

Awareness of Systemic Manifestations and Oral Infections during Pregnancy among Women in Riyadh, Saudi Arabia

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Abstract: The objective of this study was to assess the awareness among married women on the effects' of systemic changes and oral infections on pregnancy status in Riyadh , Saudi Arabia. A questionnaire was prepared online by Google Forms containing the following three sections; 1. demographic data, 2. knowledge regarding systemic changes and oral infections' effects on pregnancy outcome, and 3. dental treatment and myths during conception. A rating scale format was applied with agree, don't agree, and do not know options. The questionnaire was distributed through social media networks targeting married women across Riyadh, Saudi Arabia. A total of (491) women in Riyadh area responded to the questionnaire, with 60.3% acquiring Bachelor's degree and 40.4 % were among 25 to 34 years of age. Among the sample, 45.2% reported acquired health complications during pregnancy. Anemia, gestational diabetes, and preterm delivery were most reported in 33.9%, 27.9% and 24.3%, respectively. They recognized the risk of gestational diabetes ($p = 0.025$), anemia ($p = 0.047$), and for the increased iron demand during pregnancy ($p = 0.012$). 65% of respondents lack the knowledge on the effect of hypertension on fetus growth and death. More than half of the sample did not recognize periodontitis as a risk factor for low birth weight or fetus death. More than 2/3 acknowledge that linking tooth loss with pregnancy is a myth ($p = 0.000$). Yet, 63.1 % owed that to calcium withdraw from mother teeth to supply fetus demand ($p = 0.293$). More than 70 % knew that pregnancy will not cause hypersensitivity of teeth, and that dental radiographs are not safe in the first 3 months ($p = 0.041$), as well as ibuprofen is not a safe analgesic. Around 65% agreed on that pregnant women can be treated in a dental clinic ($p = 0.032$). A considerable portion of the sample were confused about the safety of dental local anesthesia, and that pregnancy may cause a swollen gum requiring surgical removal.

Keywords: awareness, oral infections, pregnancy, systemic changes, women.

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I. INTRODUCTION

Pregnancy or gestation can be defined as; the state of carrying a developing embryo or fetus within the female body.¹ Throughout the pregnancy period, the body is encountered with many physiological changes including respiratory, hematologic, cardiovascular, and immunological shifts.² These changes can directly impact the pregnant woman by increasing susceptibility to various oral and systemic infections. Moreover, the exposure of pregnant woman to different oral and systemic infections, poses a direct risk on the developing fetus leading to undesired pregnancy outcomes.³

During pregnancy, various hormonal changes occur resulting in the alteration of the physiologic functions of the body, therefore, numerous systemic changes are enhanced "Fig.1".

The first of the most common systemic manifestations associated with pregnancy is hematological changes which include hypercoagulation due to increased pro-coagulant action and anemia usually necessitating the use of iron and folic acid supplements.^{4,5} Second, are the different respiratory changes that occur during pregnancy such as increased rate of respiration (tachypnea) and dyspnea that is aggravated by the supine position. Subsequently, prevention is necessary within the dental practice through the implementation of stress reduction and avoidance of rubber dam utilization which may lead to exacerbation of dyspnea.⁵ Third, are the cardiovascular changes that might occur during gestation. Such changes are associated with hypertension, tachycardia, heart murmurs, glomerulopathies, peripartum cardiomyopathy, arterial aneurysms, and arteriovenous malformations.⁵ Furthermore, during pregnancy, hormonal changes contribute to several

immunological shifts which aid in diminishing the risk of fetal rejection while increasing anti-inflammatory responses promoting the transfer of maternal antibodies to the fetus.⁴

Periodontitis is one of the most common oral infections associated with pregnancy. The action of sex hormones during pregnancy potentiate periodontal diseases by promoting inflammation. The elevation of the hormones estrogen and progesterone produce an exaggerated response to plaque leading to periodontal inflammation "Fig.2". The occurrence of periodontitis during pregnancy may result in low birth weight and preterm birth of the fetus, and the chances of their occurrence is likely to be elevated through systemic manifestations associated with pregnancy.^{6,7}

