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The importance of pH, salivary flow and different dental caries risk factors in pregnant women

Joel A Méndez-Monge[1,2]*, Zurisadai Neri-Aranda[1], Alejandra Luna-Ayala[1], Hector Manuel Hernandez Navarro[1], Jany Ariadne Jimenez-Del Valle[1], Alma Nidia Calderon-Porras[1], Luis Ricardo Sosa-Martinez[1,2] and Myriam Angelica De La Garza-Ramos[2]

[1]Escuela de Ciencias Estomatológicas, Universidad de Montemorelos, Montemorelos, Mexico.
[2]Facultad de Odontologia Centro de Investigación y Desarrollo en Ciencias de la Salud (CIDICS), Universidad Autonoma de Nuevo Leon, Monterrey, Mexico.

During pregnancy, there are certain changes in a woman´s body that can affect or alter oral health. Likewise, in this period some changes in factors such as pH and salivary flow can contribute to an increased risk of caries in pregnant women; therefore, this research was conducted on 85 women from the city of Montemorelos who attended Montemorelos General Hospital, of whom 53 were pregnant and 32 were not, using these as a control group. Salivary flow, pH, the decayed, missing and filled teeth (DMFT) index, and the Caries Risk Assessment Tool were used to assess caries risk. Of the pregnant women, 67.9% had a low salivary flow compared to non-pregnant women; of these, 50.6% showed a decreased salivary flow. The mean salivary pH of the pregnant women was 6.5 compared to the control group, which was 6.9. The mean DMFT index in pregnant women was 10.92 compared to the control group, which was 8.0. According to the caries risk evaluation, of the 53 pregnant women, 1.9% had low caries risk, 24.5% moderate risk, and 73.6% high caries risk.

Key words: Caries, pregnancy, saliva, missing and filled teeth (DMFT), pH, risk factors.

INTRODUCTION

Pregnancy is a natural and physiological process where changes occur in the production of hormones, such as progesterones, estrogens, human chorionic gonadotropin (HCG), among others (Rengifo and Herney, 2009), which causes vascular, cellular and immunological alterations (Lacalzada, 2011).In this period, a series of temporary adaptive changes in the body structures of women are presented, because of thehormonal alteration. The oral cavity is not exempt from undergoing the influence of these changes, being able to present some reversible or transitory alterations and others more considered as pathological (Díaz Guzmán and Castellanos, 2004). Oral tissues such as teeth andsupport tissues and oral mucosa, among others, become direct targets that may

be affected (Rodríguez Chala and López Santana, 2003). Constant revisions of the pregnant women is important from the first trimester to guarantee optimal and normal development of the mother and baby, and their general health (Méndez de Varona et al., 2016). Among these, it is vital to include all preventive care that they need to avoid tooth decay. In addition, in some places in Mexico, there is a belief that the deterioration in oral health of pregnant women is impossible to avoid due to loss of calcium in the teeth during this period, which is known not to be related (Rodríguez Chala and López Santana, 2003).

The relationship between pregnancy and caries has not been frequently studied and the research that has been performed indicates that the increase in caries in pregnant women is due to local cariogenic factors. Among these are changes in the composition of saliva and the oral flora, vomiting from acid reflux, deficient hygiene, and changes in dietetic habits. These increase the vulnerability to develop tooth decay (Bastarrechea Milián et al., 2009; Díaz Valdés and Valle Lizama, 2015). Gestation has biopsychosocial factors that, if not considered, can produce or worsen oral disease. Recent studies consider a higher prevalence of dental caries in pregnant women than in non-pregnant women due to several factors: snacks during pregnancy and hormonal changes, specifically estrogen levels during pregnancy. These cause a decrease in salivary flow, which in turn causes greater susceptibility to caries development. (Rodríguez Lezcano et al., 2013). Pregnant and non-pregnant women have the accessibility dental care; however, pregnant women usually do not attend to the belief that they cannot take care of other issues during this period. For decades, research has shown that the predisposition to the occurrence of caries is associated with diverse risk factors such as the host, the microflora, salivary pH, dental plaque, a sugar-rich diet, and salivary flow, among others.

The propose of this research was to evaluate some of these cariogenic factors in a group of pregnant women compared to a group of non-pregnant women of the same age. The risk of caries was determined through the evaluation of different factors that predispose to the appearance of carious lesions: pH and salivary flow analysis. With this information, it was possible to evaluate caries risk; also, the DMFT index was assessed and the results were compared with a control group of non-pregnant women. The results of this analysis can be used to implement special measures for this specific group with the aim of fomenting the importance of oral health and specific care during pregnancy.

