothers; mothers who had given birth at most one month previously; submission of an informed consent form by the mothers; and mothers with at least 20 teeth that could be preserved.

The following exclusion criteria were adopted: a history of any systemic disease such as type I and II diabetes, pregnancy, hypertension, bleeding disorders, iron deficiency, anemia, vitamin D deficiency, calcium deficiency and infectious diseases; a history of the use of vitamin D and calcium supplements; a refusal to sign an informed consent form; and breastfeeding mothers who weaned their babies from mother's milk for any reason.

Data Collection

The subjects were selected from the mothers who had referred to Health Centers for the routine check-up of their newborn babies. Eligible subjects were included in the study after they received sufficient explanations about the study protocol, and after they signed informed consent forms. A checklist was used to collect data, which consisted of two sections: the first section dealt with age, occupation, educational level, medical history, the number of pregnancies, and the duration of breastfeeding. The second section dealt with periodontal and dental health indices.

Bleeding on Probing (BOP)

The internal surface of the gingival sulcus was touched with the use of a probe. Bleeding from the sulcus after 30 seconds was registered as positive, and the absence of bleeding was recorded as negative [17].

Pocket Depth

Defined as the distance between the sulcus depth and the gingival margin (in mm) and was measured in all the existing teeth, and the pocket depths were determined with the use of a Williams periodontal probe at mesiobuccal, mid-buccal, distobuccal, mesiolingual, mid-lingual and distolingual aspects. All the measurements were rounded to the nearest mm value [18,19] (Table 1).

Table 1. The diagnostic criteria for the severity of periodontitis.

Periodontal Status	Description
No Periodontitis	No CAL
Mild Periodontitis	A maximum of 1-2 mm of CAL
Moderate Periodontitis	3-4 mm of CAL
Severe Periodontitis	5≥ of CAL

Gingival Index

The periodontal probe was moved horizontally along the soft tissues of the gingival sulcus wall on each tooth, and the severity of inflammation was recorded as follows [18,19]: 0) Normal and healthy gingiva; 1) Mild inflammation: Discoloration and mild edema, without bleeding subsequent to contactor probing; 2) Moderate inflammation: Redness, edema and bleeding subsequent to probing; 3) Severe inflammation: Redness, severe edema, the presence of ulcers and the tendency of the gingiva for spontaneous bleeding. These parameters were determined at four areas of the gingiva, including mesiobuccal and distobuccal papillae and buccal and lingual margins, and the gingival index of each tooth was registered as their means.

Clinical Attachment Level (CAL)

CAL is defined as the distance between the sulcus depth and CEJ of all the existing teeth. It was measured with the use of a Williams periodontal probe at mesiobuccal, mid-buccal, distobuccal, mesiolingual, mid-lingual and distolingual areas. The measurements were rounded to the nearest mm value.

DMFT Index

DMFT is an epidemiologic index for the caries process in permanent teeth, in which D stands for decay and represents the number of carious teeth, M stands for missing and represents the number teeth extracted due to dental caries, and F stands for filling and represents the number of restored teeth; DMFT is the sum of D+M+F [18].

A total of 50 mothers were included in this study. The participants were selected from those referring to Health Centers in Tabriz, Iran, for vaccination and check-up of their newborn babies and

had given birth at least one month before the initiation of the study. The subjects were included based on inclusion and exclusion criteria, and they signed informed consent forms after receiving adequate explanations about the study protocol. The participants were assigned to two groups: breastfeeding and non-breastfeeding (n=25, each). As for as possible, the subjects were matched in relation to their cultural status, educational level, socioeconomic status, and the number of births.

The subjects' serum calcium and vitamin D levels were checked in both groups based on their medical records in the Health Center, and only those with normal serum calcium and vitamin D levels were included in the study. Mothers with abnormal serum calcium and vitamin D levels were excluded from the research and were given information and instructions about such low levels of the factors above and were asked to consult with their physician. During the study period, none of the subjects received calcium and vitamin D supplements, and no intervention was carried out in this respect. During the initial examination, in addition to recording the demographic data and obtaining informed consent forms from the participants, the orodental conditions of the subjects were evaluated based on orodental health indices and data were recorded in a separate datasheet.