Oral health is essential to general wellbeing, and since pregnancy is a period of vulnerability in terms of oral health, pregnant women and their providers require more knowledge and learning about the many changes that happen in the oral cavity during pregnancy which can influence the health of the unborn child.⁸ To reduce the incidence of infants with congenital abnormalities, women should have knowledge about preventive measures against maternal disorders during pregnancy. However, knowledge and awareness of pregnant women about their teeth and gingival condition has been shown to be generally poor.⁹ A study in 2015

conducted by *Asa'ad et al.* measured the level of awareness among pregnant women in both Central and Eastern regions of Saudi Arabia regarding periodontal disease and its effects on pregnancy. The level of awareness was found to be inadequate.¹⁰ Also, *Sajjan et al.* in 2015 revealed that the majority of pregnant women in Bagalkot District, India were not aware that periodontal diseases are common during pregnancy. Furthermore, most of them were not aware of the safe period for undergoing dental treatment during pregnancy.¹¹ Moreover, a diversity of oral health knowledge among pregnant women has been noticed according to race, ethnicity, beliefs, and maternal education before and during pregnancy.¹²

Since oral infections have become more commonly seen in pregnant women, which may lead to serious complications affecting both the mother and the fetus. It is critical to consider awareness level regarding such conditions. Nonetheless, it is important to promote awareness where deficiency is evident through public health educational preventive programs.

In the literature, there is a lack of studies concerning knowledge and awareness of married or previously married women in Riyadh, Saudi Arabia. Awareness about the systemic manifestations associated with pregnancy and the effect of different oral infections and dental treatment on pregnancy outcomes. Collection of such data would be a valuable tool for policy makers in planning and implementing educational and preventive programs for the pregnant women population.

The purpose of this study is to assess awareness level regarding systemic manifestations associated with pregnancy and the effect of different oral infections on pregnancy among married or previously married women living in Riyadh, Saudi Arabia. The null hypothesis tested in this study is that there is no awareness among married women in Riyadh about systemic manifestations and effect of oral infections on pregnancy.

II. MATERIALS AND METHODS

The present study is a cross sectional questionnaire-based survey targeting married or previously married women in Riyadh, Saudi Arabia. The approval to conduct the study was obtained from the College of Dentistry Research Center (CDRC) at King Saud University. The consent of the respondents was based on their approval to initiate and complete the online questionnaire. The questionnaire was prepared online through Google Forms. It contained the following four sections: 1) Demographic data (including social status, number of children, age group and educational level), 2) Health disorders acquired during pregnancy, and related information. 3) Knowledge regarding systemic manifestations' adverse effects on pregnancy outcome, and 4) Dental treatment and myths during conception. A rating scale format was applied with agree, do not agree, and do not know options. The questions were formulated to state wrong and correct facts to adequately analyze the knowledge level. The inclusion criteria involved Saudi nationals and residents, living in Riyadh city, and married or previously married women. The questionnaire was distributed in Arabic version through social media networks targeting married women across Riyadh from December 2016 to March 2017. A pilot study of (20) participants was performed and evaluated for validity. Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) version 21 software (SPSS Inc., Chicago, IL, USA). The frequencies and percentages for all nominal variables was performed. One-way analysis of variance (ANOVA) was used to compare the total scores with respect to different levels of education, age groups, marital status and complications during pregnancy. Also, t-test was conducted to compare the total scores with respect to those who have children and those who do not have children. The Pearson's Correlation Coefficient was calculated to find the relationship between the total score of the two dimensions of section 3 and 4. All statistical analysis were set at a significance level of $p < 0.05$.

III. RESULTS

A total of 525 females responded to the questionnaire, within age range 19 - 40 years. Thirty four respondents did not meet the inclusion criteria, and were excluded, therefore, a total of 491 respondents was analyzed. The majority of the respondents were married 95.7% as shown in Table 1. A considerable number of the respondents were between the age 25 to 34 years being 40.4% as presented in Table 1. Bachelor degree holders had the highest response rate and made 60.3% of the total sample, an intermediate school education level had the least response rate of 4.1%, as illustrated in Table 1. Most of the respondents 83.6% had children, and (13.4%) reported having two children. Of the respondents 48.3% reported acquired health disorders during pregnancy. Interestingly, the highest number of health disorders was reported with the first pregnancy 43.8%, then it reduced with the second pregnancy to 32.0%, and increased during the third and fourth pregnancy to 33.3% and 37.9%, respectively. The most common reported acquired health disorder among the sample was anemia with a percentage of 33.9% as illustrated in Table 2.

