

Associated Factors for Tooth Loss in the Postpartum Women in Vojvodina

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Abstract

Background: Pregnancy increases the risk of developing oral diseases and can lead to tooth loss. The aim of our study is to determine the influence of demographic factors, social status, attitudes, habits, and behaviors related to diet and oral hygiene, that may result in tooth loss in postpartum women.

Methods: This cross-sectional survey was conducted in General Hospitals and Clinics for gynecology and obstetrics in the territory of the Autonomous Province of Vojvodina. Data on attitudes, habits and behaviors related to diet and oral hygiene that may result in tooth loss were obtained by surveying postpartum women on the day of discharge. Univariate and multivariate logistic analysis was used to study the relationship between associated factors and the tooth loss using CR and a 95% confidence interval. Values $p < 0.05$. was considered statistically significant.

Results: Our study included 4310 mothers with an average age of 27.31 years. Based on multivariate regression analysis, higher tooth loss was observed in: mothers over the age of 35 (CI=1.029-1.660; $p=0.028$), with low or no education (CI=1.388 -2.258; $p<0.001$), living alone (CI=1.126-3.728; $p=0.019$), who are of poor social status (CI=1.300-2,005; $p<0.001$), brush teeth for less than 2 minutes (CI=1.006-1.575; $p=0.044$), visit a dentist for dental treatment (CI=1.367-2.131; $p<0.001$), and consume cigarettes (CI=1.015-1.685; $p=0.038$).

Conclusions: Our research has shown that sociodemographic factors, habits, attitudes and behaviors of postpartum women regarding oral hygiene and nutrition are directly related to tooth loss and can serve as a platform for adoption of special oral health promotion programs.

Keywords: tooth loss, associated factors, postpartum women

Background

Oral health is an integral component of a woman's general health. Pregnancy increases the risk of developing oral diseases as a consequence of hormonal changes (Erchick et al., 2019). The level of progesterone and estrogen is 10 - 30 times higher in pregnancy, which results in gingivitis Kabali and Mumghamba (2018), proliferation and desquamation of oral mucosal cells, creating a favorable environment for the growth of cariogenic bacteria and caries Rocha et al. (2018), most often resulting in tooth loss. The production of collagen fibers of the periodontium was also reduced (Africa & Turton, 2019). There are also changes in the composition of saliva (decrease in the concentration of sodium and calcium, increase in potassium levels, number and type of microorganisms - *Candida albicans*, *Streptococcus mutans*). Untreated periodontal disease in pregnancy can also lead to tooth loss (Marla et al., 2018). The ingrained opinion and belief of a mother loses one tooth with each pregnancy has no medical justification (Oziegbe & Schepartz, 2020). Tooth loss is the most serious consequence of oral diseases and an important indicator of oral health, because it provides information on the prevalence of oral diseases, quality of life as well as the availability and organization of dental care. Masticatory and aesthetic imbalance are the most noticeable effects of tooth loss (Wandera et al., 2009). Pregnancy increases the severity of existing gingivitis, if good oral hygiene is not performed, resulting in 2.5 times more frequent caries, and 20 times more common gingivitis (Schramm et al., 2016). If left untreated, gingivitis can progress to periodontal disease in 5-20% of pregnant women involving the alveolar bone, periodontal ligament resulting in tooth loss (Erchick et al., 2019). Gingival bleeding during probing indicates the active progression of periodontal disease and is a predictor of tooth loss (Liu et al., 2016). Pregnant women are more prone to caries due to increased consumption of sugary foods and neglect of oral health (Hans et al., 2019). A survey of 2,259 pregnant women in China showed very low (16.7%) use of dental services during pregnancy, especially by young women with low SES, who do not maintain oral hygiene (Cuschieri, 2019). Our hypothesis was that tooth loss in postpartum women was associated with poor oral hygiene and inadequate nutrition during pregnancy. The aim of our study is to determine the prevalence of invariant (demographic factors, SES), and variable risk factors (attitudes, habits, and behaviors related to diet and oral hygiene) that may result in tooth loss in women who have recently given birth in the territory of Vojvodina, Republic of Serbia.

