

Dynamics of Pregnant Women's Oral Health Status during Preventive Programme

Ingrida Vasiliauskiene, Simona Milciuviene, Egle Bendoraitiene, Julija Narbutaite, Egle Slabsinskiene, Vilija Andruskeviciene

SUMMARY

The aim of the study was to determine the efficiency of the applied preventive measures during pregnancy and to improve oral health status to pregnant women. Material and Methods. Oral health status of 180 pregnant women was determined according to WHO criteria (WHO: Basic methods, 1997). Dental caries prevalence, DMF-T and DMF-S were evaluated. Gingival status was estimated according to Silness-Loe (GI) index. Women were asked about tooth brushing frequency; oral hygiene was evaluated according to Green-Vermilion (OHI-S) index. Participants were divided into test (89) and control (91) groups. During pregnancy, the following preventive measures were applied to the test group: fluoride varnish applications, mouthrinsing with 0.12 % chlorhexine digluconate, professional oral hygiene. Results. Oral health status was evaluated three times during pregnancy. Reduction in dental caries increment of the test group was 56.25 % in comparison with the control group. The periodontal status has improved, oral hygiene index (OHI-S) has decreased from 1.48 ± 0.05 to 0.94 ± 0.06 in the test group, and from 1.49 ± 0.06 to 1.9 ± 0.06 in the control group. Conclusion. Results of the study showed that selected dental caries preventive measures were effective and significantly improved women's oral health during pregnancy.

Key words: pregnant women, dental caries, gingivitis, oral hygiene, prevention.

INTRODUCTION

In order to prevent early childhood caries, it is necessary to start applying preventive measures very early, when women is pregnant. Prenatal dental caries prevention is in practice in many countries. The aim of prevention is to keep healthy woman's teeth during pregnancy and to provide knowledge about the prevention of early childhood caries. [1] Pregnant women are instructed proper oral hygiene. Professional hygiene and other preventive methods are applied to them. The practice showed that the measures not only improved pregnant women's oral health, but also

reduced prevalence and severity of early childhood caries. [2, 3]

Streptococcus mutans plays an important role in dental caries etiology [4, 5, 6]. It participates in the production of extracellular polysaccharides, increases acidity and enamel solubility, participates in dental plaque formation and adhesion to smooth surfaces. Kohler and Andrren [7] indicate that *Streptococcus mutans* is not found anywhere else except human mouth, therefore it might be to conclude that children are infected by those who have high levels of these microorganisms in their mouth by a frequent contact with a child. It was determined that oral cavity of newborn is sterile [6, 8]. Consequently it is considered that children are infected by their mothers in early age [5, 9, 10].

Thus, mothers should pay attention to their oral hygiene, know about the risk factors of early childhood caries. Good mothers' oral hygiene, knowledge about the prevention of their and their baby's teeth will improve oral health of both [9].

Prenatal prevention is based on reducing risk factors of dental caries and periodontal diseases and keep oral health status during pregnancy as it was before. Consequently different measures as well, as dental caries

*Department of Oral Health and Paediatric Odontology, Kaunas University of Medicine

*Ingrida Vasiliauskiene** – D.D.S., PhD, lecturer

*Simona Milciuviene** – D.D.S., PhD., professor, Head of Department of Oral Health and Paediatric Odontology, Kaunas University of Medicine

*Egle Bendoraitiene** – D.D.S., PhD, lecturer

*Julija Narbutaite** – D.D.S., PhD, assoc. prof.

*Egle Slabsinskiene** – D.D.S., PhD, lecturer

*Vilija Andruskeviciene** – D.D.S., PhD, lecturer

Address correspondence to Dr. Ingrida Vasiliauskiene, Department of Oral Health and Paediatric Odontology, Kaunas University of Medicine, Luksos Daumanto Str. 6, LT-50106 Kaunas, Lithuania. E-mail: vaikstom@med.kmu.lt

Table 1. Evaluation of GI values

Gingival Inflammation	Scores
No inflammation (healthy gums)	0
Slight gingivitis	0.1-1.0
Moderate gingivitis	1.0-2.0
Severe gingivitis	2.1-3.0

prevention programs are applied [3, 10, 11, 12, 13]. There are few preventive programs for pregnant women and studies about the effectiveness of these programmes.

Results of epidemiological studies about oral health status of young women in Lithuania showed that DMF-T was 12.56 ± 0.66 among 21-28-year-olds [14]. DMF-S was 19.7 ± 0.88 . Prevalence of periodontal diseases was 90%. Prevailing pathology was calculus (59.1%) and gingival bleeding (19.62%). Deep periodontal pockets were found in 15.15% of cases. Two thirds of women showed only satisfactory oral hygiene (74.24% had OHI-S from 1.1 to 2.0). Similar data about periodontal status was published by Globiene [15], where most of young people had gingivitis (84.3%), and deep periodontal pockets were diagnosed in 12% of participants.