In question 3.1, almost half of the sample 57.4%, knew that morning sickness doesn't increase in the last trimester. However, two-third of the respondents 60.9% did not know the cause of it. Among the sample 73.5% were not aware about the correlation between hypotension and the supine position. Only 14.9% of respondents were aware that the right lateral position is not preferable for pregnant women. Three quarter of the sample 76.8%, recognized risk factors for gestational diabetes. More than half 51.9% of the sample were aware that gestational diabetes increases the likelihood of diabetes mellitus after pregnancy. On the other hand, 66.2% of respondents lack the knowledge about the effect of hypertension on fetus growth. Furthermore,

only 12.8% have responded correctly stating a positive relationship between hypertension and periodontitis. Most of the respondents agreed about iron requirements during pregnancy as stated in question 3.10 and 3.12 with 95.5% and 96.1% respectively. As well as the effect of anemia on pregnancy, question 3.11 had a high percentage of correct respondent 87.4%.

In section 4 of the questionnaire as shown in Table 4., the majority 90.4% were not aware of the serious complications of periodontitis with low birth weight and death, question 4.1. However, 67.8% of the sample were aware that pregnancy does not always cause tooth loss, in question 4.2. Yet, only 22.6% did not agree that tooth loss during pregnancy was due to infant's calcium supply being from the mothers' teeth, question 4.3. In question 4.4 and 4.5, there was similar knowledge level regarding the lack of effect of fetus gender on tooth loss 70.7%, and teeth sensitivity 73.9% during pregnancy. Likewise, 70.9% of the sample knew that dental radiographs are contraindicated in the first trimester of pregnancy, in question 4.6. Comparably to question 4.7, 71.9% of the sample were aware that "Ibuprofen" analgesic is contraindicated during pregnancy. Similarly, most of the sample 84.9%, question 4.8, did not agree on the use of any available antibiotic in the pharmacy during pregnancy. On the other hand, only 32.6% in question 4.9 were aware that local anaesthesia used in the dental clinic usually does not cause any complications for pregnant women. While in question 4.10, 89.6% did not know that it is common for a pregnant woman to have a gingival swelling, which can be removed by a simple surgery. Nonetheless, 65.6% of the sample knew that pregnant women can be treated in the dental clinic, question 4.11. However, a relatively small percentage 35.6%, question 4.12, knew that enamel wears more in pregnant women which increases the caries rate.

IV. DISCUSSION

Oral health is a fundamental factor that has an influential effect on both the mother and the fetus during pregnancy.⁸ Such effects are also evoked by the physiological changes that occur with pregnant women.

Preterm low birth weight, for example, is one of the common adverse pregnancy outcomes which needs to be dealt with as a result of several factors including the presence of periodontal disease through elevated sex hormones found in pregnancy along with the production of bacterial toxins.^{6,13,14} Consequently, this study addressed questions regarding oral infections and some widespread myths and its correlation to pregnancy to assess the level of awareness among married, and previously married women living in Riyadh, Saudi Arabia.

Accordingly, when asked if periodontitis displayed serious complications that may lead to low birth weight and death, only 9.6% identified the harmful correlation suggesting a low

awareness. Whereas, the study conducted by Tarannum *et al.* (2015) displayed that younger, educated and married females living in Bangalore, India exhibited more awareness regarding the association of periodontal disease and preterm low birth weight among females.¹³ As well as, George *et al.* in South-West Sydney suggested that less than 50% were aware of the potential harmful effects of poor oral health during pregnancy.¹⁵ Henceforth, further proposing the value of education on the level of awareness

Moreover, the first pregnancy displayed the highest number of health disorders of 43.8%, of the sample with the most common reported acquired health disorder attributing to anemia (33.9%). Subsequently,

while associated with the level of education as well, a large proportion of the sample (94.5% and 96.1%, respectively) were able to determine the benefits of iron supplements on the fetus' health in addition to providing an understanding of the factors that contribute in preventing anemia. Nevertheless, a correlation with level of education suggests that 12.7% of the sample were not aware that anemia has an effect on pregnancy.

Furthermore, the study conducted displayed the highest number of responses to the age group 25-29 in addition to the Bachelor degree holders contributing to 20.8% and 60.3% of the sample, respectively. As such, a correlation has been found with particular questions in respect to both age and education level. There was a statistically significant differences noticed with age groups regarding questions; 3.1, 3.4, and 3.5; which evaluated morning sickness intensity in the first trimester ($P = 0.024$), factors effecting the risk of gestational diabetes ($P = 0.025$), and preferable side of lateral position for pregnant women ($P=0.001$), respectively as shown in Table 3. On the contrary, question 4 witnessed no significant difference. A significant difference in the sampled population regarding their level of education was reflected in association with questions: 3.10, and 3.11, iron requirement ($P=0.012$), and the effect of iron deficiency on pregnancy ($P = 0.047$), respectively as shown in Table 3. Similarly, responses to questions 4.2, 4.6, and 4.11 which discuss tooth loss, ($P= 0.000$), dental radiographs ($P = 0.041$) and dental treatment during pregnancy ($P = 0.032$) were statistically significant differences with education level, as illustrated in Table 4.

