High-risk Pregnancy Nursing: Analyzing the Impact of Prenatal Stress, Maternal-Fetal Attachment, and Social Support on Prenatal Depression

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Abstract:

Background: The purpose of this study is to examine the effects of pregnancy stress, maternal-fetal attachment, and social support on prenatal depression among high-risk pregnant women. This research aims to provide foundational data to assist in preventing prenatal depression in high-risk pregnant women within the nursing field.

Methods: A study was conducted on 141 high-risk pregnant women diagnosed as high-risk and hospitalized, who were less than 37 weeks pregnant. The study investigated pregnancy stress, maternal-fetal attachment, social support, and general characteristics. The collected data were analyzed using the SPSS WIN 22.0 software, employing methods, such as frequency, percentage, standard deviation, t-test, one-way ANOVA, Pearson's correlation coefficient, Scheffé test, and hierarchical multiple regression analysis.

Results: The participants showed a positive correlation between prenatal depression and pregnancy stress ($r = 0.51$, $p < 0.001$) and negative correlations with maternal-fetal attachment ($r = -0.38$, $p < 0.001$) and social support ($r = -0.50$, $p < 0.001$). Regression analysis revealed that the relationship with the spouse ($\beta = -0.42$, $p = 0.006$), a family history of depression ($\beta = 0.35$, $p < 0.001$), pregnancy stress ($\beta = 0.30$, $p < 0.001$), and maternal-fetal attachment ($\beta = -0.15$, $p = 0.033$) significantly influenced prenatal depression in that order, with an explanatory power of 52% ($F = 16.04$, $p < 0.001$).

Conclusion: In managing prenatal depression in high-risk pregnant women, it is essential to identify individuals with strained relationships with their spouses or a family history of depression. Furthermore, implementing educational and nursing intervention programs designed to reduce pregnancy stress and encourage maternal-fetal attachment behaviors is crucial.

Keywords: High-risk pregnancy, Stress, Social support, Prenatal care, Depression, Child birth.

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1. INTRODUCTION

A high-risk pregnancy refers to a situation in which the mother or fetus has a higher risk of complications during pregnancy or childbirth than in a typical pregnancy [1]. In high-risk pregnancy, the mother has medical conditions, such as hypertension, diabetes, heart disease, kidney disease, or advanced maternal age. It can also include issues, such as preterm labor, miscarriage, preterm birth, antepartum hemorrhage, and premature rupture of membranes [2]. Additionally, high-risk pregnancy can increase the likelihood of delivering a high-risk newborn, such as a premature infant or a low-birth-weight baby, which can also affect infant mortality [3, 4].

A high-risk pregnancy is closely related to the age of the woman [5]. The increase in age is influenced by changes in reproductive function and an increased risk of chronic conditions, such as hypertension and diabetes [6]. Qualitatively, according to data from the National Statistics Office in 2022, the average age of first marriage for women has increased by 1.9 years compared to a decade ago, reaching 31.3 years old. Moreover, the average age at first childbirth for women increased by 2.8 years over the same period, reaching 33.5 years old [7]. Accordingly, increased attention is required for high-risk pregnancies to align with societal changes.

High-risk pregnant women often experience higher levels of anxiety than normal pregnant women because of concerns about obstetric complications and fetal health issues. Anxiety can also lead to depression [8]. Some studies have reported that high-risk pregnant women experience depression at a rate more than three times higher than normal pregnant women, with approximately 31% to 40% of pregnant women experiencing prenatal depression [9, 10]. Prenatal depression is the most common psychological issue [9]. Pregnant women experiencing prenatal depression may encounter difficulties in performing daily activities, household chores, or engaging in social activities [11, 12]. Further- more, even after childbirth, symptoms, such as lack of interest in the baby, lethargy, sadness, feelings of guilt, and thoughts of suicide, can manifest [13]. Therefore, prenatal depression is a strong determinant of postpartum depression, underscoring the importance of recognizing the severity of prenatal depression and showing interest in early detection and prevention efforts [14].