Dental plaques plays important role in the aethiology of periodontal diseases. Therefore oral hygiene is very important in prevention of periodontal diseases and dental caries [1, 16, 17].

Oral health status among Lithuanian pregnant women was not evaluated before. No preventive measures were applied. So, the aim of the study was to determine the efficiency of the applied preventive measures during pregnancy and to improve oral health status to pregnant women

MATERIAL AND METHODS

Methodology of Oral Status Evaluation

Dental caries was recorded following the criteria of WHO (WHO Basic Methods 1997) [18]. All surfaces

Table 2. Pregnant women's answers concerning toothbrushing frequency

Code	Toothbrushing frequency
1	Twice a day
2	Once a day
3	1-3 times a day
4	Less than once a week
5	Never

were examined. Dental mirror and blunt explorer were used. The study was undertaken in a dental office.

Dental caries prevalence indicate the percentage of examined population with dental caries. DMF-T and DMF-S were used to show severity of dental caries.

Increment in dental caries intensity was assessed while estimating the difference between DMF-T or DMF-S indexes in a certain period of time.

Reduction in increment of dental caries intensity indicated the effectiveness of preventive measures, i.e. reduction in dental caries increment in the test group in comparison to that in the control group. The value was expressed in percent.

GI index (Loë and Silness) was used to evaluate gingival status [19]. It is used to estimate the severity of gingivitis by evaluating gum colour, consistence and bleeding during probe. GI may be applied on selected tooth, teeth group, quadrant, side of a mouth or all teeth gingiva.

Mesial, vestibular, distal and lingual marginal gingiva of the teeth 16, 21, 24, 36, 41, 44 was examined. Values of GI are presented in Table 1.

Oral Hygiene Index OHI-S (*Green-Vermillion*) with value from 0 to 6 was used to evaluate oral hygiene [19].

During experimental prospective study each woman was asked about frequency of toothbrushing with 5 possible answers (Table 2).

Dental Caries Prevention Methods Applied to Pregnant Women

All pregnant women who participated in the preventive programme gave their written consents.

Table 3. Dynamics of women's dental caries intensity DMF-T and DMF-S during pregnancy

Studied women's groups	Number of studied women	First pregnancy trimester		Second pregnancy trimester		Third pregnancy trimester		Increment during pregnancy		Increment reduction in comparison to control group	
		DMF-TX± SE	DMF-SX± SE	DMF-TX± SE	DMF-SX± SE	DMF-TX± SE	DMF-SX± SE	DMF-TX± SE	DMF-SX± SE	DMF-TX± SE, %	DMF-SX± SE, %
Test group	89	13.40± 0.32	20.00± 0.82	13.50± 0.34	20.09± 0.73	13.97± 0.27	20.66± 1.09	0.56± 0.42	0.66± 1.10	56.58	56.58
Control group	91	12.45± 0.31	18.85± 0.81	13.38± 0.26	19.76± 0.72	13.74± 0.26	20.37± 0.75	1.28± 0.41	1.52± 1.08	-	-

$p < 0.05$, $F = 0.75$, when comparing control group results in 1st and 2nd trimesters;
 $p < 0.01$, $F = 1.02$, when comparing control group results in 1st and 3rd trimesters.

Oral health status of women in test and control groups was examined three times: in the first, second, and third pregnancy trimesters. Preventive measures (fluoride varnish applications, mouthrinsings with 0.12% chlorhexine digluconate, and professional oral hygiene) were applied to the test group. No preventive measures were applied to the control group.

Oral Hygiene

Pregnant women received oral hygiene instructions. Professional oral hygiene was performed twice. OHI-S was evaluated during each examination, oral health care instructions were performed, and toothbrushing inequality was discussed upon request.

Fluoride Varnish applications

Before procedure, test group patients' teeth were cleaned from soft plaque and drained, isolated from saliva. The fluoride varnish was applied and left for 3-

5 minutes until it set. After procedure patient was instructed not to eat, drink and not to rinse for half an hour. It was also advised not to eat milk products the same day. Varnish retains for 24 or 48 hours. During that time fluoride is releasing. Fluoride varnish applications for test group women were performed three times during pregnancy. "Fluoridin" and "Bifluorid 12" varnishes (Voco) were used.

Mouthrinsings with 0.12% Chlorhexine Digluconate

Test group were using the solution of 0.12% chlorhexine digluconate. Mouthrinsings were started from fourth month of pregnancy and continued until the end. Three periods with duration of 10 days with break of 6 weeks were planned (29-30 days in total). Mouth was rinsed for 2 minutes every day with 20 ml (two table spoons) of 0.12% chlorhexine digluconate.