Additionally, in a study by Górnaczyk *et al.* (2017) aimed to investigate the health-related behaviors of pregnant women, less than 50% of women informed their dentist about their pregnancy.¹⁶ A correlation to the level of education in this study further suggests that 70.9% and 65.6%, respectively, responded correctly as they believed that dental radiographs are not safe in the first three months of pregnancy ($P = 0.041$) and that a pregnant women can be treated in the dental clinic ($P = 0.032$), suggesting the importance of improved education.

Some systemic complications have both oral and systemic effects on pregnant women. Seraphim A. *et al.* has noted that gestational diabetes mellitus has a bidirectional relation with the development of periodontitis such that women with such condition may have an increased risk of developing severe periodontitis, disturbing the insulin signal and causing insulin

resistance.¹⁷ This, in turn, may cause periodontal pathogens to reach the amniotic cavity and cause adverse pregnancy outcomes including preterm birth and/or low birth weight.¹⁷

Hypertension during pregnancy has further been reported and can lead to end-stage organ damage or preeclampsia, a clinical condition of pregnancy that manifests as hypertension, proteinuria, edema, and blurred vision. Preeclampsia may further result in fetal growth restriction.¹⁸ Nevertheless, the study displayed that 65% were not aware, that hypertension in pregnancy can increase the likelihood of fetus death by 5 times.

As a result, since different oral and systemic diseases have become more commonly seen in pregnancy and cause serious complications to both the mother and particularly to the fetus, it is important to consider the knowledge of such conditions and promote awareness where deficiency is evident through simple educational preventive programs.¹¹ This is further supported by the American Academy of Pediatric Dentistry's recommendations in 2011 which recommend the establishment of early intervention and counseling during the perinatal period from all health care providers including dentists and physicians with the aid of legislators and policy makers to support efforts in improving the access to oral health care for pregnant women through increased treatment frequency and comprehensive services.¹⁹

V. Conclusion

The overall results suggest that married and previously married women living in Riyadh, Saudi Arabia exhibit a lack of knowledge and awareness in regards to oral infections effects' on pregnancy. Oral health educational and preventive programs should be implemented to improve the knowledge and prevent further complications of oral diseases on both the mother and fetus.

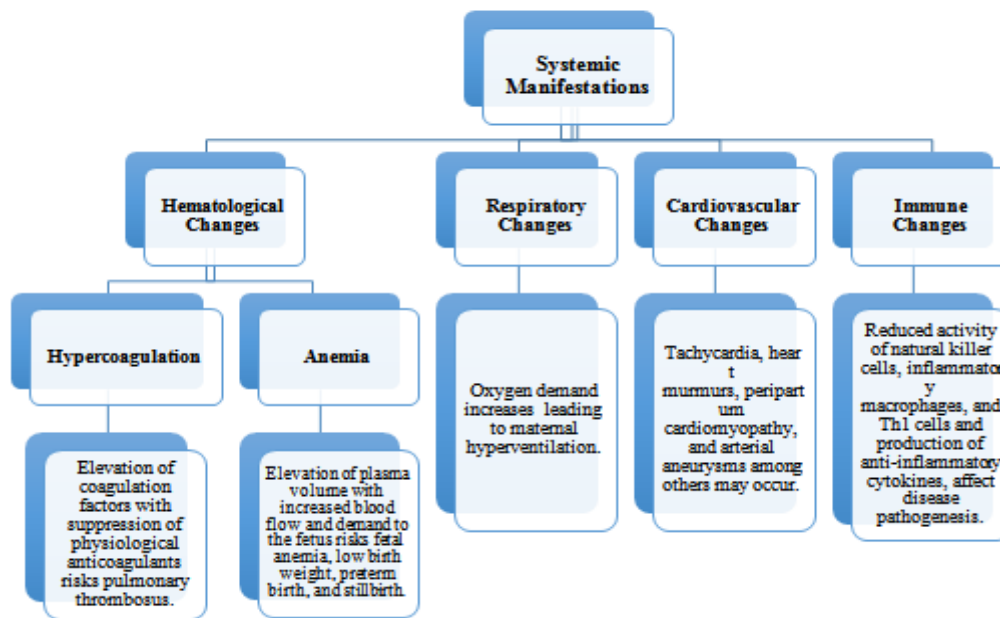


Figure (1) : Summary of Systemic Manifestations in Pregnancy ^(2,4,5)

