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KNOWLEDGE AND AWARENESS LEVEL OF PREGNANT WOMEN IN KSA ABOUT THE RELATIONSHIP BETWEEN PERIODONTITIS AND PRETERM BIRTH LOW-WEIGHT INFANTS

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Abstract

Background: Preterm delivery (PB), defined as birth before 37 weeks of gestation, significantly contributes to neonatal morbidity and mortality, affecting approximately 11.1% of births annually. Periodontal disease (PD), prevalent among pregnant women, is associated with chronic inflammation and has been linked to adverse pregnancy outcomes, including PB and low birth weight (LBW) infants. Despite the potential impact of maternal oral health on fetal outcomes, awareness among pregnant women regarding this relationship remains unclear. This study aimed to assess the knowledge and awareness levels of pregnant women in Saudi Arabia regarding the association between periodontitis and the risk of preterm LBW infants.

Methods: A cross-sectional questionnaire survey was conducted from July to November 2024, involving 400 pregnant women aged 18-50 years in Saudi Arabia. A structured questionnaire, consisting of demographic data, knowledge of oral health care, and attitudes towards oral health, was utilized. Data were analyzed to identify correlations between awareness levels and various demographic factors.

Results: The age of participants, ranging from 22 to 74 years, was 34.9 years with a concentration in the Assir region responses. While 75.7% thought that pregnancy may lead to more periodontal disease, 59.8% were not aware of PB's relationship with periodontal disease. Only 8.5% were highly aware of this relationship while 62.3% were not. Correlations with knowledge were significant (p=0.0001), with educational level (p=0.0001), occupational status (p=0.023), and monthly income (p=0.008).

Conclusion: The results emphasize knowledge and awareness gap in pregnant women with regard to periodontal disease and its impact on pregnancy outcomes. While there is acknowledgment of periodontal disease during pregnancy, misconceptions regarding its effect on PB and LBW continue.

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These results show the critical and immediate need for targeted education aimed at increasing maternal knowledge as it relates to oral health improved preventative measures to improve prenatal cares and to decrease adverse pregnancy outcome. Partnered efforts between obstetricians and dental professionals are important to build oral health education into standard prenatal care.

Keywords: Knowledge, Awareness, Periodontitis, Saudi Arabia, preterm birth low weight infants.

Introduction: A preterm delivery or premature birth (PB) means an infant with a gestational age (GA) of less than 37 weeks at time of delivery [1].PB is the main cause for neonatal morbidity and motility PB affects 11.1% of births each year [2].Periodontal disease (PD), caused by Gram-negative anaerobic bacteria, is a highly prevalent disease characterized by chronic inflammation and Maternal periodontitis is associated with increased risk of adverse birth outcomes in many observational studies [3]. These changes are associated with an increase in the secretion of estrogen and progesterone during pregnancy.These changes can increase susceptibility to oral diseases. Periodontal disease is a disease of the oral cavity that is often found in pregnant women, such as gingivitis and periodontitis. In a very severe condition can form a pregnancy tumor called epulis gravidarum. The incidence of gingivitis and periodontitis in pregnant women is reported to be 36-100%. This condition may occur due to the gingival response to plaque bacteria increased by hormonal changes. Pregnancy also often causes various complaints, such as nausea and vomiting, predisposed to tooth erosion. Also, pregnancy is reported to increase caries risk. Apart from hormonal changes, dietary factors and oral hygiene also play an essential role in developing oral diseases. Many studies have shown that maternal oral health plays a role in birth outcomes and infant oral health. It has been shown that mothers with poor oral health can increase their infant's caries risk by transmitting cariogenic bacteria through improper feeding. Several studies have also shown an association between periodontal health and pregnancy outcome. Periodontal disease during pregnancy can cause babies with low birth weight (LBW) and preterm birth. Good nutrition and a healthy lifestyle including good measures in maintaining oral hygiene play an essential role in the general welfare of pregnant women. Oral health problems and its complications during pregnancy can be prevented by maintaining oral health behaviors that include knowledge, attitude, and practice [4].