Table 4. Changes in women's DMF-T index composition during pregnancy

Groups of studied pregnant women	DMF-T index composition					
	D		F		M	
	$\bar{X} \pm SE$	%	$\bar{X} \pm SE$	%	$\bar{X} \pm SE$	%
<i>First pregnancy trimester</i>						
Test group	5.81±0.40	43.36	7.34±0.40	54.78	0.25±0.09	1.86
Control group	6.02±0.43	48.35	6.29±0.42	50.52	0.14±0.05	1.12
<i>Second pregnancy trimester</i>						
Test group	3.64±0.25	26.96	9.58±0.36	70.96	0.28±0.09	2.07
Control group	5.26±0.24	39.31	7.91±0.29	59.12	0.21±0.06	1.57
<i>Third pregnancy trimester</i>						
Test group	2.55±0.15	18.25	11.09±0.25	79.38	0.33±0.10	2.36
Control group	4.87±0.23	35.44	8.66±0.26	63.02	0.21±0.08	1.52

$p < 0.001$, $F = 0.03$, when comparing D of test and control groups in the second pregnancy trimester;
 $p < 0.001$, $F = 0.19$, when comparing F of test and control groups in the second pregnancy trimester;
 $p < 0.05$, $F = 6.40$, when comparing P of the control group in the first and second trimesters;
 $p < 0.05$, $F = 12.43$, when comparing D of the test group in the first and second trimesters;
 $p < 0.05$, $F = 0.92$, when comparing F of the test group in the first and second trimesters;
 $p < 0.01$, $F = 0.77$, when comparing D of the control group in the second and third trimesters;
 $p < 0.001$, $F = 2.56$, when comparing F of the control group in the second and third trimesters;
 $p < 0.001$, $F = 9.06$, when comparing D of test and control groups in the third trimester;
 $p < 0.001$, $F = 0.11$, when comparing F of test and control groups in the third trimester.

Table 5. Changes in women's DMF-S index composition during pregnancy

Groups of studied pregnant women	DMF-S index composition					
	DS		FS		MS	
	$\bar{X} \pm SE$	%	$\bar{X} \pm SE$	%	$\bar{X} \pm SE$	%
<i>First pregnancy trimester</i>						
Test group	6.87±0.72	36.45	11.86±0.61	59.30	1.26±0.45	6.3
Control group	8.38±0.93	41.90	9.77±0.53	51.83	0.70±0.27	3.71
<i>Second pregnancy trimester</i>						
Test group	3.73±0.33	18.57	14.98±0.48	74.56	1.38±0.48	6.87
Control group	6.35±0.48	31.14	12.37±0.72	62.60	1.04±0.46	5.11
<i>Third pregnancy trimester</i>						
Test group	2.03±0.22	9.92	17.01±0.45	82.33	1.52±0.49	7.43
Control group	4.97±0.42	23.70	14.31±0.41	70.25	1.09±0.47	5.25

$p < 0.01$, $F = 15.44$, when comparing DF results of the control group in the first and third stages;
 $p < 0.001$, $F = 2.78$, when comparing FS results of the control group in the first and third stages;
 $p < 0.001$, $F = 39.05$, when comparing DF results of the test group in the first and third stages;
 $p < 0.001$, $F = 1.60$, when comparing FS results of the test group in the first and third stages.

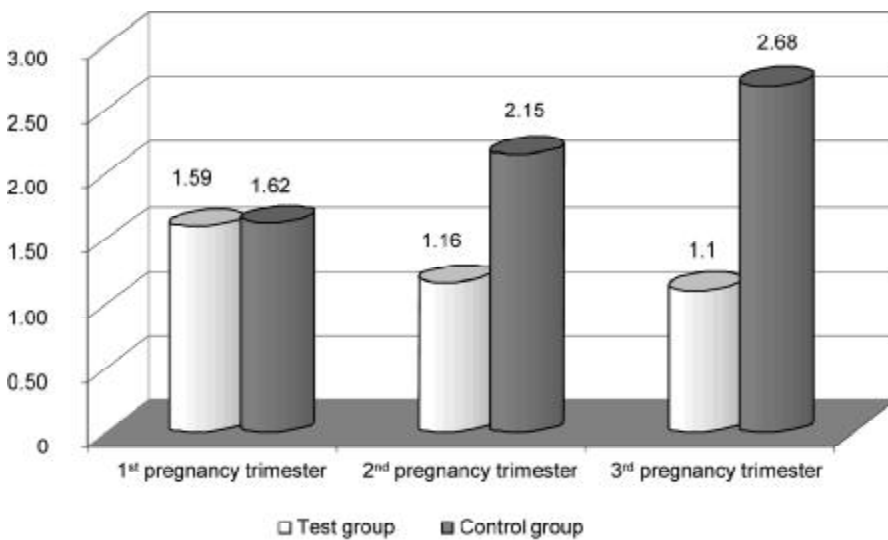


Fig. 1. Changes in pregnant women's gingival index (GI) during pregnancy
 $p < 0.001$, $F = 22.46$, when comparing test and control group results in the third stage;
 $p < 0.001$, $F = 23.85$, when comparing control group results in the first and second stages;
 $p < 0.001$, $F = 0.64$, when comparing control group results in the second and third stages;
 $p < 0.001$, $F = 0.06$, when comparing test group results in the first and second stages;
 $p < 0.001$, $F = 0.73$, when comparing test group results in the second and third stages.