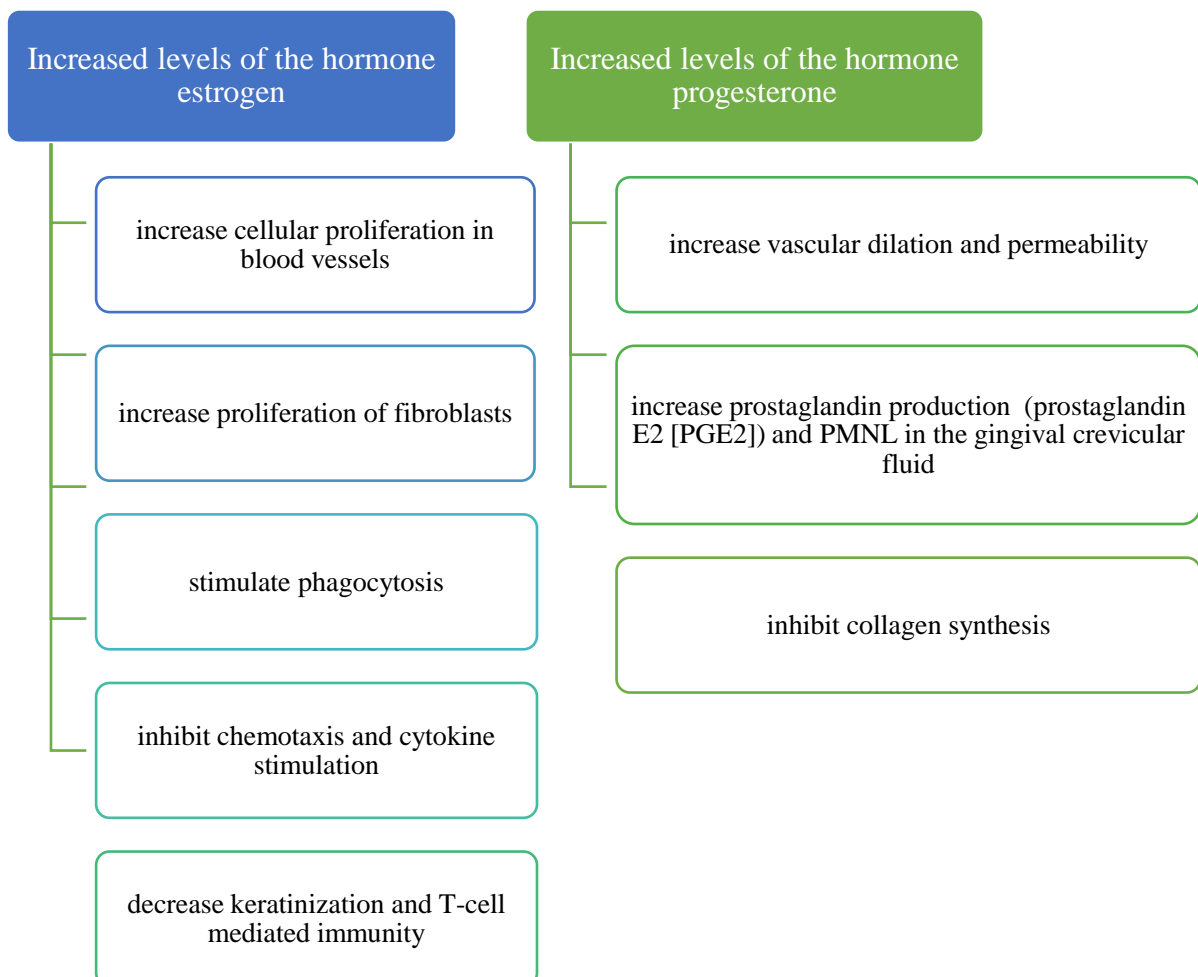


Figure (2) : Pathogenesis of Periodontal Disease in Pregnancy ⁽⁶⁾

Table (1): Description of the sample by age, marital status, and level of education.