In addition, for the purpose of matching the conditions in all the subjects, scaling and polishing were carried out, and oral hygiene instructions were provided. In this context, a pamphlet was given to all the participants to match the educational process. The operator carrying out the examinations was blinded to the breastfeeding status of the mothers. The participants were followed at 2, 4, and 6-month intervals (at the time of newborn babies' vaccinations) and their periodontal health indices were evaluated gain and registered.

Statistical Analysis

Data were presented with the use of descriptive statistics (frequencies, means and standard deviations) and analyzed with IBM SPSS Statistics for Windows Software, version 20 (IBM Corp., Armonk, NY, USA). The gingival health parameters were compared between the two groups with the use of Chi-square, Wilcoxon, and Kruskal-Wallis tests. The level of significance was set at 5%

Ethical Considerations

The procedural steps were explained to the mothers and they were free to participate in the study and leave the study whenever they wished to. The mothers were informed about the status of their gingiva and teeth and were free to receive all the services that were offered. The data presented here were extracted from a thesis for a Doctorate in general dentistry presented to Tabriz Faculty of Dentistry under the Code 58747 and the ethical code IR.tbzmed.REC.1397.228.

Results

For the education level, 50% of the mothers had a high school education, the first pregnancy (64%), and the children were male (56%) (Table 2).

Table 2. Distribution of mothers according to demographic data.

Variables	Mothers					
	Breastfeeding		Non-Breastfeeding		Total	
	N	%	N	%	N	%
Educational Level						
Some High School Education	11	44.0	14	56.0	25	50.0
Associate's Degree	3	12.0	2	8.0	5	10.0
Bachelor's Degree	8	32.0	6	24.0	14	28.0
Master's Degree	3	12.0	3	12.0	6	12.0
Pregnancy Number						
First	14	56.0	18	72.0	32	64.0
Second	8	32.0	5	20.0	13	26.0
Third	3	12.0	2	8.0	5	10.0
Gender of the Newborn Baby						
Female	12	48.0	10	40.0	22	44.0
Male	13	52.0	15	60.0	28	56.0

Evaluation of PD showed that in the breastfeeding mothers increased from 1.97 mm at baseline to 2.44 mm after six months, indicating a significant increase in these mothers ($p<0.05$). In the non-breastfeeding mother, the PD increased from 2.03 mm at baseline to 2.11 mm after six months ($p>0.05$). In addition, at all the three follow-up intervals (baseline and at 2- and 4-month, intervals), there were no significant differences in PDs between the two groups. However, at the 6-month interval, the PD was significantly higher in the breastfeeding mothers compared to non-breastfeeding mothers (Table 3).

Table 3. Evaluation of pocket depth, clinical attachment level and BOP according to the evaluation period.

Variables	Baseline	2 Months	4 Months	6 Months	p-value[1]
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Pocket Depth					
Breastfeeding Mothers	1.97 ± 0.79	2.07 ± 0.34	2.31 ± 0.43	2.44 ± 0.27	0.025
Non-Breastfeeding Mothers	2.03 ± 0.42	2.08 ± 0.38	2.0 ± 0.4	2.11 ± 0.39	0.357
p-value	0.850	0.059	0.155	<0.001	
Clinical Attachment Level					
Breastfeeding Mothers	2.31 ± 1.24	2.33 ± 1.05	2.48 ± 1.81*	2.79 ± 1.74*	0.055
Non-Breastfeeding Mothers	2.42 ± 2.01	2.38 ± 1.69	2.41 ± 1.88	2.43 ± 2.05	0.357
p-value[2]	0.850	0.059	0.155	<0.001	
Bleeding on Probing					
Breastfeeding Mothers	35.86 ± 25.84	41.58 ± 16.16	50.66 ± 25.98	59.31 ± 20.14	0.035
Non-Breastfeeding Mothers	35.12 ± 28.29	35.54 ± 27.87	38.34 ± 20.33	41.41 ± 25.23	0.258
p-value	0.350	0.665	0.042	<0.001	

*Mann-Whitney Test; [1]Wilcoxon Test; [2]Kruskal-Wallis Test.