Prenatal depression arises from a complex interplay of various factors, including biological, psychological, and social influences, and is easily precipitated by hormonal changes. Hormonal fluctuations that accompany pregnancy and childbirth significantly alter women's emotions and render them vulnerable to depression [13]. Therefore, confirming the factors influencing prenatal depression is crucial for the healthy birth and upbringing of children [15]. It is necessary to examine various physical, psychological, and social factors to comprehensively understand prenatal depression [16]. Pregnant women experience stress owing to the physical discomfort caused by pregnancy, concerns about pain during childbirth, worries about household and childcare responsibilities, and concerns about their relationships with their spouses [10, 17]. Prenatal stress not only affects physical health, leading to pregnancy-induced hypertension, preeclampsia, and sleep disorders, but also has implications for mental health [18, 19]. Thus, it can lead to inadequate prenatal care, shortened gestational periods, structural fetal abnormalities, and the birth of low-birthweight infants, among other obstetric complications [20, 21].

Maternal-fetal attachment refers to the emotional bond and interaction that a pregnant woman develops with her fetus through physical and psychological changes during pregnancy [22]. In South Korea, activities, such as talking to the fetus, listening to music, and reading, are seen as forms of prenatal care that encourage interaction between the mother and fetus and are considered important elements in fostering maternal-fetal attachment [23]. Individuals who fail to form a secure attachment to the fetus or develop an unstable attachment can experience emotional distress and mental health issues [24]. However, social support not only promotes the physical and psychological health of pregnant women but also enhances their satisfaction with recognizing and perfor-ming their roles as parents during pregnancy [25]. Social support is the most effective support system for pregnant women, enabling them to experience pregnancy positively and providing psychological stability [26].

Notably, research targeting high-risk pregnant women is lacking amid the societal changes that have led to an increased population of high-risk pregnancies. This is because high-risk pregnant women often experience heightened anxiety about their own health and that of their fetus [27]. Accordingly, this study attempted to provide foundational data that could aid in the prevention of prenatal depression among high-risk pregnant women in clinical settings by investigating the impact of pregnancy stress, maternal-fetal attachment, and social support on prenatal depression through clear communi-cation with these women. It aimed to positively influence maternal mental and fetal developmental health, thus contributing to the provision of basic information helpful in preventing prenatal depression among high-risk pregnant women in nursing practice.

2. MATERIALS AND METHODS

2.1. Study Design

This study followed a correlational research design based on the STROBE guidelines to investigate the impact of pregnancy stress, maternal-fetal attachment, and social support on prenatal depression among high-risk pregnant women.

2.2. Samples and Data Collection

High-risk pregnant women diagnosed and hospitalized in the Obstetrics Department of Keimyung University Dongsan Hospital, Daegu Metropolitan City, participated in this study. The selection criteria for participants included pregnant women who were diagnosed with high-risk pregnancy based on diseases registered with the Health Insurance Review and Assessment Service by obstetrics specialists, under 37 weeks of gestation, living with their spouses, understood this study's purpose, and agreed to participate, and could understand and respond to the survey questionnaire. Pregnant women currently diagnosed with depression and those taking anti-depressant medications were excluded.

The study's purpose was explained, and the cooperation of the nursing education team, obstetrics and gynecology professors, and nurses in the obstetrics and gynecology ward (Ward 81) was sought before proceeding with data collection. From June 1st, 2020, to July 31st, 2020, the researchers visited high-risk pregnant women

admitted to the obstetrics and gynecology ward and provided verbal explanations about the research objectives, data collection procedures, etc. Only those who agreed to participate were given the questionnaire. The survey lasted for 15–20 minutes, and a token of appreciation was provided upon completion.

The G*Power 3.1.9.2 program was used to determine the sample size for this study. Multiple regression was used, with a significance level of 0.05, a medium effect size of 0.15, and a sample size of 0.80 that met the test power of 0.80. The sample size comprised 131. Considering the potential dropout rate, data were collected from 145 participants. Among the collected data, 4 people who gave insincere answers were excluded, and 141 people were finally selected for this study.

2.3. Study Tools

2.3.1. Pregnancy Stress

To measure the level of stress in pregnant women, Ahn [28] pregnancy stress scale was used. This tool focuses on the physiological, psychological, and physical changes that pregnant women experience due to pregnancy, and the sub-factors are 9 questions about stress for the fetus, 11 questions about stress about the pregnant woman herself, and 6 questions about stress about her spouse. It consists of 26 questions. Using a 5-point Likert scale, 1 point means 'I am not worried at all,' and 5 points mean 'I am always worried,' with a minimum of 26 points and a maximum of 130 points. A higher score means higher pregnancy stress. In this study, Cronbach's α was 0.92.