Age		
Characteristic	Frequency	Percentage
19 or less	56	11.4
20-24	63	12.8
25-29	102	20.8
30-34	96	19.6
35-39	68	13.8
40 or more	106	21.6
Total	491	100.0
Marital Status		
Characteristic	Frequency	Percentage
Married	470	95.7
Divorcee	14	2.9
Widow	7	1.4
Total	491	100.0
Education Level		
Characteristic	Frequency	Percentage
Intermediate School	20	4.1
High school	109	22.2
Bachelor degree	296	60.3
Masters	40	8.1
PhD	26	5.3
Total	491	100.0

Table (2): Description of the sample by Pregnancy related Complications.

Characteristic	Yes		No	
	Frequency	Percentage	Frequency	Percentage
Acquired pregnancy complications	237	45.2%	210	54.8%
Type of acquired pregnancy complications				
Gestational diabetes	70	27.9%		
Hypertension	36	14.3%		
Anemia	85	33.9%		
Preterm delivery	61	24.3%		
Depression	46	18.3%		
Others	42	16.8%		
Occurrence of pregnancy complications				
First	104	41.6%		
Second	75	30%		
Third	80	32%		
Fourth or more	89	35.6%		

Table (3): Description of the Responses of the Sample to Questions about General Knowledge on Systemic Manifestations adverse effects on Pregnancy outcome.

Question	Correct Answer		Wrong Answer		Don't know		P - value
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	
2.1 Morning sickness increases in the last three months	282	(57.4%)	123	(25.1%)	86	(17.5%)	0.024*
2.2 Factors leading to morning sickness include high sugar diet, changes in hormones levels and taste buds	192	(39.1%)	49	(10.0%)	250	(50.9%)	0.065
3.3 Hypotension occurs in pregnant women when she lays on her back	130	(26.5%)	84	(17.1%)	277	(56.4%)	0.053
3.4 It's preferable for pregnant women to lay down on the right side	73	(14.9%)	326	(66.4%)	92	(18.7%)	0.001*
3.5 Risk of gestational diabetes increase by weight gain, sedentary life style and having relatives with diabetes mellitus	377	(76.8%)	30	(6.1%)	84	(17.1%)	0.025*
3.6 Gestational diabetes doesn't increase the likelihood of diabetes mellitus after pregnancy	254	(51.7%)	110	(22.4%)	127	(25.9%)	0.691
3.7 Hypertension in late months of pregnancy increase likelihood of fetus death by 5 times	166	(33.8%)	6	(1.2%)	319	(65.0%)	0.787
3.8 Fetus growth restriction has many factors other than hypertension in pregnant women	46	(9.4%)	140	(28.5%)	305	(62.1%)	0.734
3.9 Periodontitis has no effect on	63	(12.8%)	92	(18.7%)	336	(68.4%)	0.906

	hypertension							
3.10	Iron requirements increase during pregnancy to provide fetus with adequate nutrients	464	(94.5%)	0	0	27	(5.5%)	0.012**
3.11	Anemia has no effect on pregnancy	429	(87.4%)	16	(3.3%)	46	(9.4%)	0.047**
3.12	Taking iron supplements, folic acid and iron-rich foods during pregnancy will prevent anemia	472	(96.1%)	3	(0.6%)	16	(3.3%)	0.794

* Statistically Significant with the age groups
 ** Statistically Significant with education level

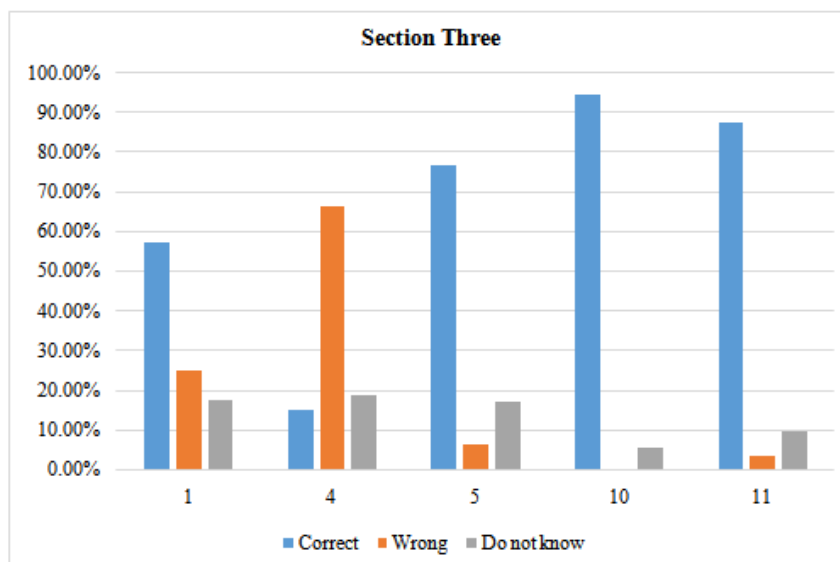


Figure (3) : Bar Chart representing the Responses to Specific Questions in Section 3 with Statistically Significant Differences