Methods

This study was approved by Committee on Human Research of the Medical Faculty of Novi Sad, process number: 01-266/87/14.05.2019. All respondents gave written consent to participate in research. The methodology conformed to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (Ramos et al., 2021). This cross-sectional survey was conducted in General Hospitals and Clinics for Gynecology and Obstetrics in the territory of the Autonomous Province of Vojvodina. Based on the records on the number of births from 2018, which are submitted to

the Center for Informatics and Biostatistics in Health of the Institute of Public Health of Vojvodina (IOPHOV), the size of the sample frame of about 4,000 postpartum women was estimated. The criteria for excluding units from the sample are: postpartum women with systemic and autoimmune diseases, who are unable to provide competent answers (illiterate), regardless of the reason, who do not want to participate in the research or gave up during the research and postpartum women younger than 15 years and older than 50 years. An anonymous survey questionnaire was used as a research instrument, which was constructed on the basis of previous research and a review of the professional literature. The postpartum women on the day of discharge from the maternity hospital from the entire territory of Vojvodina, in the period June-November 2019 were included. Data on attitudes, habits and behaviors related to diet and oral hygiene that may result in tooth loss were obtained by surveying postpartum women on the day of discharge from the maternity hospital. The survey questionnaire contained 35 closed-ended questions in Serbian and national minority languages regarding:

- sociodemographic data: age (18–24, 25–29, 30–34 and + 35 years),
- marital status: (married, living alone),
- employment status: (yes / no),
- number of pregnancies (one, two, more than two),
- level of education: (without education, primary, secondary, higher),
- employment: (yes / no);
- oral health: good, bad;
- dental history: (oral hygiene, fluoride prophylaxis, visit to the dentist);
- oral health behavior: cigarette consumption (yes, no),
- diet: (milk and dairy products, meat, fish, eggs, sweets, etc.),
- attitudes about oral health
- number of teeth lost

The questionnaires will be delivered by mail to the District Institutes for Public Health in Autonomous Province of Vojvodina, Republic of Serbia and collected in the same way at the end of the month, from June to November 2019. Each general hospital in AP Vojvodina and the Clinic for Gynecology and Obstetrics of the Clinical Center of Vojvodina will receive:

1. questionnaires,
2. forms for Informed Consent for participation in the research;
3. Instructions for nurses in the maternity hospital and
4. Evidence form for monthly records of the number of mothers and the number of completed surveys filled out by the nurse from the maternity hospital.

The questionnaire is filled in independently by the postpartum women, the day before the discharge from the maternity hospital or on the day of the discharge. After completing the questionnaire, the mothers put them in a closed box and received a brochure: "Prevent the early appearance of caries in your baby" from the nurse. Questionnaires collected after the survey will be coded at the Institute of Public Health of Vojvodina (Center for Health Promotion, Center for Biostatistics and Informatics in Health and Center for Analysis, Planning and

Organization of Health Services), and then entered into the database using the Abby Flexi Capture (IBM) hardware unit and database creation software adapted for SPSS 21 for Windows. Maternity data were processed using descriptive and inferential statistics. Numerical data are presented through mean values, volumes and measures of variability, and attributive features through frequency distribution and relative numbers. Differences were checked using parametric and nonparametric methods (ANOVA, χ^2 -test). Univariate and multivariate logistic analysis was used to study the relationship between demographic indicators, attitudes, habits and behaviors related to diet and oral health and the final outcome (tooth loss) using CR and a 95% confidence interval. Values $p < 0.05$ were considered statistically significant. Due to the usefulness of the survey questionnaire, a pilot study was previously conducted that included 42 postpartum women with a healthy newborn.