MATERIALS AND METHODS

This study was reviewed and approved by the research Department of the University of Montemorelos with permission granted by the Department of Teaching and Research of the General Hospital of Montemorelos.

To carry out the comparative crossectional study, 53 pregnant women, 18 to 37 years of age, and 32 non-pregnant women as a control group were recruited. The women were randomly selected at the general hospital of Montemorelos in gynecology and obstetrics before their reviews during the months of September to November of 2017. First, the aspects of the research were carefully explained and then they were invited to participate and sign an informed consent.

The Caries Risk Assessment of the CAMBRA (Caries Management by Risk Assessment) protocol was used to evaluate the risk of dental caries using a questionnaire that includes a series of questions and a clinical evaluation to determine the factors that predispose to caries (Featherstone and Chaffee, 2018). With this, risk factors such as dietary habits, taking drugs that cause hyposalivation, the presence of bacterial plaque, xerostomia, coping with a disease, oral hygiene habits, among others, were evaluated.

Salivary flow was produced by stimulation: chewing paraffin for five minutes, saliva production was stored in a millimeter tube. The result was obtained by dividing the collected saliva volume by five minutes, classifying the participants as those with a low (0.5 mL/min – 1.1 mL/min) and normal (1.2 mL or more/min) salivary flow. To obtain the saliva pH, test strips were introduced into the tubes with the previously collected saliva. After 30 seconds, a change in color was observed and compared with the color scale to obtain the saliva pH, according to the manufacturer´s instructions.

The DMFT index was determined for each participant by oral examination by the same examiner using a mirror and a probe to identify carious, missing or filled teeth (Sifuentes and Stephanie, 2017). The same method was applied to all participants.

The statistical analysis was carried out with the SPSS v.22 statistical program using a descriptive analysis of the variables, a comparison of means, crossed tables and the X^2 test of the corresponding variables. Using the non-parametric Mann-Whitney U test, the significance of the variables, salivary pH and DMFT was demonstrated, being less than 0.05.

RESULTS

Mean age of the total population was 23.2 years; the youngest age was 18 years and the oldest 37.

In the group of pregnant women, mean age was 23.1 years and in the control group 23.3. Mean salivary pH in the pregnant group was 6.5 compared to the control group, which was 6.9. Using the non-parametric Mann-Whitney U test, the significance of pH and DMFT index was demonstrated. The DMFT index was 10.92 in pregnant women and 8.0 in the control group (Table 1).

Of the 53 pregnant women, 1.9% had a low risk of caries, 24.5% a moderate risk, and 73.6% a high risk. In the control group, out of 32 participants, 6.3% had low risk of caries, 59.4% moderate risk, and 34.4% high risk. Of the total population, 3.5% had a low risk of caries, 37.6% had moderate risk, and 58.8% had high risk. According to the tool used in this study, there is a greater risk of caries in pregnancy. In the comparison of pregnant women and the control group regarding caries risk, the X² test showed a statistically significant distribution; the X² value was 12.7 with a significance level less than 0.001

Table 1. Age, pH and DMFT index: Comparison of means of age, pH and DMFT between pregnant and non-pregnant women.

Variable	Pregnant women	Non-pregnant Women	P-value
Age, mean (SD)	23.19 (5.31)	23.22 (2.562)	NS
PH, mean (SD)	6.564 (0.4188)	6.966 (04763)	0.000*
DMFT, mean (SD)	10.92 (5.083)	8.06 (3.636)	0.004*

NS, non-significant with U Mann-Whitney test; *significance at <0.05 U Mann-Whitney test.

Table 2. Caries risk levels in pregnant and non-pregnant women: Comparison of frequencies of risk levels between pregnant and non-pregnant women using the CAMBRA protocol.

CAMBRA	Pregnant women N (%)	Non-pregnant women N (%)	X^2	P-value
Low risk	1(1.9%)	2(6.3%)		
Moderate risk	13(24.5%)	19(59.4%)	11.781	0.001*
High risk	39(73.6%)	11(34.4%)		

*Significance at <0.05 with X^2.

Table 3. Salivary flow in pregnant and non-pregnant women: Comparison of frequencies of salivary flow levels between pregnant and non-pregnant women.