The results of a previous study that was done in 2019 among pregnant women in KSA showed that 45% of mothers had poor knowledge levels about oral health during pregnancy [1]. The majority of pregnant mothers knew very little about periodontal disease, dental hygiene, and how they affect pregnancy. As a result, most of them (87.3%) had gingivitis on clinical examination according to the results of a study obtained between 55 pregnant women in Agbowa, Logas, Nigeria [2]. Moreover, another research in Saudi Arabia was conducted more recently in 2024 among 481 women visiting the obstetrics and gynaecology departments in Riyadh and Eastern governmental hospitals [3] found that 64.4% of the women who were screened reported having dental issues, 49.7% experienced a drop in their oral health during pregnancy, and 17.5% had undesirable pregnancy outcomes.The reasons for conducting this topic are due to the lack of researches that assess the knowledge of pregnant women in KSA about periodontitis and its relation to preterm birth low-weight infants specifically and did not cover the entire country to overcome the limitation of the small sample size and to encourage dentists to be an integral part of pregnant patient education. This research focuses on evaluating the knowledge and awareness level of the relationship between periodontists and preterm low birth weight infants.

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Materials and Method:

Study Design and Setting:

This study was a cross-sectional questionnaire survey, based on a structured questionnaire that was developed by authors and conducted between July to November 2024 in Saudi Arabia.

Subject: Participants, recruitment and sampling procedure:

The study population consisted of pregnant women in the Kingdom of Saudi Arabia (aged 18-50 years) about the relationship between periodontists and preterm low birth weight infants in 2024 from women who received the questionnaire.

Sample size:

The sample size of 384 was determined using the Raosoft sample size calculator to ensure a representative sample for the entire population. This calculation was based on an assumed indicator percentage of 0.50, a margin of error of 5%, and a confidence interval (CI) of 95%.

Inclusion and Exclusion Criteria:

Saudi women who aged between (18-50) years old and who are pregnant or were pregnant was included in the study, while pregnant women who have current systemic disease was excluded.

Method for data collection, instrument, and score system:

Structured questionnaire was used as a study tool. The final version of the questionnaire consisted of 24 with 3 sections. Section1, demographic data such as age, educational level and occupation. Section 2, includes questions that asses the knowledge of oral health care. Section 3, The participants was asked about their attitude of oral health care

Scoring system:

In all, 10 statements served to assess the participants' attitudes and degree of knowledge. 5 statements for demographics, 2 for knowledge, and 2 for awareness. One point is given for correct answers, and zero points are given for incorrect answers or “I don't know”. For scoring, we utilized Likert scales (Dichotomous, Three-Point, and Quality Scales) The maximum score was 37 and divided as follows: The original Bloom's cut-off points, 80.0%-100.0%, 60.0%-79%, and 59.0%, The participants were divided into three groups based on their scores.

knowledge score varied from 0 to 17 points and was classified into three levels as follows: those with a score of 9 or below ($\leq$ 10) were classified as having a **low level of knowledge**, those with scores between 11 and 13 as having a **moderate level of knowledge**, and those with scores 14 or above ($\geq$ 14) as a **high level of knowledge.**

Awareness scores varied from 0 to 20 points and were classified into three levels as follows: those with a score of 12 or below ($\leq$ 12) were classified as having a **bad attitude**, those with scores between 13 and 15 as having a **moderate attitude**, and those with scores 16 or above ($\geq$ 16) as having a **good attitude**.

Pilot test:

The study was carried out on 18 participants to evaluate the validity of the tool, which was used in this

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study for data collecting and accordingly necessary modification was done. The participants who were tested as pilot study were excluded from the study sample.

Results:

Table (1) displays various demographic parameters of the participants with a total number of (732). Notably, the mean age of participants is approximately 34.9 years, with a standard deviation of 10.1, indicating a predominance of younger adults, particularly those aged 25 to 30 years, comprising 26.2% of the sample. The geographic distribution reveals a significant concentration of respondents from Assir, accounting for 45.1%, which could suggest regional socioeconomic factors influencing participation. Educational attainment appears to be relatively high, with 63.9% holding a bachelor's degree, emphasizing a well-educated demographic. However, it is concerning that over half (50.5%) of the participants are unemployed, coupled with a substantial portion (58.2%) earning less than 5000 SAR monthly, highlighting potential economic challenges.