Results

Our study included 4310 mothers with an average age of 27.31 years. It was noted that 87.96% had secondary or higher education and 12.04% had primary or no education. The majority of mothers live in marriage or cohabitation (95.71%). The largest number of mothers were those with multiple pregnancies (56.44%), employed (59.17%), and with low SES (65.70%). Univariate regression analysis (Table 1) showed higher tooth loss in older mothers (> 35 years, 74.9%,

$p=0.000$), with low or no education at all (78.6%, $p<0.001$), who gave birth several times 68.3%, $p=0.000$), living alone (75.3%, $p=0.004$), not employed (67.1%, $p=0.005$), and with low SES (67.7%, $p<0.001$). Compared to oral hygiene habits and behaviors of mothers (Table 2), higher tooth loss was observed in those who brushed their teeth less often (72.4%), used improper technique (66.8%), and shorter brushing time (66.4%), if mothers did not visit the dentist during pregnancy (67.0%) or went to the dentist (71%) due to dental complications (pain, swelling, tooth extraction). Analysis of eating habits and tobacco consumption (Table 3) also proved to be significant for the final outcome. Greater tooth loss was observed in mothers who consumed milk and dairy products less frequently ($p=0.017$), who consumed sweets more often ($p=0.021$) and who smoked ($p<0.001$) during pregnancy. Based on the multivariate regression analysis of risk factors, a prediction model was defined (Table 4) that shows the probability that the mother will lose one or more teeth:

- mothers over the age of 35 (CI=1,029-1,660; $p=0.028$),
- with low or no education (CI=1,388-2,258; $p<0.001$),
- living alone (CI=1.126-3.728; $p=0.019$),
- assesses its SES as poor (CI=1.300-2.005; $p<0.001$),
- brush teeth for less than 2 minutes (CI=1.006-1.575; $p=0.044$),
- visits the dentist exclusively for dental treatment (CI=1.367-2.131; $p<0.001$), and
- consumed cigarettes (CI=1.015-1.685; $p=0.038$).

Associated demographic factors during pregnancy		How many teeth are you missing?						P value
		I have all teeth		I miss one or more teeth		total		
		n	%	n	%	n	%	
Age (years)	15-19	72	47.4	80	52.6	152	100	<0.001
	20-34	1117	36.6	1937	63.4	3054	100	
	>35	135	25.1	402	74.9	239	100	
Level of education	high school, high school or college	1212	37.0	2061	63.0	3273	100	<0.001
	primary school or less	96	21.4	352	78.6	448	100	
Marital status (married, unmarried couple)	living in a marriage or cohabitation	1207	36.1	2137	63.9	3344	100	0.004
	living alone	37	24.7	113	75.3	150	100	
Parity or Pregnancy number	first (primipara)	673	40.2	1002	59.8	1675	100	<0.001
	second or more (multipara)	687	31.7	1483	68.3	2170	100	
Employment status	employed	804	37.5	1338	62.5	2142	100	0.005
	unemployed or occasionally employed	487	32.9	991	67.1	1478	100	
Socio-economic Status (SES)	good or very good	517	41.7	727	58.3	1246	100	<0.001
	average, bad, very bad	771	32.3	1616	67.7	2387	100	

Table 1: Influence of demographic factors on tooth loss in postpartum women in Vojvodina

Associated factors during pregnancy		How many teeth are you missing?						P value
		I have all teeth		I miss one or more teeth		total		
		n	%	n	%	n	%	
How often have you brushed your teeth?	twice a day or more often	1118	37.6	1858	62.4	2976	100	<0.001
	once a day or less often	196	27.6	513	72.4	709	100	
When you brush your teeth during the day?	in the morning (before breakfast) and in the evening (before bed) or after each meal	753	37.3	1266	62.7	2019	100	0.010
	irregular rhythm of brushing teeth during the day	539	33.2	1086	66.8	1625	100	
How long have you been brushing your teeth?	more than 2 minutes	440	40.3	652	59.7	1092	100	<0.001
	less than 2 minutes or can't judge	830	33.6	1637	66.4	2467	100	
What did you use to clean your teeth?	brush, toothpaste, other aids	1073	35.8	1923	64.2	2996	100	0.535
	only use aids (toothpicks, dental floss, mouthwash)	196	34.4	374	65.6	570	100	
How many times have you visited a dentist?	one or more times	840	37.8	1383	62.2	2223	100	0.004
	not even once	434	33.0	881	67.0	1315	100	
What was the reason to visit the dentist?	control review, RDC	572	43.2	751	56.8	1323	100	<0.001
	pain, filling or tooth extraction	285	29.0	698	71.0	983	100	