Characteristics of the Study Sample

During experimental study 180 pregnant women aged 22 to 35 years participated in the preventive programme. At the beginning of the prevention programme, two groups: test and control of pregnant women were selected. 89 women of the test group and 91 women of the control group participated in the programme. Women were selected for those groups randomly, considering their compliance as well.

Data analysis. Results were calculated and statistic analysis performed by means of SPSS (Statistical Program for Social Science) for Windows. The analysed groups were described using the characterization of general statistics, dispersion and symmetrical association. The verification of the hypotheses of the relation between qualitative variables was performed using χ^2 criterion. The comparison of quantitative values was performed using Student's (t) or Fisher's (F) criterion. Continuous variables were described as $\bar{X} \pm SE$. P-values less than 0.05 or 0.001 were considered statistically significant.

RESULTS

Prevalence and Severity of Dental Caries

Prevalence of dental caries in both groups was 100%.

In order to evaluate changes in dental caries experience during pregnancy, mean DMF-T was estimated in test and control groups in each pregnancy trimester.

According to the data presented in Table 3, mean DMF-T at the beginning of pregnancy (in the first trimester) was similar in test and control groups with no statistically significant difference ($p > 0.01$).

Analysis of the dynamics of DMF-T in test and control groups in the second and third pregnancy trimesters, showed an increase in

both groups, despite applied preventive measures. The increment rate was lower in the test group, in comparison with control group. DMF-T increment during pregnancy was 0.56 ± 0.42 in the test group, while it was 1.28 ± 0.41 in the control group. Reduction of DMF-T during pregnancy was 56.25% in the test group (Table 3).

The same tendency was observed in DMF-S. The increment of DMF-S during pregnancy was 0.66 ± 1.09 in the test group, and 1.52 ± 1.08 in the control group. Dental caries reduction according to DMF-S index during pregnancy was 56.58%. Thus the preventive measures applied to pregnant women were effective as they significantly reduced dental caries increment considering both indexes.

Having analysed the DMF-T, it was found that pregnant women of both groups have more than one third of affected teeth that need filling (Table 4).

Analysis of the changes in DMF-T composition during pregnancy showed that the rate of teeth af-

Table 6. Pregnant women's mean OHI-S indexes during pregnancy

Groups of studied pregnant women	OHI-S values			Difference in the course of pregnancy $\bar{X} \pm SE$
	First pregnancy trimester $\bar{X} \pm SE$	Second pregnancy trimester $\bar{X} \pm SE$	Third pregnancy trimester $\bar{X} \pm SE$	
Test group	1.48±0.05	1.05±0.06	0.94±0.06	0.54±0.08.
Control group	1.49±0.06	1.77±0.04	1.90±0.06	-0.40±0.07

$p < 0.001$, $F = 0.33$, when comparing test group results in the first and third stages;
 $p < 0.001$, $F = 12.79$, when comparing control group results in the first and third stages;
 $p < 0.001$, $F = 57.26$, when comparing test and control group results in the third stage.

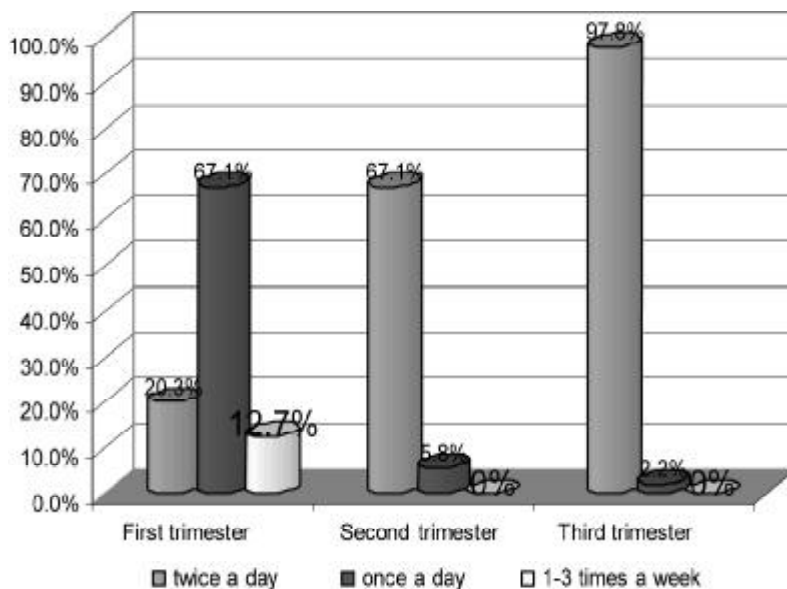


Fig. 2. Pregnant women's toothbrushing frequency in the test group. $p < 0.001$, $df = 2$, $\chi^2 = 106.01$, when comparing test group results in the first and third stages.

ected by caries (D) decreased by 9.04% in the control group and even by 16.4% ($p < 0.001$) in the test group already in the second pregnancy trimester (Table 4). In the second pregnancy trimester, the index of filled teeth (F) increased in both groups: 16.18% in the test group and by 8.6% in the control.