Table (1): Sociodemographic characteristics of participants (n=732)

Parameter		**No.**	**Percent (%)**
Age ***(Mean: 34.9, STD: 10.1)***	24 years or less	132	18.0
	25 to 30 years	192	26.2
	31 to 40 years	184	25.1
	41 to 45 years	102	13.9
	more than 45 years	122	16.7
Region of residence	Al baha	2	.3
	Northern borders	4	.5
	Riyadh	88	12.0
	Qassim	6	.8
	Madinah	152	20.8
	Eastern province	30	4.1
	Tabuk	8	1.1
	Jazan	4	.5
	Hai'l	4	.5
	Assir	330	45.1
	Makkah	92	12.6
	Najran	12	1.6
Educational level	Primary school	34	4.6
	Middle school	28	3.8
	High school	146	19.9
	Bachelor's degree	468	63.9
	Postgraduate degree	42	5.7
	Uneducated	14	1.9
Occupation	Student	94	12.8
	Healthcare professional	44	6.0
	Employee	162	22.1
	Freelancer	38	5.2
	Unemployed	370	50.5
	Retired	24	3.3

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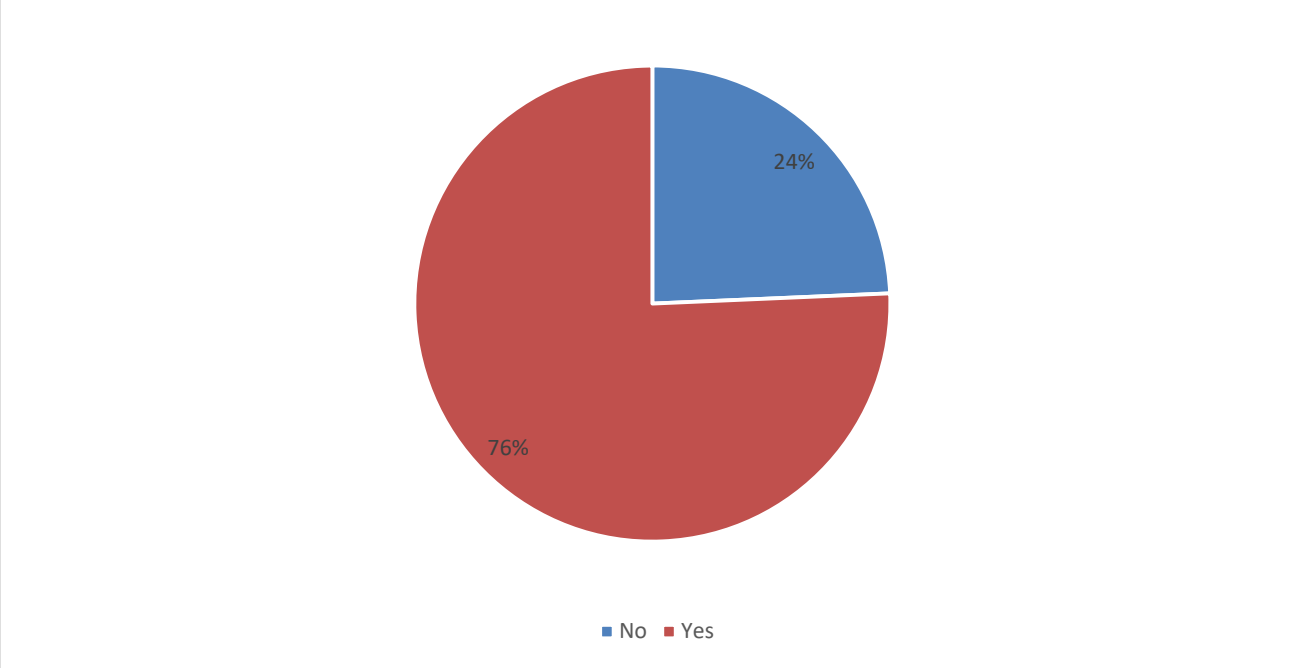
Monthly income	Less than 5000 SAR	426	58.2
	5000 to 10000 SAR	196	26.8
	More than 10000 SAR	110	15.0

As shown in figure 1, Out of a total sample of 732 participants, 554 individuals (75.7%) were aware that periodontal disease occurs at a higher rate in pregnant women, while 178 participants (24.3%) were not aware of this fact. The high level of awareness—more than three-quarters of the respondents—indicates a significant understanding of the link between periodontal disease and pregnancy among the population.

Figure (1): Illustrates the relation between periodontal disease and prgnancy among participants.