RDC = removal (removing) of dental calculus

Table 2: Oral hygiene habits and behavior during pregnancy

Associated factors during pregnancy		How many teeth are you missing?						P value
		I have all teeth		I miss one or more teeth		total		
		n	%	n	%	n	%	
How often did you take milk and dairy products?	every day	993	36.4	1733	63.6	2726	100	0.017
	several times a week or less	326	32.2	686	67.8	1012	100	
How often have you taken sweets?	rarely or never	963	36.6	1665	63.4	2628	100	0.021
	daily or several times a week	336	32.6	695	67.4	1031	100	
Smoking	no	939	38.0	1530	62.0	2469	100	<0.001
	yes	338	28.7	839	71.3	1177	100	

Table 3: Nutrition and consumption of cigarettes during pregnancy

Associated factors during pregnancy	sig.	exp(b)	95% Confidence Interval for exp(b)	
			lower	upper
How often have you brushed your teeth?	0.148	1.284	0.915	1.803
When you brush your teeth during the day?	0.644	1.054	0.843	1.317
How long have you been brushing your teeth?	0.044	1.215	1.006	1.575
What did you use to clean your teeth?	0.492	.897	0.658	1.223
How many times have you visited a dentist?	0.206	0.690	0.388	1.226
What was the reason to visit the dentist?	0.000	1.707	1.367	2.131
How often did you take milk and dairy products?	0.574	1.073	0.840	1.369
How often have you taken sweets?	0.221	1.164	0.913	1.485
Smoking	0.038	1.308	1.015	1.685
Age (years)	0.028	1.307	1.029	1.660
Level of education	0.000	1.771	1.388	2.258
Marital status	0.019	2.049	1.126	3.728
Parity - pregnancy number	0.067	1.232	0.985	1.541
Employment status	0.613	.938	0.731	1.203
Socio-economic status (SES)	0.000	1.615	1.300	2.005

Table 4: Association of associated factors in pregnancy and tooth loss in postpartum women

Discussion

Oral health is one of the 11 main goals of the W.H.O. in the 21st century, an important part of a healthy pregnancy and an indicator of the child's risk for the development of early childhood caries (Koyama et al., 2016). Unfortunately, many dental diseases during pregnancy are considered "common" (caries, gingivitis, tooth mobility, tooth erosion, periodontitis), which often result in less or more tooth loss. The quality of a woman's life is significantly affected by tooth loss after pregnancy, due to changes in appearance, chewing, speech and self-esteem, disrupting social interaction (Oziegbe & Schepartz, 2020). The most common causes of tooth loss in pregnancy are caries and periodontitis (Oziegbe & Schepartz, 2020). In our research, emphasis is placed on sociodemographic factors, attitudes, habits and behaviors of pregnant women in relation to diet and oral health, as associated factors that can lead to tooth loss. The results of our study show that the most common tooth loss was in: in older postpartum women, with low or no education, who have low SES, live alone, are not employed, and have two or more children. In this regard, Koyama S et al. (2016) state that: the age of the pregnant woman, SES, level of education and no visits to the dentist are related to a larger number of lost teeth. Similar to our study, mothers over the age of 35 in Iran had 1.3 times more carious teeth and 3.5 times more extracted teeth (Deghatipour et al., 2019). Older, single, uninformed women who have given birth several times had higher tooth loss in an Australian study (Balan et al., 2018). In contrast to our research, Vergnes JN et al. (2012) state that younger mothers (18-24 years old) are more at risk for tooth loss, regardless of the amount of dental plaque and the frequency of visits to the dentist. The authors state that hormonal imbalance during pregnancy accelerates the progression of caries. (Vergnes et al., 2012). In Chapel Hill, older pregnant women (> 36 years old) went to the dentist, mainly for tooth extraction (Boggess et al., 2010). Barbieri et al. (2018) showed that pregnant women from socially endangered areas had more caries, as well as a