2.3.2. Maternal-fetal Attachment

To measure the degree of maternal-fetal attachment of pregnant women, the maternal-fetal attachment scale MFAS developed by Cranley [22] was modified and adapted by Kim [29] to suit the Korean context. This instrument consists of five subdomains: 3 questions about distinguishing between self and fetus, 6 questions about fetal characteristics and intentions, 4 questions about role acceptance, 5 questions about interaction with the fetus, and 5 questions about self-commitment. It consists of 6 questions for a total of 24 questions. On a 4-point Likert scale, 1 is 'never like that,' and 4 is 'always like that,' ranging from a minimum of 24 to a maximum of 96, with higher scores indicating higher attachment to the fetus. In this study, Cronbach's α was 0.90.

2.3.3. Social Support

Among the social support scales developed by Park [30] to measure the degree of social support of pregnant women, Song [31] modified the indirectly perceived social support scale, and Lee and Park [15] conducted a survey of pregnant women with their husbands, and a modified tool was used focusing on family support. This tool consists of a total of 25 questions: 8 questions about emotional support, 5 questions about informational support, 6 questions about material support, and 6 questions about evaluative support. On a 5-point Likert scale, 1 point is 'not all' and 5 is 'all are like this,' ranging from a minimum of 25 points to a maximum of 125 points, with higher scores indicating higher prenatal social support. In this study, Cronbach's α was 0.98.

2.3.4. Prenatal Depression

To measure the degree of prenatal depression in pregnant women, the Edinburgh Postpartum Depression Scale EPDS, developed for pregnant women by Cox *et al.* [32], was translated, modified, and supplemented by Han *et al.* [33]. This tool includes symptoms, such as depression, anxiety, guilt, and suicidal thoughts over the past week and consists of a total of 10 questions. Each question was scored on a 4-point Likert scale, with 0 being 'strongly agree' and 3 being 'not at all true.' The reverse questions were reverse coded. The overall score ranges from 0 to 30 points, with 0-8 points being normal, 9-12 points indicating mild depression, and 13 or more points indicating severe depression, with higher scores indicating a higher degree of prenatal depression. The reliability of the instrument was Cronbach's α= 0.85, and in this study, the reliability of the instrument for prenatal depression was Cronbach's α= 0.86.

2.3.5. General Characteristics and Pregnancy-related Characteristics

General characteristics include age, religion, level of education, occupation, income, whether they have children, and their relationship with their spouse. Pregnancy-related characteristics include gestational age, number of pregnancies, history of miscarriage, prenatal check-ups, fetal health status, family history of depression, and medical history.

2.4. Data Analysis

The data collected in this study were analyzed using the SPSS/WIN 22.0 version (IBM Corporation, Armonk, NY, USA).

1) General and pregnancy-related characteristics, descriptive statistics of frequency, percentage, mean, and standard deviation were analyzed.

2) The mean and standard deviation were analyzed to determine the subject's pregnancy stress, maternal-fetal attachment, social support, and prenatal depression level.

3) Differences in the degree of prenatal depression according to the subjects' characteristics, t-test, one-way ANOVA, and post-hoc analysis were conducted using Scheffé.

4) The correlation between the subjects' pregnancy stress, maternal-fetal attachment, social support, and prenatal depression was analyzed using the Pearson correlation coefficient.

5) Hierarchical multiple regression was used to determine the degree of influence of the subject's pregnancy stress, maternal-fetal attachment, and social support on prenatal depression.

2.5. Ethical Consideration

This study was conducted after obtaining approval

from the Institutional Review Board (IRB) of Keimyung University, following a thorough review of the study's objectives, methods, participant protection measures, and questionnaire, among other aspects (IRB No. 40525-202001-HR-084-04).