As illustrated in table (2), The data elucidates the knowledge level of pregnant women in Saudi Arabia regarding the association between periodontitis and the birth outcomes of preterm and low-birth-weight infants. A noteworthy 75.7% of respondents acknowledged that periodontal disease occurs at a higher incidence during pregnancy, indicating a substantial recognition of the condition among this population. Conversely, a significant portion, approximately 59.8%, remains unaware of the potential link between periodontal disease and preterm birth, revealing a critical gap in understanding that could influence maternal and fetal health outcomes. The majority also recognized the physical changes in gum health during pregnancy, with 79.5% acknowledging symptoms such as bleeding and swelling. However, the split in awareness concerning the impact of dental health on pregnancy outcomes—46.7% affirming the risk—suggests an essential opportunity for targeted educational interventions.

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Table (2): Parameters related to knowledge level of pregnant women in KSA about the relationship between periodontitis and preterm birth low-weight infants (n=732).

Parameter		*No.*	*Percent (%)*
Do you know about the fact that periodontal disease occurs at a higher rate in pregnant women?	No	178	24.3
	Yes	554	75.7
Do you think pregnancy will affect the gums to bleed, swell, or be red?	No	150	20.5
	Yes	582	79.5
Do you think tooth and gum problems could affect pregnancy outcomes?	No	390	53.3
	Yes	342	46.7
Are you aware of preterm, low-birth-weight infants?	No	170	23.2
	Yes	562	76.8
Do you think that periodontal disease (gum disease) is a risk factor for preterm birth?	No	438	59.8
	Yes	294	40.2

As shown in figure (2), In a sample of 732 participants, only 178 individuals (24.3%) reported receiving dental counseling regarding oral health during pregnancy, while a significant 554 participants (75.7%) did not receive any counseling. These numbers indicate that a large majority of pregnant women are not receiving essential guidance on oral health, despite the known links between periodontal disease and pregnancy complications.

Figure (2): Illustrates dental counselling among pregnant women about oral health.