larger number of extracted teeth. The high prevalence of dental caries in pregnant women with low SES probably occurs as a consequence of poor oral hygiene, lack of information about oral health, improper diet and family status (a large number of family members) (Hom et al., 2012). Research in Brazil, Ferreira et al. (2020) also states that mothers with low SES have a low level of education, poor oral health and less visits to the dentist, resulting in greater tooth loss. Caries, periodontal disease and tooth loss were more common in older mothers in Uganda, who had lower SES, who lived in larger households and who had poor oral hygiene (Wandera et al., 2009). Petersen et al. (2020) suggests that dentists should pay more attention to the oral health of pregnant women with low SES. In our study, 87.8% of postpartum women had secondary and higher education. Greater tooth loss was observed in postpartum women, who did not complete primary school ($p < 0.001$), which is found in the research of Ibrahim H. et al. (2016) who point out that low-educated pregnant women are less likely to visit the dentist (Deghatipour et al., 2019). In Italy and South Africa Rocha et al. (2018) it was observed that women with lower education had a higher prevalence of more severe forms of dental caries and periodontal disease, due to poor oral hygiene which caused disease progression and tooth loss. Khalaf et al. (2018) associate daily brushing with the level of education. Unemployed postpartum women in our study had more lost teeth. Lindsay et al. (2017) in their study point out that stress due to possible job loss affects the health habits, attitudes and behaviors of pregnant women (less frequent brushing of teeth, increased cigarette consumption), causing a decrease in salivation, which accelerates the progression of caries and periodontal disease and tooth loss. An Indian study found more dental caries (56.2%) and gingivitis (59.6%) in pregnant women-housewives (Ranka et al., 2018). In Japan, patients finance only 10-30% of the cost of dental treatment, and yet occasionally employed pregnant women do not use dental care for fear that they may be fired due to absence from

work (Zaitso et al., 2018). Parity is defined as the number of pregnancies in a woman. In our study, higher tooth loss was observed in multiparous (68.3%) compared to nulliparous postpartum women (59.8%), which is confirmed by a study in Uganda, in which multiparous had 1.5 times more lost teeth compared to nulliparous (Oziegbe & Schepartz, 2020). Multiparous postpartum women have less time to maintain oral hygiene and proper eating habits, which accelerates the development of caries, gingivitis and periodontal disease (Kamate, 2017). Research in India shows that the prevalence of tooth loss was 42.5% in urban and 33.8% in rural areas, ($p < 0.05$). The authors state that multiple pregnancies have a negative effect on the periodontium (Sattar & Khan, 2020). A higher number of children in the family and poverty reduces the possibility of the mother going to the dentist, which results in greater tooth loss. A similar finding was observed in multiparous women in Kashmir (Shah et al., 2017), where mothers with three children had 4 teeth less than mothers with two children.

Multiparous women in our study, due to lack of time, extract teeth more often. Also, Russell et al. (2008) claim that pregnancy and motherhood change the patterns of dental treatment. Maternity perceptions about oral health are also important, because they shape their behavior, attitudes and habits. Instead of seeking treatment, mothers believe that tooth loss during pregnancy is a “normal occurrence” and do nothing about it. (7,31). Single status in our study significantly affected tooth loss in postpartum women ($p = 0.019$). Singhal et al. (2013) point out that married women go to the dentist more often and have better oral health. Wennström et al. (2013) show that single mothers are more at risk for tooth loss because they have low SES and lack of financial and psychological support from the spouse. Our study pointed out the great importance of diet as a associated factor for tooth loss. Rare intake of milk and dairy products as well as daily consumption of sweets have resulted in a higher number of postpartum women with tooth loss. Pregnancy changes lifestyle, hygienic habits, frequency of food intake and quantitative - qualitative composition of meals (Oziegbe & Schepartz, 2020). Increased energy needs of pregnant women emphasize snacking on products with a high content of refined, sticky carbohydrates, which affects a woman’s oral and overall health. Changes in diet to satisfy cravings or prevent nausea increase the risk of dental caries, if special attention is not paid to oral hygiene (Africa & Turton, 2019, Liu et al., 2016). Cariogenic diet leads to an increase in pathogenic oral flora, more caries and greater tooth loss.