Evaluation of CAL showed that in the breastfeeding mothers, CAL increased from 2.31 mm at baseline to 2.79 mm after six months ($p>0.05$). In the non-breastfeeding mothers, CAL increased from 2.42 mm at baseline to 2.43 after six months ($p>0.05$). Besides, at all four evaluation intervals (at baseline and 2-, 4- and 6-month intervals), there were no significant differences in CAL between the two groups. However, CAL was a little higher at the 6-month interval in breastfeeding mothers compared to non-breastfeeding mothers, which was not statistically significant. On the other hand, a

lack of difference in CAL between the two groups, in association with an increase in PD, might indicate gingival hyperplasia in breastfeeding mothers (Table 3).

Evaluation of BOP showed that 35.9% of the teeth in breastfeeding mothers exhibited bleeding at baseline, increasing to 59.3% after six months of breastfeeding, which was statistically significant. In the non-breastfeeding mothers, BOP increased from 35.1% at baseline to 41.4% after six months (p = 0.258). In addition, the evaluation of BOP in the two groups showed that BOP at baseline and two months after initiation of the study was similar in both groups; however, at 4-month and 6-month intervals, BOP in the breastfeeding mothers was significantly higher than that in non-breastfeeding mothers (Table 3).

Evaluation of the gingival index showed that in the breastfeeding mothers, 76% had healthy gingiva at baseline, and 8% had moderate inflammation. After six months, 72% exhibited no inflammation, and 12% moderate inflammation. In non-breastfeeding mothers, 80% had no inflammation at baseline, and 8% had moderate inflammation. After six months, 80% had no inflammation, and 12% had moderate inflammation (Table 4).

Table 4. Evaluation of the gingival index according to the evaluation period.

Groups	Gingival Index	Baseline	2 Months	4 Months	6 Months
Breastfeeding Mothers	Normal	76%	76%	76%	72%
	Mild	16%	16%	12%	16%
	Moderate	8%	8%	12%	12%
	Severe	0%	0%	0%	0%
Non-Breastfeeding Mothers	Normal	80%	80%	80%	80%
	Mild	12%	12%	12%	8%
	Moderate	8%	8%	8%	12%
	Severe	0%	0%	0%	0%
p-value			0.423		

Evaluation of DMFT showed that in breastfeeding mothers, the rate of dental caries was 12.68, with 11.52 in non-breastfeeding mothers. There was no significant difference between the two groups during the six-month period, although the rate was higher in breastfeeding mothers. The mean number of teeth with untreated caries lesions in breastfeeding mothers was 6.27±3.76; with 4.56±3.12 in non-breastfeeding mothers, the difference was not significant statistically. The rates of white spots in breastfeeding and non-breastfeeding mothers were 1.64 and 0.88, respectively (Table 5).

Table 5. Evaluation of DMFT and white spot in two groups.

Groups	DMFT		Dental Caries		White Spot	
	Mean	SD	Mean	SD	Mean	SD
Breastfeeding Mothers	12.68	1.80	6.27	3.76	1.64	1.15
Non-Breastfeeding Mothers	11.52	3.06	4.59	3.12	0.88	1.01
p-value	0.060		0.053		0.076	

Evaluation of DMFT in the breastfeeding mothers showed that its rate in the first round of breastfeeding was 12.45, with 13.11 in the second round. These rates in the non-breastfeeding mothers were 10.85 and 13.2, respectively. There was a significant difference in dental caries rate between breastfeeding and non-breastfeeding mothers in the first pregnancy, with no significant difference between these two groups in the second pregnancy.

The oral mucosa in both groups of mothers was examined for the presence of lesions. There were no specific lesions in any of the two groups, including white-red lesions, exophytic lesions, or ulcers. Therefore, the lesions were not reported. Further studies are recommended with larger sample sizes for these lesions.