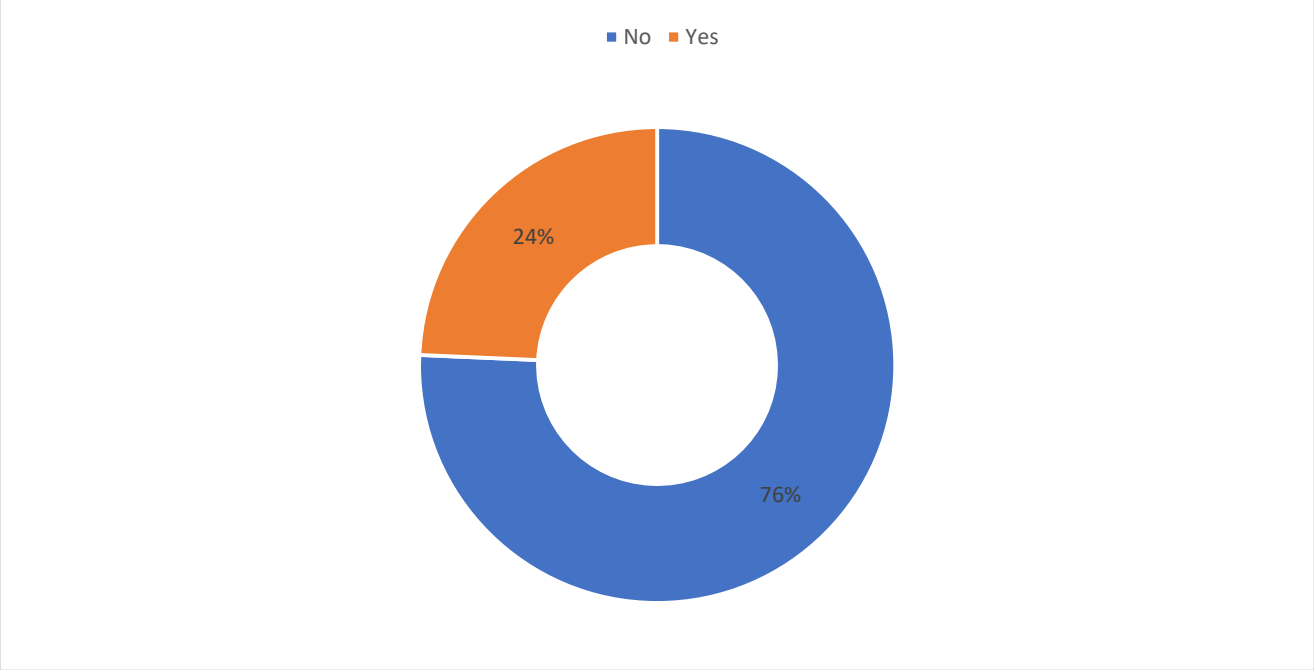

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Table (3) reveals insights into participants' awareness regarding the relationship between periodontitis and the risk of preterm birth in low-weight infants. Among the 732 participants, a substantial portion, 44.8%, reported not experiencing periodontitis during pregnancy, while 32.5% acknowledged having had the condition, and 22.7% were uncertain about their status. This uncertainty is concerning, as it suggests a lack of awareness of the potential health implications associated with periodontitis. Furthermore, when asked whether they would consider visiting a dentist if they had periodontitis, an overwhelming 63.4% indicated they would not seek dental care, highlighting a critical gap in proactive health management. Additionally, the majority, 64.2%, did not attend regular dental check-ups or scaling during pregnancy, and a significant 75.7% reported not receiving any dental counseling concerning oral health during this pivotal time.

Table (3): participants' awareness level about the relationship between periodontitis and preterm birth low-weight infants (n=732).

Parameter		***No.***	***Percent (%)***
You have or had periodontitis during your pregnancy	No	328	44.8
	Yes	238	32.5
	I don't know	166	22.7
If your answer is "Yes" for the above question, would you consider visiting a dentist?	No	464	63.4
	Yes	268	36.6
Do you visit your dentist for regular dental check-up and to do scaling during your pregnancy?	No	470	64.2
	Yes	262	35.8
Did you receive any dental counselling regarding oral health during pregnancy?	No	554	75.7
	Yes	178	24.3

The data presented in Table 4 elucidates the varying degrees of knowledge regarding the relationship between periodontitis and preterm low-weight birth outcomes among the surveyed population. Notably, a substantial portion, accounting for 44.0% of respondents, exhibited a moderate level of knowledge, which may indicate a foundational understanding yet leaves room for enhanced awareness and education on the critical implications of periodontitis on prenatal health. Conversely, those with high knowledge levels represent only 26.2%, suggesting that while some individuals are well-informed, a significant gap remains. Additionally, the 29.8% who demonstrate low knowledge highlights an urgent need for targeted educational interventions.

Table (4): Shows knowledge about the relation between periodontitis and preterm birth low-weight infants score results.

	Frequency	**Percent**
High knowledge level	192	26.2
Moderate knowledge	322	44.0
Low knowledge level	218	29.8
Total	732	100.0

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Table 5 presents the awareness levels regarding the relationship between periodontitis and preterm low-weight infants among 732 participants. The data shows that only 62 individuals (8.5%) demonstrated a high awareness level, while 214 participants (29.2%) exhibited moderate awareness. Most respondents, 456 individuals (62.3%), had a low awareness level. These findings reveal a significant gap in understanding the potential risks posed by periodontitis to pregnancy outcomes, with over 60% of participants lacking sufficient awareness.

Table (5): Shows awareness about the relation between periodontitis and preterm birth low-weight infants score results.

	Frequency	**Percent**
High awareness level	62	8.5
Moderate awareness	214	29.2
Low awareness level	456	62.3
Total	732	100.0

Table (6) shows that the knowledge about the relation between periodontitis and preterm birth has statistically significant relation to educational level (P value=0.0001), occupational status (P value=0.023), and monthly income (P value=0.008). It also shows statistically insignificant relation to age.

Table (6): Relation between knowledge about the relation between periodontitis and preterm birth and sociodemographic characteristics.

Parameters		***Knowledge level***		***Total (N=732)***	***P value****
		High or moderate knowledge	**Low knowledge level**		
Age	24 years or less	94	38	132	0.244
		18.3%	17.4%	18.0%	
	25 to 30 years	130	62	192	
		25.3%	28.4%	26.2%	
	31 to 40 years	134	50	184	
		26.1%	22.9%	25.1%	
	41 to 45 years	78	24	102	
		15.2%	11.0%	13.9%	
	more than 45 years	78	44	122	
		15.2%	20.2%	16.7%	
Educational level	Primary school	12	22	34	0.0001
		2.3%	10.1%	4.6%	
	Middle school	16	12	28	
		3.1%	5.5%	3.8%	
	High school	106	40	146	
		20.6%	18.3%	19.9%	