3. RESULTS

3.1. Participants' General and Pregnancy-related Characteristics

The general and pregnancy-related characteristics of the participants are mentioned in Table 1. The age of 141 participants ranged from 23 to 42 years (average 33.13±3.82 years). Of these, 34.8% reported following a religion. Most of the participants were university graduates (57.4%). Employment was reported by 47.5%, and 44.7% had a monthly income of over 4 million KRW. Regarding family members, 31.2% had children. Regarding the relationship with the spouse, 51.8% reported a very harmonious relationship with their spouses, and 40.4% described their relationship as harmonious.

Table 1. General and pregnancy-related characteristics (N:141).

Characteristics	Categories	N	(%)
General Characteristics			
Age (years)	<35	92	65.2
	≥35	49	34.8
	Range	23-42	
	M±SD	33.13±3.82	
Religion	Yes	49	65.2
	No	92	34.8
Level of education	≤ High school	20	14.2
	Junior college	28	19.9
	University	81	57.4
	≥Graduate School	13	8.5
Job	Yes	67	47.5
	No	74	52.5
Income per month (10⁴ won)	<400	78	55.3
	≥400	63	44.7
Having Children	Yes	44	31.2
	No	97	68.8
Relationship with spouse	Very harmonious	73	51.8
	Harmonious	57	40.4
	Average	11	7.8
Pregnancy-related characteristics			
Gestational age (weeks)	<28	38	27.0
	≥28	103	73.0
	Range	20-37	
	M±SD	29.89±4.63	
Number of pregnancies (times)	1	62	44.0
	2	48	34.0
	3	20	14.2
	≥4	11	7.8
	Range	1-6	
	M±SD	1.87±1.00	
Pregnancy method	Natural conception	86	61.0
	Ovulation induction	9	6.4
	Artificial insemination	11	7.8
	In vitro fertilization (IVF)	35	24.8
Experience of miscarriage	Yes	50	35.5
	No	91	64.5
Prenatal check-ups	Regular	50	35.5
	Irregular	22	15.6
	Not received	69	48.9
Family history of depression	Yes	12	8.5
	No	129	91.5

(Table 1) contd.....

Characteristics	Categories	N	(%)
Medical history	Yes	31	22.0
	Thyroid disorder	12	8.5
	Diabetes	5	3.5
	Hypertension	4	2.8
	Cancer	2	1.4
	Other	8	5.8
	No	110	78.0
Current diagnosis	Preterm	78	55.3
	Gestational diabetes	35	24.1
	Multiple gestation	30	21.3
	Gestational hypertension	20	14.2
	Cervical insufficiency	15	10.6
	Placenta previa	15	10.6
	Premature rupture of membranes (PROM)	13	9.2
	Amniotic fluid disorder	10	7.1
	Other disorders	13	9.2

Table 2. Pregnancy stress, maternal-fetal attachment, social support, and prenatal depression (N:141).

Variables	Possible Range	Min	Max	N(%) or M±SD
Pregnancy stress	26-130	32	111	70.89±16.51
Maternal-fetal attachment	24-96	43	96	74.31±10.21
Social support	25-125	30	125	102.06±16.92
Prenatal depression	0-30	0	24	9.68±5.09
-Normal	0-8	-	-	67(47.5)
-Mild depression	9-12	-	-	29(20.6)
-Severe depression	≥4	-	-	45(31.9)

The gestational age was under 28 weeks for 27% of the participants and between 28 and 37 weeks for 73.0% (average 29.89±4.63). The number of pregnancies was primarily the first (44.0%) and second (34.0%) (average 1.87±1.00). More than half (61.0%) of the pregnancies were natural, whereas 24.8% resulted from *in vitro* fertilization. (35.5%) Of the participants, 35.5% had experienced a miscarriage. Moreover, 35.2% of the participants regularly received prenatal check-ups, and 88.7% of the respondents stated that their fetal health condition was good. A family history of depression was present in 8.5% of the participants, and 22.0% had a history of disease, with thyroid issues being the most common (8.5%). The most frequent diagnosis among high-risk pregnancies was preterm labor (55.3%).

3.2. Pregnancy Stress, Maternal-fetal Attachment, Social Support, and Prenatal Depression

The results related to pregnancy stress, maternal-fetal attachment, social support, and prenatal depression are presented in Table 2. These criteria had total possible scores of 130 (average 70.89±16.51), 96 (average 74.31±10.21), 125 (average 102.06±16.92), and 30 (average 9.68±5.09), respectively. Normal levels of prenatal depression were observed in 47.5% of the participants, mild depression in 20.6%, and severe depression in 31.9%.