Discussion

In the present study, there were no significant differences in caries rate between breastfeeding and non-breastfeeding mothers during the 6-month study period; however, the caries rate (12.65) was higher in breastfeeding mothers than that in non-breastfeeding mothers (11.52). In addition, the rate of white spot lesions in breastfeeding mothers was 1.64 compared to 0.88 in non-breastfeeding mothers.

An increase in the number of white spot lesions during the breastfeeding period is an indication of an increase in the risk of dental caries and might also indicate a decrease in remineralization of teeth due a reduction of salivary calcium levels. On the other hand, dental caries is a chronic process, and a 6-month period cannot accurately show an increase in caries rate. Since the child is only breastfed during the first 6-month period after birth, and no supplementary food is used, in the present study, this 6-month period was selected to eliminate any confounding factors. However, further studies with longer study periods and by controlling the confounding factors are recommended.

A previous study showed that the saliva of breastfeeding women had significantly lower pH and buffering capacity compared to the control group, which might increase the risk of dental caries during the breastfeeding period [14]. Another research showed that the salivary calcium ions in the breastfeeding group were significantly higher than the two other groups, but phosphorus ions were similar in the three groups [4].

Some authors reported significant differences in the salivary calcium levels between breastfeeding and non-breastfeeding mothers, with lower levels in breastfeeding mothers [13]. The results of the present study are different from those previously reported in Baghdad [4] and are consistent with the findings in Mosul, Iraq [13]. However, due to discrepancies between the results of various studies, further researches are recommended.

Previous research developed in Baghdad showed no significant difference in caries rate between breastfeeding mothers and non-pregnant married women [4]. The results found in Baghdad in relation to the dental index [4] are consistent with those of the present study and are different concerning to gingival indexes. It should be pointed out that in the study developed in

Baghdad no attempts were made to control dental plaque and the subjects were not followed [4], while in the present study, efforts were made to control plaque and provide oral hygiene instructions in order to decrease confounding factors. Besides, the present research was a longitudinal follow-up study. In this research, dental and periodontal indices were evaluated four times during the first six months of breastfeeding. Therefore, it was able to get a better evaluation of the effect of breastfeeding on orodental health in comparison with the studies, which have evaluated these indices just one time.

Pregnancy and breastfeeding give rise to changes in the bodies of women, increasing their nutritional needs. Some of these changes might affect the bones. Women lose some density in their bones during the breastfeeding period, one of the reasons for which is a decrease in estrogen levels. A decrease in estrogen levels decreases calcium absorption, resulting in the risk of bone loss in oral structures. In addition, calcium deficiency might exacerbate periodontal status [20]. In the present study, no intervention was carried out in relation to the use of calcium and Vitamin D supplements. The mothers included in the present study were under the supervision of an obstetrician and based on their recommendations received no dietary supplements; also, their laboratory tests were normal. Mineral agents affect the severity and treatment of periodontal diseases. In addition, they reported that a diet rich in calcium is necessary for the preservation of the alveolar bone [21].

Researchers in Tohoku University in Japan evaluated the effect of breastfeeding on the alveolar bone and on the bone around the root apex in a periodontitis rat model and reported that breastfeeding women are at risk of losing bone structures around their teeth, especially when their diet is deficient in calcium [22,23].

Although the mother compensates her deficiencies after a while, during the breastfeeding period micronutrients are necessary for the integrity of bones because the bone density of the mother should be preserved and also the baby's needs should be met since the mother is responsible for providing all the needs of the baby for bone development [20].

The most critical materials for the reconstruction of bone are calcium, and vitamin D. Calcium is the main ingredient in bone structure, and 99% of the body's calcium reserves are found in bones. Vitamin D is necessary for the absorption of calcium. Unfortunately, these two essential agents are deficient in most diets [24].