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	Bachelor's degree	342	126	468	
		66.5%	57.8%	63.9%	
	Postgraduate degree	32	10	42	
		6.2%	4.6%	5.7%	
	Uneducated	6	8	14	
		1.2%	3.7%	1.9%	
Occupational status	Student	74	20	94	0.023
		14.4%	9.2%	12.8%	
	Healthcare professional	28	16	44	
		5.4%	7.3%	6.0%	
	Employee	126	36	162	
		24.5%	16.5%	22.1%	
	Freelancer	24	14	38	
		4.7%	6.4%	5.2%	
	Unemployed	244	126	370	
		47.5%	57.8%	50.5%	
	Retired	18	6	24	
		3.5%	2.8%	3.3%	
Monthly income	Less than 5000 SAR	304	122	426	0.008
		59.1%	56.0%	58.2%	
	5000 to 10000 SAR	146	50	196	
		28.4%	22.9%	26.8%	
	More than 10000 SAR	64	46	110	
		12.5%	21.1%	15.0%	

P value was considered significant if ≤ 0.05.

Table (7) shows that the awareness about the relation between periodontitis and preterm birth has statistically significant relation to monthly income (P value=0.003). It also shows statistically insignificant relation to age, educational level, and occupational status.

Table (7): Awareness level in association with sociodemographic characteristics.

Parameters		***Awareness level***		***Total (N=732)***	***P value****
		High or moderate awareness	**Low awareness level**		
Age	24 years or less	54	78	132	0.138
		19.6%	17.1%	18.0%	
	25 to 30 years	62	130	192	
		22.5%	28.5%	26.2%	
	31 to 40 years	68	116	184	
		24.6%	25.4%	25.1%	
	41 to 45 years	48	54	102	
		17.4%	11.8%	13.9%	

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	more than 45 years	44	78	122	
		15.9%	17.1%	16.7%	
Educational level	Primary school	8	26	34	0.105
		2.9%	5.7%	4.6%	
	Middle school	10	18	28	
		3.6%	3.9%	3.8%	
	High school	64	82	146	
		23.2%	18.0%	19.9%	
	Bachelor's degree	174	294	468	
		63.0%	64.5%	63.9%	
	Postgraduate degree	18	24	42	
		6.5%	5.3%	5.7%	
	Uneducated	2	12	14	
		0.7%	2.6%	1.9%	
Occupational status	Student	38	56	94	0.480
		13.8%	12.3%	12.8%	
	Healthcare professional	22	22	44	
		8.0%	4.8%	6.0%	
	Employee	58	104	162	
		21.0%	22.8%	22.1%	
	Freelancer	16	22	38	
		5.8%	4.8%	5.2%	
	Unemployed	132	238	370	
		47.8%	52.2%	50.5%	
	Retired	10	14	24	
		3.6%	3.1%	3.3%	
Monthly income	Less than 5000 SAR	160	266	426	0.003
		58.0%	58.3%	58.2%	
	5000 to 10000 SAR	88	108	196	
		31.9%	23.7%	26.8%	
	More than 10000 SAR	28	82	110	
		10.1%	18.0%	15.0%	

P value was considered significant if ≤ 0.05.

Discussion:

Periodontitis is a chronic inflammatory disease of the gingiva and its supporting structures and is known to cause systemic infection affecting the general health causing various systemic diseases, such as diabetes mellitus, hypertension, cardiovascular complications, and chronic renal failure.[19] Periodontal infection has also contributed to adverse pregnancy outcomes such as premature delivery, low birth weight (LBW) babies, preeclampsia, miscarriage, or early pregnancy loss.[20] The American Academy of Periodontology recommended that periodontal examination and appropriate treatment should be given for pregnant women and women planning for pregnancy.[21] Moreover, meta-analysis

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of randomized controlled trials suggested that periodontal treatment during pregnancy reduces the risk of preterm LBW babies.[22]. Thus, we aimed in this study to assess the knowledge and awareness level of the relationship between periodontists and preterm low birth weight infants.