3.3. Differences in Prenatal Depression according to General and Pregnancy-related Characteristics

The differences in prenatal depression according to the general and pregnancy-related characteristics of the participants are mentioned in Table 3. Participants without employment had a significantly higher prenatal depression score of 10.55±4.98 compared to those employed (t=-2.17, p=0.032). Participants with a monthly income below 4 million KRW had a prenatal depression score of 10.83±4.99, significantly higher than those earning more (t=3.11, p=0.002). There was a statistically significant difference in prenatal depression scores between participants reporting a "moderate" relationship with their spouses (16.45±5.07) and those reporting a "very harmonious" relationship (7.23±4.28) (F=31.41, p<0.001). Participants without a family history of depression had a prenatal depression score of 8.94±4.51, whereas those with it had a score of 17.67±4.05, which was significantly higher (t=7.36, p<0.001).

3.4. Correlations among Pregnancy Stress, Maternal-fetal Attachment, Social Support, and Prenatal Depression

The correlations between pregnancy stress, maternal-fetal attachment, social support, and prenatal depression among the participants are presented in Table 4. Prenatal

depression was positively correlated with pregnancy stress (r=0.51, p<0.001) and negatively correlated with maternal-fetal attachment (r=-0.38, p<0.001) and social support (r=-0.50, p<0.001), all of which were statistically significant.

Table 3. Prenatal depression according to general and pregnancy-related characteristics (N:141).

Characteristics	Categories	M±SD	t or F	p	Scheffé
General characteristics			-	-	
Age (years)	<35	9.33±4.76	-1.14	.258	-
	≥35	10.35±5.64			
Religion	Yes	10.31±5.02	1.07	.288	-
	No	9.35±5.12			
Level of education	≤ High school	10.45±5.67	0.64	.590	-
	Junior college	9.39±5.36			
	University	9.84±4.66			
	≥Graduate School	8.00±6.37			
Job	Yes	8.72±5.07	-2.17	.032	-
	No	10.55±4.98			
Income per month (10⁴ won)	<400	10.83±4.99	3.08	.002	-
	≥400	8.25±4.87			
Having Children	Yes	10.07±5.51	0.61	.544	-
	No	9.51±4.90			
Relationship with spouse	Very harmonious	7.23±4.28	31.41	<.001	a<b<c
	Harmonious	11.51±4.04			
	Average	16.45±5.07			
Pregnancy-related characteristics			-	-	
Gestational age (weeks)	<28	9.00±5.83	-0.97	.336	-
	≥28	9.93±4.79			
Number of pregnancies (times)	1	8.97±4.84	1.74	.163	-
	2	10.29±5.15			
	3	9.00±4.90			
	≥4	12.27±5.98			
Pregnancy method	Natural conception	10.19±5.10	1.08	.359	-
	Ovulation induction	8.89±4.19			
	Artificial insemination	10.27±6.78			
	In vitro fertilization (IVF)	8.46±4.59			
Experience of miscarriage	Yes	10.24±5.24	0.97	.335	-
	No	9.37±5.00			
Prenatal check-ups	Regular	10.38±4.76	1.56	.215	-
	Irregular	10.50±5.31			
	Not received	8.91±5.20			
Family history of depression	Yes	17.67±4.05	6.46	<.001	-
	No	8.94±4.51			
Medical history	Yes	10.81±5.99	1.40	.164	-
	No	9.36±4.79			

Table 4. Relationships among pregnancy stress, maternal-fetal attachment, social support, and prenatal depression (N:141).

Variables	Pregnancy Stress	Maternal-fetal Attachment	Social Support	Prenatal Depression
	r(p)	r(p)	r(p)	r(p)
Pregnancy stress	1	-	-	-
Maternal-fetal attachment	-.26(.002)	1	-	-
Social support	-.45(<.001)	.45(<.001)	1	-
Prenatal depression	.51(<.001)	-.38(<.001)	-.50(<.001)	1

Table 5. Factors influencing prenatal depression (N:141).