In addition, hormonal changes during the breastfeeding period can, in itself, be a factor to increase inflammatory reactions in gingival tissues [6]. In the present study, there were no significant differences in PD and BOP between the breastfeeding and non-breastfeeding mothers at baseline and at the 2-month interval; however, at the 6-month interval both these variables increased significantly in breastfeeding mothers. The results of the present study showed that the clinical attachment level (CAL) of periodontal tissues during the study period was not significantly different between the breastfeeding and non-breastfeeding mothers. These findings indicate that breastfeeding mothers are more susceptible to gingivitis and periodontal problems compared to non-breastfeeding mothers, consistent with the results reported previously [23,24].

The results of the present study showed that at baseline, 76% of breastfeeding mothers and 80% of non-breastfeeding mothers had healthy gingival tissues. After six mothers, 72% of breastfeeding women and 80% of non-breastfeeding mothers had healthy gingival tissues. There were no significant differences in GI between the two groups. It should be emphasized that all these results were achieved with proper plaque control during the study period.

Previous research results showed that the plaque and gingival indexes in the pregnant group were the highest, followed in descending order by the breastfeeding and non-pregnant married women; however, the differences were not significant statistically [4]. It has also been demonstrated that breastfeeding women had more plaque and calculus and gingivitis severity compared to pregnant women who were 18-34 years of age. In the present study, all the subjects underwent scaling and polishing procedures to match and to control the confounding factors before being included in the study [25]. Also, oral hygiene instructions were provided in the first visit and at subsequent periodic follow-up visits.

The results showed that although changes during breastfeeding might increase susceptibility to bleeding and gingival inflammation, observing oral health instructions and proper control of plaque in breastfeeding, women can present variations in CAL. In the present study, the majority of breastfeeding mothers had healthy gingiva, and at the beginning of the study, only one-third of the mothers in both groups had a BOP, which can be managed with proper oral hygiene instructions. The periodontal problems of the majority of these women can be resolved with simple techniques and treatments such as oral hygiene instructions and scaling, with no need for complicated procedures such as surgery. It should be pointed out that factors such as ethnicity, geographical location, cultural variables, and diet are effective, too. Younger age, cultural factors such as high educational level and better economic status result in better management of oral health; however, aging and the number of children has a negative effect.

Conclusion

There were no significant differences in caries rate between breastfeeding and non-breastfeeding mothers. The rate of dental caries at baseline in breastfeeding women was higher than that in non-breastfeeding women. Pocket depths and bleeding on probing in breastfeeding mothers were higher than those in non-breastfeeding women; however, clinical attachment levels were not significantly different between the two groups.

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References

[1] Gambhir RS, Nirola A, Gupta T, Sekhon TS, Anand S. Oral health knowledge and awareness among pregnant women in India: A systematic review. J Indian Soc Periodontol 2015; 19(6):612-7. https://doi.org/10.4103/0972-124X.162196

[2] Iriadam M. Variation in certain hematological and biochemical parameters during the peri-partum period in Kilis does. Small Ruminant Res 2007; 73(1-3):54-7. https://doi.org/10.1016/j.smallrumres.2006.11.001

[3] Weiss G. Endocrinology of parturition. J Clin Endocrinol Metab 2000; 85(12):4421-5. https://doi.org/10.1210/jcem.85.12.7074

[4] Issa ZMT, El-Samarrai SK. Oral health status among a group of pregnancy and lactating women in relation to salivary constituents and physical properties (A comparative study). J Bagh Coll Dentistry 2012; 24(2):155-9.

[5] Zanata RL, Fernandes KBP, Navarro PSL. Prenatal dental care: Evaluation of professional knowledge of obstetricians and dentists in the cities of Londrina/PR and Bauru/SP, Brazil, 2004. J Appl Oral Sci 2008; 16(3):194-200. https://doi.org/10.1590/S1678-77572008000300006

[6] Chandran L, Gelfer P. Breastfeeding: The essential principles. Pediatr Rev 2006; 27(11):409-17.