Our study shows that postpartum women who consumed sweets during pregnancy (67.4%) had higher tooth loss. Therefore, it is proposed to reduce the frequency of cariogenic food and beverage intake. Tanaka et al. (2010) observed that milk and dairy products have cariostatic effects. Daily consumption of yogurt reduced the prevalence of caries ($p=0.04$) and the authors recommend the intake of nutrients that promote tooth remineralization (vitamins A, C, D, calcium, phosphates). A study in China showed that 18% of mothers did not eat vegetables, 78.8% did not eat fruit, and 75.7% never

drank milk during pregnancy (Xiang et al., 2019). In the absence of adequate information, mothers often adopt the traditional beliefs and practices of older women in the family (Xiang et al., 2019). Maternal improper, short (<3 minutes) brushing once a day, using only oral hygiene aids (toothpicks, mouthwashes), and going to the dentist for pain, swelling, or tooth extraction were associated with greater loss teeth in our study. Since pregnancy induces an increased response of gingival tissues to plaque and tartar, if preventive and prophylactic measures are not taken, gingivitis, periodontitis and tooth loss will occur (Erchick et al., 2019). Gingival hemorrhage may be the result of poor maintenance or inadequate oral hygiene. Deghatipour et al. (2019) report that half of pregnant women in Iran, brush their teeth once a day, which is less than the frequency of brushing teeth in pregnant women in Finland (90%), Australia (91%), Kuwait (92%) and England (73.7%), and point out that only 10% used additional oral hygiene products. In Sudan (Ibrahim et al., 2016) and Egypt (Khalaf et al., 2018), better oral health was found in pregnant women who regularly and properly maintained oral hygiene. Our study shows that 73.3% of mothers brushed their teeth two or more times a day during pregnancy. However, of the 26.7% of mothers who brushed their teeth only once a day, 72.4% were partially toothless. The frequency of brushing teeth, rinsing the mouth and flossing were significant predictors of visiting a dentist in a Chinese study (Hans et al., 2019). A study in Sydney (36) found that more than two-thirds of postpartum women (67.5%) brushed their teeth twice a day during pregnancy, which is more than in our study (53.4%). To maintain oral hygiene during pregnancy, postpartum women in Sydney also used mouthwashes (40.7%) and dental floss (42.7%). In our study, dental floss was used in only 3.3% and toothpicks in 1.4% of postpartum women. Also, only 30.6% of postpartum women, during pregnancy, brushed their teeth for more than two minutes, which proved to be significant in the prediction of tooth loss. In Zambia (Erchick et al., 2019), 57.1% of pregnant women brushed their teeth long enough (1–3 minutes). Proper and regular oral hygiene with the use of basic and additional oral hygiene products for its implementation are important in reducing the risk of tooth loss in mothers. Research in the world shows that less than half of pregnant women visit the dentist even though they have dental problems (Johnson et al., 2015). The main reason is difficult access and high treatment costs (Oziegbe & Schepartz, 2020). Our study showed that 37% of postpartum women did not visit the dentist during pregnancy, which led to greater tooth loss ($p= 0.004$) in relation to other mothers. As a reason for visiting the dentist, the mothers most often pointed out pain, treatment or tooth extraction, which in 71% of cases resulted in tooth loss. In China, rare visits of pregnant women to the dentist (16.7%) were recorded for financial reasons (Hans et al., 2019). Only 79% of pregnant women in Pittsburgh visited the dentist last year, compared to 45.6% in Sydney (George et al., 2013). As the main reasons for not going to the dentist, pregnant women pointed out: neglect of oral health (31.9%), high treatment costs (29.2%), lack of time (29.2%) and the belief that dental procedures are harmful for them and the future baby (George et al., 2013). Although the state provides part of the costs for