Variables	Model 1				Model 2			
	B	β	t	*p*	B	β	t	*p*
Job	-0.63	-.06	-0.88	.383	-0.87	-.09	-1.29	.198
Income per month	-1.22	-.12	-1.66	.100	-0.68	-.07	-0.97	.332
Relationship with spouse	-	-	-	-	-	-	-	-
Very harmonious	-6.75	-.67	-4.81	<.001	-4.24	-.42	-2.78	.006
Harmonious	-3.50	-.34	-2.52	.013	-2.58	-.25	-1.88	.063
Family history of depression	6.58	.36	5.43	<.001	6.43	.35	5.68	<.001
Pregnancy stress	-	-	-	-	0.09	.30	4.22	<.001
Maternal-fetal attachment	-	-	-	-	-0.08	-.15	-2.15	.033
Social support	-	-	-	-	-0.01	-.02	-0.28	.782
R^2	.46				.55			
Adj. R^2	.43				.52			
F(*p*)	16.29 (<.001)				16.04 (<.001)			

3.5. Factors Influencing Prenatal Depression

To examine the impact of pregnancy stress, maternal-fetal attachment, and social support on prenatal depression among high-risk pregnant women, significant factors from general and pregnancy-related characteristics, such as employment status, monthly income, relationship with spouse, and family history of depression, were included as independent variables (Table 5). Among the independent variables, nominal variables (e.g., employment, monthly income, relationship with spouse, and family history of depression) were treated as dummy variables. The regression analysis showed that significant predictors of prenatal depression were relationship with the spouse (especially those in a very harmonious group, β=-0.42, p=0.006), family history of depression (β=0.35, p<0.001), pregnancy stress (β=0.30, p<0.001), and maternal-fetal attachment (β=-0.15, p=0.033), with these variables collectively explaining 52% of the variance in prenatal depression.

4. DISCUSSION

This study aimed to provide foundational data to help prevent prenatal depression in high-risk pregnant women. It examined the impact of pregnancy stress, maternal-fetal attachment, and social support on prenatal depression. We also investigated the general and pregnancy-related characteristics of these women. The average prenatal depression score for high-risk pregnant women was 9.68 out of a total of possible 30 points. A previous study [15] that utilized the same measurement tool reported an average score of 7.80. Meanwhile, another study [34] focusing on pregnant women over the age of 35 years found a slightly higher average score of 7.89. The increased scores in this study are believed to result from higher ages at first marriage and childbirth than in the past, contributing to heightened stress and anxiety concerning the health of both high-risk pregnant women and their fetuses [35]. Consequently, it is crucial to develop a program that offers monitoring and feedback on maternal and fetal health to effectively manage prenatal depression, especially in older mothers.

Furthermore, this study found that 20.6% of the participants experienced mild depression, whereas 30.9% experienced severe depression. These findings underscore the need for prenatal depression screening among high-risk pregnant women, with intensive management tailored to screening outcomes. Additionally, hospitals should offer information about accessing central infertility and depression counseling centers operated by the Ministry of Health and Welfare in the community, enabling patients to seek further support.

In this study, hierarchical multiple regression analysis was performed to identify the factors influencing prenatal depression among high-risk pregnant women. The analysis revealed that the significant predictors of prenatal depression were the quality of the relationship with the spouse (particularly in the very amicable group), family history of depression, pregnancy stress, and the level of maternal-fetal attachment. Collectively, these factors explained 52% of the variance in prenatal depression, among which relationship with spouse emerged as the most significant predictor. High-risk pregnant women who reported having a very amicable relationship with their spouses exhibited lower levels of prenatal depression. This finding aligns with the results from a study [36] that confirmed that spousal support plays a critical role in influencing prenatal depression. This underscores the importance of education in maintaining harmonious relationships with the spouse to support pregnant women in adapting to psychological changes during pregnancy. Furthermore, Jackson *et al.* [37] highlighted that spousal education for high-risk pregnant women is crucial to help them understand their role in childbirth and childrearing, ultimately benefiting the well-being of the entire family.

Another significant factor influencing prenatal depression is a family history of depression. Depression is a syndrome influenced by several factors, including family history, biological aspects, lifestyle, and environmental conditions, rather than being a single disease, as reported previously [38]. During prenatal care, it is crucial to assess

the history of depression in the families of high-risk pregnant women. Additionally, it was found [39] that family functioning and self-efficacy are vital in managing a family history of depression. Therefore, counseling nurses should increase awareness among professionals and counseling organizations about the importance of building a positive self-image and fostering an encouraging environment within families.