[7] Australian Institute of Health and Welfare 2011, 2010 Australian National Infant Feeding Survey: Indicator Results. Canberra: AIHW. Available at: http://www.aihw.gov.au/publication-detail/?id=10737420927. [Accessed on February 16, 2018].

[8] World Health Organization. Baby-friendly hospitals boost breastfeeding in New Zealand. Available at: http://www.who.int/features/2014/new-zealand-breastfeeding/en/. [Accessed on February 16, 2018].

[9] Peres KG, Cascaes AM, Nascimento GG, Victora CG. Effect of breastfeeding on malocclusions: A systematic review and meta-analysis. Acta Pediatr 2015; 104(467):54-61. https://doi.org/10.1111/apa.13103

[10] Mutlak NQ, Yas BA. Dental caries severity in relation to selected salivary variables among a group of pregnant women in Baghdad city, Iraq. J Bagh College Dentistry 2017; 29(2):116-21. https://doi.org/10.12816/0038760

[11] Briese V, Seyfarth M, Brock J. Serum concentration of secretory IgA during pregnancy and in gynaecological diseases affecting glands and mucosas. J Zentralbl Gynakol 1991; 113(18):987-94.

[12] Laine MA. Effect of pregnancy on periodontal and dental health. Acta Odontol Scand 2002; 60(5):257-64.

[13] Al-Nuaimy KMT, Al-Sandook TA. Salivary calcium level during lactation. Al-Rafidain Dent J 2006; 6(1):12-4.

[14] Oztürk LK, Akyüz S, Garan A, Yarat A. Salivary and dental - oral hygiene parameters in 3rd trimester of pregnancy and early lactation: The effect of education. Marmara Dent J 2013; 1(1):1-8.

[15] Blinkhorn AS. Dental preventive advice for pregnant and nursing mothers - sociological implications. Int Dent J 1981; 31(1):14-22.

[16] Figuero E, Carrillo-de-Albornoz A, Martín C, Tobías A, Herrera D. Effect of pregnancy on gingival inflammation in systemically healthy women: A systematic review. J Clin Periodontal 2013; 40(5):457-73. https://doi.org/10.1111/jcpe.12053

[17] Muhlemann HR, Mazor ZS. Gingivitis in Zurich school children. Helv Odontol Acta1958; 2:3-12.

[18] Wei SH, Lang KP. Periodontal epidemiological indices for children and adolescents: I. Gingival and periodontal health assessments. Pediatr Dent 1981; 3(4):353-60.

[19] Newman M, Takei H, Klokkevold P, Carranza F. Carranza's Clinical Periodontology. 12th. ed. Philadelphia: Saunders; 2014.

[20] Specker B. Vitamin D requirements during pregnancy. Am J Clin Nutr 2004; 80(6 Suppl):1740S-7S. https://doi.org/10.1093/ajcn/80.6.1740S

[21] Varela-López A, Giampieri F, Bullón P, Battino M, Quiles JL. A Systematic review on the implication of minerals in the onset, severity and treatment of periodontal disease. Molecules 2016; 21(9):E1183. https://doi.org/10.3390/molecules21091183

[22] Tanaka M, Toyooka E, Kohno S, Ozawa H, Ejiri S. Long-term changes in trabecular structure of aged rat alveolar bone after ovariectomy. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2003; 95(4):495-502. https://doi.org/10.1067/moe.2003.135

[23] Kawamoto S, Ejiri S, Nagaoka E, Ozawa H. Effects of oestrogen deficiency on osteoclastogenesis in the rat periodontium. Arch Oral Biol 2002; 47(1):67-73. https://doi.org/10.1016/S0003-9969(01)00086-3

[24] Sabour H, Hosseinnezhad A, Maghbooli Zh, Bagher ALM. Effects of vitamin D and calcium intake on serum bone markers at delivery. J Reprod Infertil 2007; 8(2):135-41.

[25] Malisa JE, Mosha HJ, Masalu JR. Periodontal status of pregnant and postpartum mothers aged 18-45 years attending MCH clinics in Tanga Municipality, Tanzania. East Afr Med J 1993; 70(12):799-802.