Salivary Flow	Pregnant Women, N (%)	Non-pregnant Women, N (%)	X^2	P-value
Low salivary flow	36(67.9%)	7(21.9%)	16.9	0.000
Normal Salivary flow	17(32.1%)	25(78.1%)		

*Significance at <0.05 with X^2.

(Table 2).

When evaluating salivary flow after 5 minutes of stimulation, it was found that in the pregnant group, 67.9% had a low salivary flow and 32.1% a normal salivary flow. In the control group, 21% had a low salivary flow and 78.1% a normal flow. In the total group of participants, 50.6% had a low salivary flow and 49.4% a normal flow. In the comparison of pregnant women and the control group regarding salivary flow, the X² test showed a statistically significant distribution; the X² value was 16.9 with a significance level less than 0.001 (Table 3).

DISCUSSION

The purpose of this study was to evaluate those factors that predispose tooth decay. It is known that pregnancy is a condition in which a woman's body experiences change in metabolism and their systemic hormones that can influence oral health; however, it is considered that the gestation period is not by itself the cause of caries and other oral disorders but that other factors play a very important role during this period. Similar studies have shown a higher frequency of caries in women, and it has also been shown that women who have had more than one child have a higher percentage of caries (Gaffield et al., 2001; Nishikawara et al., 2006; Pérez Oviedo et al., 2011).

When the 53 pregnant women were compared with the control group, differences were found in each analyzed variable. Regarding salivary pH, the mean in pregnant women was 6.5 and in the control group 6.9. This shows that pregnant women have a slightly more acid pH, this could be due to frequent consumption of foods that produce a recurrent reduction in salivary pH as well as a decrease in the volume of saliva production. These data are like those of other previous studies (Chamilco, 2013; Jiménez, 2004; Molnar-Varlam et al. 2011; Ortiz-Herrera et al., 2012). Although in our study only factors from pregnant and non-pregnant women were compared, it is

interesting to note that there may also be some differences in salivary pH between each trimester, as indicated by previous researches (Chamilco 2013; Molnar-Varlam et al., 2011).

Regarding stimulated salivary flow, most pregnant women (67.9%) had a low flow, in contrast with the control group, where 21.9% had a low flow. This create the believe that pregnant women with a low salivary flow are more predisposed to developing dental caries since saliva, due to its composition, plays an important role as a protector against caries. Previous studies have found similar results (Sifuentes and Stephanie, 2017), but unlike this research, others have classified pregnant women by trimester of pregnancy and differences were found between the first, second, and third trimesters, where an increased, normal and decreased salivary flow, respectively, was found (Chamilco, 2013; Jiménez, 2004). This could be related to salivary stimulation because of nausea and vomiting during the first months of pregnancy.

In this study, the mean DMFT index in pregnant women with a mean age of 23.2 years was 10.92; indicating a high rate of caries. This is because, according to the Epidemiological Surveillance System of Oral Pathologies (SIVEPAB, in Spanish) (Secretaria de Salud, 2016), in Mexico, the mean DMFT index in women for this age group is 7.5, observing a large difference between these values; in the non-pregnant group, the index was 8.06, with this being slightly above the mean. These data are like other studies where pregnant women had more caries than non-pregnant women (Gaffield et al., 2001).

With the instrument used to assess risk factors, the Caries Risk Assessment Tool, it was found that the group of pregnant women had a greater risk of caries compared to the control group where a moderate risk was found. In recent research the results were similar, concluding that pregnant women had higher risk of caries (Dolić et al., 2017; Molnar-Varlam et al., 2011; Pérez Oviedo et al., 2011).

Lack of dental care in this period can be attributed to poor oral health information because most of the population analyzed believed that the changes that occur in their oral cavity and tooth damage are inevitable (Rodríguez Chala and López Santana, 2003).

Conclusions

During pregnancy, there is decrease in salivary pH and flow, which together with the results of a risk caries assessment, it was concluded that during this stage there is an increase in the risk of caries. Likewise, it was found that the group of pregnant women had a DMFT index greater than the mean for their age. In the case of pH, a significant difference was found between pregnant women and controls. The analysis of pH and stimulated

saliva production, as well as the evaluation of caries risk factors, constitute a good method for early detection of caries risk in pregnant patients thanks to the fact that it is non-invasive.