Table (4): Description of the Responses of the sample to Oral Related Conditions during Pregnancy.

Question 4		Correct Answer		Wrong Answer		Don't Know		P -Value
4.1	Periodontitis may lead to low birth weight or death	47	(9.6%)	175	(35.6%)	269	(54.8%)	0.966
4.2	Pregnancy always cause tooth loss	333	(67.8%)	85	(17.3%)	73	(14.9%)	0.000*
4.3	Tooth loss during pregnancy is due to fetus calcium supply from the mothers teeth	111	(22.6%)	310	(63.1%)	70	(14.3%)	0.293
4.4	Fetus gender has an effect on the teeth loss	347	(70.7%)	16	(3.3%)	128	(26.1%)	0.699
4.5	Teeth sensitivity increase in pregnant women	363	(73.9%)	44	(9.0%)	84	(17.1%)	0.326
4.6	Dental radiographs are safe in the first three months of pregnancy	348	(70.9%)	38	(7.7%)	105	(21.4%)	0.041*
4.7	Use of analgesic (Ibuprofen) is safe during pregnancy	353	(71.9%)	37	(7.5%)	101	(20.6%)	0.392
4.8	It's safe to use any available antibiotic in the pharmacy during pregnancy	417	(84.9%)	31	(6.3%)	43	(8.8%)	0.617
4.9	Local anaesthesia used in dental clinic usually doesn't cause any complications in pregnant women	160	(32.6%)	182	(37.1%)	149	(30.3%)	0.844
4.10	It's common to have a gum swelling in the pregnant women and can be removed by simple surgical procedure	51	(10.4%)	181	(36.9%)	259	(52.7%)	0.792
4.11	A pregnant women can't be treated in the dental clinic	322	(65.6%)	101	(20.6%)	68	(13.8%)	0.032*
4.12	Enamel wears more in pregnant women due to increased caries rate	175	(35.6%)	124	(25.3%)	192	(39.1%)	0.105

* Statistically Significant with education level

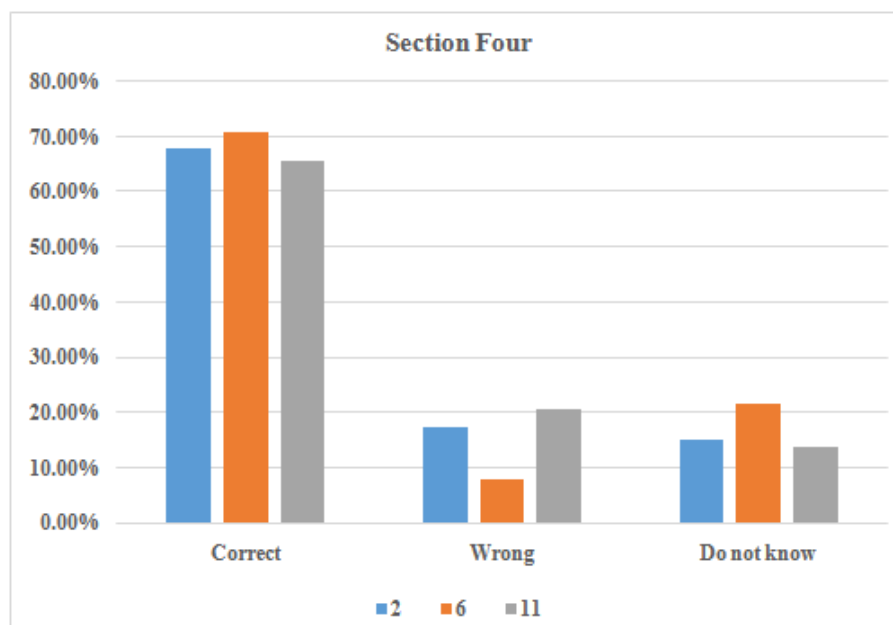


Figure (4) : Bar Chart representing the Responses to Specific Questions in Section 4 with Statistically Significant Differences.