At the end of pregnancy, the average of women's teeth affected by caries (D) decreased significantly in the test group.

During the entire preventive program, the index of filled teeth (F) increased by 24.6% in the test group and by 12.5% in the control ($p < 0.001$). The index extracted teeth (M), varied little during pregnancy both test and control groups (Table 4).

Analysing of the composition of DMF-S during prevention programme showed that teeth were treated in both groups during pregnancy, therefore, the number of filled teeth surfaces (FS) increased from 11.86 to 17.01 in the test group and from 9.77 to 14.31 in the control group. Statistically significant difference between groups was found (Table 5).

Results demonstrated that women treated their teeth during entire pregnancy, even in the last pregnancy trimester, what is not recommended. The number of filled surfaces increased by a one third in both groups. Despite applied preventive measures and treatment, none of the groups had 100% of cured surfaces.

In both groups, the number of caries lesions (DS) decreased during pregnancy: from 6.87 to 2.03 in the test group, and from 8.38 to 4.97 in the control group. The number of extracted teeth (MS) was almost the same in both groups (Table 5).

Evaluation of Gingival Index according to Silness-Loë (GI)

In the first pregnancy trimester, the mean gingival index according to *Silness-Loë (GI)* was 1.59 ± 0.7 in the test group and 1.62 ± 0.06 in the control group, which was scored as moderate gingivitis (scores 1.0-2.0). Gingivitis prevalence (light, moderate, severe) was 93.6% in the test group and 94.2% ($p > 0.01$) in the control group.

A statistically significant difference was found between test and control groups in the second examination stage (Figure 1).

Comparing the data of the first and second stages, it was found that mean *GI* score decreased significantly in the test group ($p < 0.001$), although it remained on the level of moderate gingivitis. In the control group, the mean *GI* score increased significantly. Applied preventive measures

showed positive results after the first stage already, and it increased in the third stage (Figure 1).

The results of the third stage in the test group differ significantly from those in the control group: moderate gingivitis was found in the test group and severe gingivitis in the control group. *GI* difference between groups was 1.58 ± 0.07 (Figure 1).

Comparing mean *GI* scores at the beginning and at the end of pregnancy, they significantly increased in the control group: from moderate gingivitis at the beginning of pregnancy to severe gingivitis at the end. Whereas in the test group, the mean *GI* score significantly decreased comparing the results of the first and third stages. Thus, selected preventive measures had impact on reduction of gingival inflammation.

Evaluation of Oral Hygiene

Pregnant women in both groups brushed their teeth at the same frequency during the first stage (Figures 2 and 3).

At the end of pregnancy, however, it was found that even 97.8% of women in the test group brushed their teeth twice a day, while there were only 33.0% ($p < 0.001$) in the control group.

Pregnant women's oral hygiene status was evaluated by Oral Hygiene Index *OHI-S* (Table 6). The *OHI-S* of the test group was 1.48 ± 0.05 in the first pregnancy trimester. This score is considered as satisfactory hygiene status. The control group also showed satisfactory hygiene status and *OHI-S* value was 1.49 ± 0.06 ($p > 0.05$).

The results showed that mean *OHI-S* in the test group decreased significantly in the second stage of

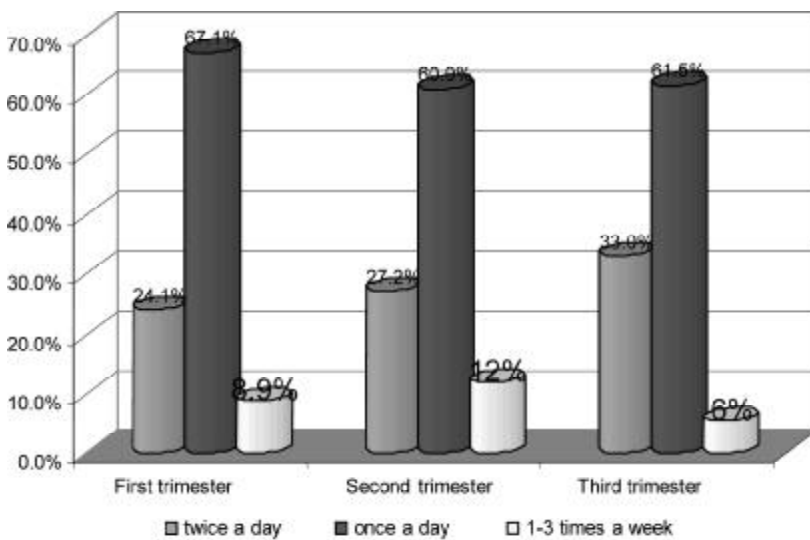


Fig. 3. Pregnant women's toothbrushing frequency in the control group.

the program in comparison with the data in the first stage.