In comparing the relative knowledge and awareness regarding the association between periodontitis and adverse pregnancy outcomes among pregnant women in Saudi Arabia with previous cross sectional studies on this, numerous similarities and differences are seen. According to our study a big 75.7 % of participants recognised that periodontal disease became more common during pregnancy; but 59.8 % did not know about the possible association between their periodontal health and the risk of preterm birth. This lack of understanding of this association could have significant impact on maternal and fetal health and would be in line with what Boggess et al. [23] found, which was that women who were pregnant were not aware of how oral health was linked to pregnancy with some differences in knowledge between race and ethnicity of the woman. In addition, Gupta et al. [24] stated that 60 percent of respondents had low awareness of dental health regardless of education and age, which is fully consistent with our own observations. The trends seen in our study were also found by Nagi et al [25] who reported 75% of individuals who were unaware of the complications of periodontal disease. In contrast, among gynecologists, a study of 50 gathered a high level of awareness: 48/50 (96%) acknowledged the way oral health impacts pregnancy outcomes. This high level of knowledge contrasts so sharply with pregnant women cohort, and may suggest a gap between the healthcare providers and patients on how important periodontal health is during pregnancy. Sixty percent of gynecologists thought dental checkups were an essential part of routine prenatal care, but only 28 percent referred their pregnant patients to have a dental evaluation, a gap between knowledge and practice [26, 27, 28]. Following our study, Resul Turabi et al. [29] reported who recognized that periodontal disease can have a detrimental effect on pregnancy (77.5%), with a level of recognition higher than that of our study and very close to that of the USA (84%) and France (74.7%) [30, 31]. This was especially lower in India where the awareness rate stood at 47.3 per cent which is indicative of regional knowledge gaps [32]. Women expressed concern about gingival health as shown in our study, as women reported gingival bleeding (as per previous studies [30, 33, 34]) as a complaint, yet only 38.7% linked gingival enlargement as a reported symptom, distinguishing ourselves from other studies in India (81%), France (80.4%) Brazil (68.5%) [30, 33, 34].
In addition, the study by Sireen Al Raeesi et al. [35] showed that half or more of all pregnant females only go to the dentist when in pain and not for preventative dental care. This fits into the problematic trend of limited proactive dental care among pregnant women, which was supported by cross sectional studies in Iran showing that 59% of the participants had used dental care because of pain, and only 18% had come for the check up [36]. Only 52% of pregnant women in Kuwait visited a dentist, of which a third (30 %) did so because of pain, not as a result of maintenance care [37]. Al Habashneh et al. [38] added that maternal age, level of education, and levels of healthy lifestyle behaviors affected significantly dental care utilization of pregnant women, and older and educated mothers were more likely to seek dental care during pregnancy. This is consistent with what we found in our own work, which showed a strong relationship between education, occupational status, and income among pregnant women's awareness levels for which we had p values of 0.0001, 0.023 and 0.008 respectively. Collectively, these studies emphasize the urgent need for enhanced interdisciplinary communication and collaboration between obstetricians and dental professionals. Gynecologists, as the first point of contact for pregnant women, hold a vital role in promoting awareness of the relationship between periodontal health and pregnancy outcomes. By integrating dental health education into routine prenatal care and increasing referrals to dental professionals, maternal and fetal health outcomes could be

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significantly improved [27, 28]. Overall, both our findings and the insights from various studies accentuate the dire necessity for educational initiatives aimed at both healthcare providers and pregnant women to bridge the knowledge gap surrounding periodontal health and its implications for pregnancy. Implementing seminars, workshops, and informative materials may serve as effective strategies to enhance understanding and encourage proactive health behaviors among pregnant women, ultimately leading to improved health outcomes for mothers and their infants [40].

Conclusion:

In conclusion, this study highlights a significant gap in knowledge and awareness among pregnant women in Saudi Arabia regarding the relationship between periodontal disease and adverse pregnancy outcomes, particularly preterm birth and low birth weight. While a substantial majority (75.7%) recognized the increased incidence of periodontal disease during pregnancy, nearly 60% were unaware of its potential link to preterm birth. This disconnect underscores the urgent need for targeted educational interventions to enhance awareness of oral health's critical role in maternal and fetal health. The findings demonstrate that socioeconomic factors, such as education and income, significantly influence awareness levels, indicating that tailored educational programs should be developed to address these disparities. Enhancing interdisciplinary collaboration between obstetricians and dental professionals is essential to integrate oral health education into prenatal care, ultimately improving health outcomes for mothers and infants. Future efforts should focus on implementing comprehensive educational strategies to empower pregnant women with the knowledge necessary for proactive health management.

Acknowledgement:

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Ethical approval

An informed consent was obtained from each participant after explaining the study in full and clarifying that participation is voluntary. Data collected were securely saved and used for research purposes only.

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Conflict of interests

The authors declare no conflict of interest.

Informed consent:

Written informed consent was acquired from each individual study participant.

Data and materials availability

All data associated with this study are present in the paper.

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