References

- [1]. Medical Definition of Pregnancy. MedicineNet Online Dictionary. Accessed December 2017. <https://www.medicinenet.com/script/main/art.asp?articlekey=11893>
- [2]. Soma-Pillay P, Catherine N-P, Tolppanen H, Mebazaa A, Tolppanen H, Mebazaa A: Physiological changes in pregnancy. Cardiovascular Journal of Africa. 2016; 27(2): 89 - 94.
- [3]. Khan R, Virginia Antony V. Dentistry for the Pregnant Patient. IOSR Journal of Dental and Medical Sciences. 2014; 13(1):83-90.
- [4]. Bialobok KM, Monga M. Fatigue and work in pregnancy. Current Opinion in Obstetrics and Gynecology. 2000;12(6):497-500.
- [5]. Little JW, Falace DA, Miller CS, Elsevier c2008., Rhodus NL. Little and Falace's dental management of the medically compromised patient. 7th ed. Philadelphia, PA, United States: Elsevier Mosby; July 24, 2007:324-334.
- [6]. Srivastava A, Gupta K, Srivastava S, Garg J. Effects of Sex Hormones on the Gingiva in Pregnancy: A Review and Report of Two Cases. Journal of Periodontology & Implant Dentistry. 2011;3(2):83-87. Penova-Veselinovic B, Keelan JA, Wang CA, Newnham JP, Pennell CE. Changes in inflammatory mediators in gingival crevicular fluid following periodontal disease treatment in pregnancy: Relationship to adverse pregnancy outcome. Journal of Reproductive Immunology. 2015; 112:1-10.
- [7]. Hartnett Erin, et al. Oral Health in Pregnancy. Journal of Obstetric, Gynecologic, & Neonatal Nursing. 2016; 45 (4): 565-573.
- [8]. Alwaeli HA, Al-Jundi SH. Periodontal Disease Awareness among Pregnant Women and its Relationship with Socio-demographic Variables. International Journal of Dental Hygiene. 2005; 3 (2): 74-82.
- [9]. Asa'ad FA, et al. Periodontal Disease Awareness among Pregnant Women in the Central and Eastern Regions of Saudi Arabia. Journal of Investigative and Clinical Dentistry. 2015; 6 (1): 8-15.
- [10]. Sajjan P, et al. Oral Health Related Awareness and Practices among Pregnant Women in Bagalkot District, Karnataka, India. Journal of International Oral Health. 2015;7(2):1-5
- [11]. Boggess KA, et al. Knowledge and Beliefs Regarding Oral Health among Pregnant Women. The Journal of the American Dental Association. 2011; 142 (11): 1275-1282.
- [12]. Tarannum F, Shiva Prasad R, Shobha R, Santosh Kumar B, Ebenezer S. Awareness of the association between periodontal disease and adverse pregnancy outcome among the general female population. Indian Journal of Dental Research. 2015;26(1):21.
- [13]. Naseem M, Khurshid Z, Khan H, Niazi F, Zohaib S, Zafar M. Oral health challenges in pregnant women: Recommendations for dental care professionals. The Saudi Journal for Dental Research. 2016;7(2):138-146.
- [14]. George A, Johnson M, Blinkhorn A, Ajwani S, Bhole S, Yeo A et al. The oral health status, practices and knowledge of pregnant women in south-western Sydney. Australian Dental Journal. 2013;58(1):26-33.
- [15]. Górniasczyk A, Czech-Szczapa B, Sobkowski M, Chmaj-Wierzchowska K. Maternal health-related behaviours during pregnancy: a critical public health issue. The European Journal of Contraception & Reproductive Health Care. 2017;22(4):321-325.
- [16]. Seraphim A, Chiba F, Pereira R, Mattera M, Moimaz S, Sumida D. Relationship among periodontal disease, insulin resistance, salivary Cortisol, and stress levels during pregnancy. Brazilian Dental Journal. 2016;27(2):123-127.
- [17]. Anthony J, Damasceno A, Ojji D. Hypertensive disorders of pregnancy: What the physician needs to know. Cardiovascular Journal of Africa. 2016;27(2):104-110.
- [18]. Council on Clinical Affairs. Guideline on Perinatal Oral Health Care. American Academy of Pediatric Dentistry. 2011;37(6):15-16

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