In the third stage, OHI-S was also estimated in the test group. Comparing the results at the beginning and at the end of pregnancy, significant difference was found: the mean *OHI-S* decreased even by 0.54 ± 0.08 . The mean *OHI-S* of control group significantly increased ($p < 0.05$) in this stage. The increment of the mean *OHI-S* was 0.40 ± 0.07 (Table 6).

Having evaluated the dynamics of oral health status during pregnancy, it was found that preventive measures applied to the test group during pregnancy were effective, showing significant differences between the results in test and control groups.

DISCUSSION

There was no difference found between dental caries prevalence and severity in the test and control groups. Moderate and severe gingivitis, according to Silness-Loe, was widely prevalent among studied women. The data is similar with the findings in the other countries [20, 21, 22]. DMF-T in the second and third pregnancy trimester showed, that despite applied preventive measures, the rate increased in both groups. The findings reveal, however, that DMF-T increment in the test group during pregnancy was twice as low as that in the control group. After preventive measures had been applied during pregnancy, the decrease in DMF-T increment was 56.25% in comparison to the control group. The obtained results are similar to those of other countries.

Borovskij et al. [13] divided pregnant women into 5 groups according to applied preventive measures in his study: 1st group – fluoride varnish applications, 2nd group – ‘Remodent’ (remineralizing liq-

uid), 3rd group – fluoride varnish and ‘Remodent’, 4th group – controlled toothbrushing, and 5th group – control group that did not receive any preventive measures. Having compared individual test groups with the control group, the DMF-T increment reduction was from 30% to 53.2%. It was determined in the study that the highest reduction in DMF-T increment (53.2%) was noted in the group where fluoride varnish and remineralizing liquid was applied. DMF-T increment reduction of 42.2% was observed in the group where controlled toothbrushing was applied.

According to Butane [23], the DMF-T increment during pregnancy was 0.24 in the control group and remained unchanged in the test group where controlled toothbrushing, fluoride varnish applications and professional oral hygiene were applied.

While analyzing the dynamics of DMF-S, it was ascertained that there was no DMF-S increment in the test group, whereas dental caries increment in the control group was 2.88 ± 0.21 . Therefore, it is possible to presume that the author reached 100% reduction in dental caries intensity increment. Author observed active demineralization in many surfaces of the teeth in the control group, which once again confirmed the necessity to apply preventive measures.

Analogous tendencies were observed in the present study when evaluating DMF-S increment and reduction in increment during pregnancy in test and control groups. Borovskij *et al.* [13] in his study found DMF-S increment of 0.71 in the test group and 2.43 in the control group. The findings of the study revealed that they estimated even higher reduction in dental caries increment of 70.78 in the course of the study than it was estimated in the present study. When analyzing the results of groups where different preventive measures were applied, best results were obtained when fluoride varnish and controlled toothbrushing were applied, which corresponds to the data of our study.

Having examined oral health status of 59 pregnant women aged from 22 to 29, Chlapovska and co-authors found that DMF-T was 13.64, which is similar to oral health status of women examined in this study. During implemented preventive programme nutrition and oral hygiene were corrected and toothpaste with fluoride was used. The measures had improved oral health status of the pregnant women who participated in the programme [24].

During pregnancy, gingivitis was observed in 40-100% of cases [25]. In the course of the study, gingivitis prevalence 93.6-94.2% was noted.

Changes in gingival index (*GI*) were evaluated during pregnancy when preventive measures were applied in the test group. At the beginning of pregnancy, moderate gingivitis was identified both in test and control groups. At the end of pregnancy, *GI* remained unchanged in the test group, whereas it increased significantly in the control group. Similar tendencies were observed by Anraham-Inpijn L. *et al.* [25] when examining changes in gingival inflammation during the pregnancy. The authors emphasize that gingivitis during pregnancy depends not only on oral hygiene, but on other factors as well, especially on the activity of hormones. Increased amount of progesterone and oestrogen enhances exertion of gingivitis, and therefore preventive procedures for oral hygiene are extremely important. The impact of other factors is manifested in the present findings where gingivitis of the test group remained on the same level (moderate), although numeral evaluation of gingivitis decreased in scores. Preventive measures applied to pregnant women in the test group reduced the severity of gingival inflammation, yet the efforts to reduce or eliminate were not successful.

Other scientists notice that periodontal status and DMF-T during pregnancy is closely related to socioeconomical factors, to general health status, age, place of residence, profession and education [26, 27]. Comparable findings are presented by Gongaza *et al.*, Okuda *et al.* [28, 29]

Brambilla *et al.* [10], in preventive programme for pregnant women, also used the mouthrinsings with solution of 0.12% chlorhexine digluconate and had positive results: pregnant women's oral health status improved and the amount of *Streptococcus mutans* in saliva decreased. In his study, Seppa L. [28] indicates that using fluoride varnish in prevention of dental caries, positive results were obtained due to much longer contact of varnish and enamel, when more fluoride ions are released to enamel surface.