The next factor influencing prenatal depression is pregnancy-related stress. High-risk pregnant women are particularly susceptible to stress from various sources, including prolonged hospitalization, activity restrictions owing to treatment, concerns about fetal well-being, and social isolation, as indicated previously [17]. The significant impact of pregnancy stress on prenatal depression is supported by a study [18], which linked physical symptoms, such as morning sickness and fatigue, to depression. High levels of stress concerning the health of the fetus and self have been found to directly contribute to prenatal depression. These results align with the findings of a previous study [15], which demonstrated that stress arising from physical discomfort during pregnancy, anxiety about childbirth pain, concerns about household and childcare responsibilities, and spousal relationships significantly affect prenatal depression.

In response, it is vital to assess the various stressors and levels of stress experienced by high-risk pregnant women. Providing these women with opportunities to learn and practice stress management techniques through individual and group counseling sessions is essential for effective management.

Finally, fetal attachment was identified as a factor influencing prenatal depression. However, comparing its effects is challenging because of the scarcity of studies establishing a causal relationship between fetal attach-ment and prenatal depression. Consequently, further research is needed to explore how fetal attachment affects prenatal depression. Fetal attachment refers to the emotional bond a pregnant woman develops with her fetus [25]. It is believed to play a crucial role in the emotional well-being and positive pregnancy experiences of high-risk pregnant women, potentially reducing prenatal dep-ression. Supporting this, it was discovered that engaging in prenatal education significantly influenced fetal attachment [40]. Similarly, a higher level of fetal attachment was observed when pregnant women and their spouses partici-pated in prenatal education together [41]. Therefore, prenatal education involving couples should be incor-porated when designing management programs for prenatal depression in high-risk pregnant women. However, social support was not a significant factor. This could be attributed to variations in the perceived amount and quality of social support among high-risk pregnant women and the limitations of the tools used to measure social support and prenatal depression.

Among high-risk pregnant women, factors, such as domestic violence, anxiety, and experiencing significant disasters within the past year, have been observed to double the risk of prenatal depression [42]. Additionally, medical complications, psychological stress, lack of social support, and feelings of isolation and loneliness due to prolonged hospital stays are also significant factors impacting prenatal depression [43]. Despite ongoing research into these various impact factors, the field is not yet considered sufficiently explored, indicating a need for further studies. In response, this researcher will develop specific solutions and clear protocols from a nursing perspective to establish and implement consistent nursing guidelines. These efforts are expected to be applicable across various fields and contribute to improving women's health.

CONCLUSION

This study was conducted at a single university hospital in a specific region, which limits the generaliz- ability of our findings. Additionally, this study did not account for factors, such as the duration of hospitalization and treatment methods, that could influence prenatal depression. However, despite the increase in high-risk pregnancies associated with the rising age at first marriage and childbirth among women, this study has successfully identified various factors that influence prenatal depression in high-risk pregnant women. These insights contribute positively to the mental health management of this demographic group.

AUTHORS' CONTRIBUTION

It is hereby acknowledged that all authors have accepted responsibility for the manuscript's content and consented to itssubmission. They have meticulously reviewed all results and unanimously approved the final version of the manuscript.

LIST OF ABBREVIATIONS

IVF   =   *In vitro* Fertilization

PROM   =   Premature Rupture of Membranes

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was conducted after obtaining approval from the Institutional Review Board (IRB) of Keimyung University, South Korea following a thorough review of the study's objectives, methods, participant protection measures, and questionnaire, among other aspects (IRB No. 40525-202001-HR-084-04).

HUMAN AND ANIMAL RIGHTS

All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committee and with the 1975 Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION

Verbal and written information about the study was given to each potential participant. Participation was voluntary and based on written informed consent. Participants were informed that they could withdraw at any time and that all data would be confidentially treated.

STANDARDS OF REPORTING

STROBE guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The data mentioned in the study is personal data. Additional materials related to this study, such as research protocols, informed consent forms, and data analysis tools, can be provided by the corresponding author upon reasonable request, subject to Keimyung University IRB's approval.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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