This research was implemented in a Mexican population; therefore, the results cannot be generalized to every pregnant woman. It is recommended to continue the research in other populations to improve knowledge. In addition, the information can be used as a strategy to prevent future carious lesions and foment the importance of oral health during pregnancy.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

Bastarrechea Milián MdlM, Alfonso Betancourt NM, Oliva Pérez M (2009). Algunos riesgos durante el embarazo en relación con la enfermedad periodontal y la caries dental en yemen. Revista Cubana de Estomatología 46(4):1-15.

Chamilco A (2013). Variación del ph y flujo salival durante el periodo gestacional en embarazadas de un servicio asistencial público. [Lima]: Universidad Nacional Mayor de San Marcos.

Díaz Guzmán L, Castellanos J (2004). Lesiones de la mucosa bucal y comportamiento de la enfermedad periodontal en embarazadas. Medicina Oral Patologia Oral Cirugia Bucal 9(5):430-437.

Díaz Valdés L, Valle Lizama RL (2015). Influencia de la salud bucal durante el embarazo en la salud del futuro bebé. Gaceta Médica Espirituana 17(1):111-125.

Dolić O, Obradović M, Kojić Ž, Sukara S (2017). Caries risk assessment in pregnant women using cariogram. Srp Arh Celok Lek. 145(3-4):178-183.

Featherstone JDB, Chaffee BW (2018). The evidence for caries management by risk assessment (cambra(r)). Advances in Dental Research 29(1):9-14.

Gaffield ML, Gilbert BJ, Malvitz DM, Romaguera R (2001). Oral health during pregnancy: An analysis of information collected by the pregnancy risk assessment monitoring system. Journal of the American Dental Association 132(7):1009-1016.

Jiménez R (2004). Importancia del ph, flujo y viscosidad salival sobre el desarrollo de caries dental en mujeres gestantes del primer trimestre [tesis doctoral]. Lima: Universidad Nacional Mayor de San Marcos.

Lacalzada-Pastor M, Gil-Samaniego J, Giménez-Juncosa M, López-López J, Chimenos-Küstner E (2011). Estado periodontal y de la mucosa oral en un grupo de embarazadas: Estudio clínico. Avances en Periodoncia e Implantología Oral 23(2):123-128.

Méndez de Varona YB, Batista Sánchez T, Peña Marrero Y, Torres Acosta R (2016). Principales enfermedades bucodentales en embarazadas. Correo Científico Médico de Holguín 20(4):702-713.

Molnar-Varlam C, Cristina M-V, Loana-Gabriela B, Tohati A (2011). Risk assessment of caries in pregnancy. Acta Medica Marisiensis 57(6).

Nishikawara F, Katsumura S, Ando A, Tamaki Y, Nakamura Y, Sato K, Nomura Y, Hanada N (2006). Correlation of cariogenic bacteria and dental caries in adults. Journal of oral science 48(4):245-251.

Ortiz-Herrera D, Olvera-Pérez A, Carreón-Burciaga G, Bologna-Molina R. (2012). Evaluación del ph salival en pacientes gestantes y no gestantes. Revista ADM 69(3).

Pérez Oviedo AC, Betancourt Valladares M, Espeso Nápoles N, Miranda Naranjo M, González Barreras B (2011). Caries dental

asociada a factores de riesgo durante el embarazo. Revista Cubana de Estomatología 48(2):104-112.

Rengifo R, Herney A (2009). Creencias acerca de la salud oral en gestantes en tres ciudades colombianas. Revista Facultad de Odontología Universidad de Antioquia 20(2)171-178.

Rodríguez Chala HE, López Santana M (2003). El embarazo: Su relación con la salud bucal. Revista Cubana de Estomatología. 40(2):0-0.

Rodríguez Lezcano A, León Valle M, Arada Otero A, Martínez Ramos M (2013). Factores de riesgo y enfermedades bucales en gestantes. Revista de Ciencias Médicas de Pinar del Río 17(5):51-63.

Secretaria de Salud. (2016). Resultados del sistema de vigilancia epidemiológica de patologías bucales: Sivepab 2016. In: Subsecretaría de Prevención y Promoción de la Salud, editor. Mexico City: Secretaria de Salud.

Sifuentes B, Stephanie D (2017). Cpod, volumen de flujo salival y nivel de ph salival en adolescentes gestantes y no gestantes del hospital de segundo nivel de barranca-cajatambo, direccion regional de salud, lima-2016.