Pregnant women's oral hygiene status was evaluated by *OHI-S* and there was no significant difference as satisfactory status of oral hygiene was observed in both groups. At the end of pregnancy oral hygiene of the test group was good (*OHI-S* < 1.0), whereas that of the control group was satisfactory (*OHI-S* > 1.1). Undoubtedly, such results in the test group because procedures of individual and professional oral hygiene. We think that a specific effect of fluoride in the varnish, which inhibits accumulation of plaque on tooth surfaces, had a considerable impact on this as well [30].

Pregnant women's toothbrushing frequency at the beginning of pregnancy did not differ significantly between groups. Oral hygiene skills of both groups were insufficient. At the end of pregnancy, after the instructions on oral hygiene and professional hygiene procedures, a significant difference was obtained when comparing the results in test and control groups. Even 97.8% of women in the test group indicated in the questionnaire that they brush their teeth twice a day. Consequently, a conclusion may be drawn that application of preventive measures and instruction on oral hygiene gave positive results. This is also maintained in the other studies [3, 10, 13, 20].

Bachmudov and Bakhmudova also emphasise the necessity to care about pregnant women's dental and oral hygiene status [31]. Having examined 664 pregnant women, they notice that oral hygiene status was not satisfactory at the beginning of pregnancy and the instructions on oral hygiene as well as controlled toothbrushing are necessary to improve it.

Analogous results were presented by a Latvian scientist Butane [23]. In her study, the mean *OHI-S* of pregnant women's control group varied from 1.50±0.05 at the beginning of pregnancy to 1.82±0.07 at the end of pregnancy; whereas the mean *OHI-S* of the test group where controlled toothbrushing was applied, decreased from 1.50±0.05 at the beginning of pregnancy to 1.22±0.03 at the end. McCann A.L., Bonci L. [32] notice that dentists should not only apply dental caries preventive measures for pregnant women but also talk about the importance of correct nutrition and damage of low physical activity and alcohol; provide knowledge about measures to keep good oral hygiene. The same ideas were expressed by Bowsher I. [33]. Integrated attitude towards prevention of dental caries among pregnant women is of high importance.

A prominent role here is of obstetricians-gynaecologists, nurses, and obstetricians either [28]. Good results may be reached only having united efforts while improving pregnant women's oral health status and reducing the risk of early childhood caries [11, 28, 32].

Consequently, having reviewed scientific studies undertaken in various countries and referring to the data of the present study, we state that it is necessary to apply measures to prevent dental caries during pregnancy. It helps to improve pregnant women's oral health status significantly.

CONCLUSIONS

1. Preventive measures (mouthrinsings with 0.12% chlorhexine digluconate, fluoride varnish application, and individual oral hygiene) were effective in the test group and reduced increment in dental caries

intensity. Reduction of dental caries increment was up to 56.58%.

2. Oral hygiene of pregnant women who participated in the prevention programme has improved. In the test group, the number of women brushing their teeth twice a day increased up to 97.8%, *OHI-S* decreased from 1.48 to 0.94 (0.54 ± 0.08) scores in the

test group during pregnancy and increased from 1.49 to 1.90 scores in the control group.

3. Applied preventive measures decreased gingival inflammation for pregnant women in the test group.

4. The preventive methods applied in our study were effective and are recommended for the pregnant women during pregnancy.