dental services for pregnant women in Iran, they have visited less dentists (Deghatipour et al., 2019). In the United States, it is recommended that pregnant women receive dental treatment during the second trimester (Deghatipour et al., 2019), and that dentists rarely receive them sooner or later. Among pregnant women who did not visit the dentist, 57.2% expressed concern about local anesthetics and antibiotics, and 70% believed that the fetus extracted calcium from their teeth (Öcek et al., 2020). Saddki et al. (2010) in this regard, consider that more frequent visits to dentists are associated with better educational status and prenatal regular visits. Obstacles to seeking dental services also include poor perception of the quality of care provided, language barriers (Tušek et al., 2020) as well as the husband's influence on the pregnant woman's decision to see a dentist. There are barriers by dentists as well. More than half (56.4%) of dentists in Nigeria are afraid of intervention during pregnancy due to possible complications, 10.7% of dentists were against dental radiography, 8.1%, against endodontic therapy, 1.3% against composite restoration and 32.2% of dentists were against nitric oxide sedation (Azodo & Umoh, 2013). In addition to oral treatment of pregnant women, dentists are required to provide theoretical and practical education on preventive dental measures before, during and after pregnancy. Our study shows that 50.2% of pregnant women preventively visited the dentist, while the rest went to the dentist for treatment or tooth extraction. More than one-fifth of pregnant women in Sudan said their oral health was poor but they did nothing, because a dental examination was not important to them which resulted in tooth loss (Ibrahim et al., 2016). The type of dental treatment and the dentist's desire to perform it can also affect the loss of teeth in pregnant women. Half of dentists in Australia have advised pregnant women to delay treatment after giving birth and since mothers have less time due to child care, the consequence of such an attitude of the dentist is the loss of teeth (George et al., 2017). It is necessary to prenatally determine the risk of future mothers for caries and periodontitis, to educate them in the direction of correct habits related to diet and oral hygiene, and to treat oral diseases. Smoking has been shown in our research to be a significant predictor of tooth loss. Nicotine stimulates excessive formation of dental biofilm and metabolic activity of SM, the most important pathogen for the development of dental caries. Although cigarette smoking decreases during pregnancy, increased parity is associated with relapses of smoking after childbirth, due to psychological stress (Huang et al., 2015). Pregnancy is a good time to change oral hygiene and eating habits, so it is necessary to engage public and private dental offices in order to provide free dental services and the priority of admission to the dentist. If the language barrier is an obstacle to a dental visit, it is necessary to introduce linguistic mediators who will establish communication between dentists and pregnant women (Tušek et al., 2020), especially in multiethnic environments such as Vojvodina. It is necessary to redefine and consistently implement preventive programs, including education on oral health during prenatal care, pregnancy and puerperium. In addition to dentists, it is necessary to include gynecologists and other health professionals who monitor motherhood. There is a need to raise awareness of the

importance of dental care and the safety of treatment in pregnancy in order to overcome the cultural myths that tooth loss in pregnancy is a "normal" phenomenon. Healthcare professionals should be continuously educated for preventive and curative dental care for pregnant women. It is necessary to investigate other associated factors (psychosocial, ethnic, behavioural), their interdependence and the impact on tooth loss in postpartum women.

Conclusion

Our research has shown that sociodemographic factors, habits, attitudes and behaviors of pregnant women regarding oral hygiene and nutrition are directly related to tooth loss in postpartum women and can serve as a platform for decision-making on health policy, planning and organizing dental care as well as for adoption of special oral health promotion programs for pregnant and postpartum women.

Ethics approval and consent to participate

This study was approved by Committee on Human Research of the Medical Faculty of Novi Sad, process number: 01-266/87/14.05.2019.

Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available as ethics approval was granted on the basis that only the researchers involved in the study could access the identified data but are available from the corresponding author on reasonable request.

Competing interests

All the authors declare no conflicts of interest.

Authors' contributions

IT searched and reviewed the literature, analyzed the data, wrote the manuscript. JT, JV, BT, assisted in finding documents, issuing the questionnaires, critically reviewed the manuscript and supervised the whole study process.

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