REFERENCES

- Axelsson P. Worldwide prevalence of oral disease . In: An Introduction to risk prediction and preventive dentistry. Quintessence Publ Co.Inc; 1999. p. 1-7.
- Caulfield PW. Dental caries- a transmissible and infectious disease revisited .A position paper. *Pediatr Dent* 1997;19:491-8.
- Gomez SS, Weber AA. Effectiveness of a caries preventive program in pregnant women and new mothers on their offspring. *Int J Paediatr Dent* 2001;11:117-22.
- Hamada S, Slade HD. Biology, immunology and cariogenicity of *Streptococcus mutans*. *Microbiol Rev* 1980;44:331-84.
- Alaluusua S. Transmision of *mutans streptococci*. *Proc Finn Dent Soc* 1991;87:443-7.
- Smith DJ, Anderson JM, King WF, van Houte J, Taubman MA. Oral streptococcal colonization of infants. *Oral Microbiol. Immunol* 1993;8:1-4.
- Kohler B, Andren I. Influence of caries preventive measures in mothers on cariogenic bacteria and caries experience in their children. *Arch Oral Biol* 1994; 39: 907-11.
- Berkowitz R. Etiology of nursing caries: a microbiologic perspective. *J Publ Health Dent* 1996; 56:51-4.
- Aaltonen AS, Tenovuori J. Association between mother – infant salivary contacts and caries resistance in children : A cohort study. *Pediatr Dent* 1994; 16:110-16.
- Brambilla E, Felloni A, Gangiani M, Malerba A Malerba A, Garcia-Godoy F, Strohmenger L. Caries prevention during pregnancy : results of a 30 month study. *JADA* 1998; 129:871-7.
- Loverett DH, Adair SM, Vaughan BW, Proskin HM, Moss ME. Randomized clinical trial of the effect on prenatal fluoride supplements in preventing dental caries. *Caries Res* 1997;31:174-9.
- Nowak A, Crall J. Prevention of Dental Disease. In: Pediatric Dentistry Infancy through Adolescence 3rd ed. W.B.Saunders Co; 1999. p. 195-212.
- Borovskii EV, Tsvetkova LA, Kulikov RI, Borisova GV. Ocenka effektivnosti stomatologičeskoi profilaktiki u beremennyh.(The evaluation of effectiveness of dental caries prevention measures among pregnant women. *Stomatologija* (Mosk) 1985;64:17-9. Rus.
- Milčiuvienė S, Sakalauskienė J, Saldūnaitė K. Jauno amžiaus žmonių burnos būklės vertinimas. [Evaluation of young people's oral health status]. *Stomatologija* 2000; 2:14-8.
- Globienė J. Lietuvos rajonų gyventojų periodonto būklė. [Periodontal status among Lithuanian rural population]. *Stomatologija* 20013: 14-6.
- Kornman KS. Microbiology and Etiology of Periodontal Diseases. In: Fundamental of Periodontics. Quintessence Publ.Co.Inc.; 2003. p. 46-63.
- Axelsson P. Role of Dental plaque. In: Diagnosis and Risk Prediction of Dental Caries Quintessence Publishing Co.Inc.; 2000. vol.2. p. 2-42.
- WHO. Oral health surveys. Basic Methods. 4th. ed. Geneva; 1997.
- Harris NO, Wilmann DE. Periodontal Diseases prevention: Facts, risk assessment, and evaluation. In: Harris NO, Garsia –Godoy F. Primary Preventive Dentistry. 6th ed. Pearson Prentice Hall; 2004. p. 365-90.
- Hugoson A, Norderyd O, Slopte C, Thorstensson H. Oral hygiene and gingivitis in a Swedish adult population 1973,1983, 1993. *J Clin Periodontol* 1998;254: 807-12.
- Splieth Ch, Schwahn Ch, Bernhardt O, Kocher T, Born G, John U, Hensel E. Caries prevalence in an adult population: results of the Study of Health in Pomerania, Germany (SHIP). *Oral Health Prev Dent* 2003;1:149-55.
- Bielskienė D. Motinų dantų būklės ir nėštumo anamnezės įtaka vaikų pieninių ir nuolatinių dantų uduoniui. [The relationship between mothers oral health status and childrens dental caries][summary of dissertation] . Kaunas: Kaunas Med. Uiv.; 2000.
- Butane IJ. [Prevention of stomatological diseases in pregnant women]. *Stomatologija* (Mosk);62:25-6. Rus.
- Chlapowska J, Opydo- Szymaczek J. Dietary and hygienic aspects of fluoride exposure in pregnant women. *Ann Acad Med Stetin* 2004;50 Suppl 1:19-22.
- Abraham-Inpijn L, Polsacheva OV, Raber-Durfacher JE. [The significance of endocrine factors and mikroorganisms in the development gingivitis in pregnant women]. *Stomatologija* (Mosk). 1996;75:15-18. Rus.
- Machuca G, Khoshfeiz O, Lacalle JR, Machuca C, Bullon P. The influence of general health and social –cultural variables on periodontal condition of pregnant women. *J Periodontol* 1999;70:779-85.
- Radnai M, Gorzo I, Nagy E, Urban E, Eller J, Novak T, Pal A. Caries and periodontal status of pregnant women. *Fogorv Sz* 2005; 98:53-7.
- Gongaza HF, Buso L, Jorge MA, Gongaza L.H. Intrauterine dentistry: an integrated model of prevention. *Braz Dent J* 2001;12:139-42.
- Okuda K, Adchi M, Lijima K. The efficacy of antimicrobial mouth rinses in oral health care. *Bull Tokyo Coll* 1998;39:7-14.
- Seppa L. Efficacy and safety of fluoride varnishes. *Compend Contin Educ Dent* 1999;20:18-26.
- Bakhmudov BR, Bakhmudova ZB. [Caries prevalence and intensity and the health and hygiene habits of oral care in pregnant women]. *Stomatologija* (Mosk) 2000;79:12-4. Rus.
- McCann AL, Bonci L. Maintaining womens oral health. *Dent Clin North Am* 2001;45:571-601.
- Bowsher I. Dental care during pregnancy. *Prof Care Mother Child* 1997;7:101-4.

Received: 20 08 2007

Accepted for publishing: 21 12 2007