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Investigating the Relationship between Dysmenorrhea and Menstrual Disorders with the Type and Severity of Blood Pressure Disorders in Pregnancy in Bandar Abbas Hospitals in 2024

Ashraf Beirami [1], Maryam Naji Abhary [2], Aboubakr Jafarnezhad [3], Seydeh Zeynab Hoseinnezhad [4]*

1. Department of Nursing, Bandar Abbas Branch, Islamic Azad University, Bandar Abbas, Iran
2. Department of Midwifery, School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran
3. Department of Epidemiology, Student Research Committee, Shiraz University of Medical Sciences, Shiraz, Iran
4. Sexual and Reproductive Health Research Center, Mazandaran University of Medical Sciences, Sari, Iran

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Corresponding Author:
Seydeh Zeynab Hoseinnezhad
zeynabhoseinnezhad@gmail.com

ABSTRACT

Background: The current study aims to investigate the relationship between dysmenorrhea and menstrual disorders with the type and severity of blood pressure disorders in pregnancy in Bandar Abbas hospitals in 2024.

Methods: This research is a cross-sectional study of the descriptive-analytic type. 404 pregnant women in the third trimester of pregnancy who were hospitalized in Bandar Abbas hospitals due to high blood pressure were included in this study. After receiving the consent form, the demographic-social and medical information form was recorded by a researcher from patients' files. The blood pressure of pregnant women was measured during hospitalization. The dysmenorrhea multidimensional scoring system questionnaire and checklist on other menstrual cycle disorders such as menorrhagia and menstrual irregularity were completed by the participants. After collecting the data, SPSS version 26 software was used to analyze the data.

Results: According to the results of the present study, it has been shown that the average age of the patients was 30.43 ± 5.82. There is a significant positive correlation between primary dysmenorrhea and gestational hypertension, preeclampsia, eclampsia, and superimposed ($p < 0.05$). There is a significant positive correlation between secondary dysmenorrhea and gestational hypertension, preeclampsia, and superimposed ($p < 0.05$). There is a significant positive correlation between menstrual disorders and gestational hypertension, preeclampsia, eclampsia, and superimposed ($p < 0.05$). There is a significant positive correlation between hypermenorrhea and gestational hypertension and superimposed ($p < 0.05$).

Conclusion: The results of the study showed that there is a significant relationship between menstrual disorders and hypertension in pregnancy.

Keywords: Hypertension, menstrual irregularity, Menorrhagia, dysmenorrhea

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Introduction

Hypertension during pregnancy is defined as systolic pressure greater than 140 mm Hg and diastolic pressure greater than 90 mm Hg (1). Hypertension disorders in pregnancy are one of the main causes of death and maternal and fetal complications and include 10% of all pregnancies (2). Hypertension disorders in pregnancy include gestational hypertension, chronic hypertension, preeclampsia, eclampsia, and superimposed (3, 4).

Among hypertension disorders in pregnancy, preeclampsia, and eclampsia are considered the main causes of perinatal complications and maternal mortality (5). It is estimated that eclampsia and pre-eclampsia cause 50 thousand maternal deaths in the world every year (4). In Asia and Africa, hypertension disorders in pregnancy, especially eclampsia, account for nearly one-tenth of all maternal deaths (6, 7). Placental ischemia and hypoxia cause the release of various factors that have profound effects on endothelial function arterial blood flow and blood pressure regulation, and cause widespread dysfunction of maternal vessel endothelium. In addition, preeclampsia is associated with a decrease in the formation of vasodilators such as nitric oxide and prostacyclin. The high concentration of anti-angiogenic factors produced by the placenta in pre-eclampsia inhibits the formation of nitric oxide in pregnancy (8-10).

Several risk factors can predispose a person to preeclampsia. The main risk factors of preeclampsia include a history of preeclampsia in previous pregnancies, diabetes mellitus before pregnancy, antiphospholipid syndrome, and obesity (11, 12). Other risk factors include history of chronic kidney disease, use of assisted reproductive techniques, history of thrombophilia, polycystic ovary syndrome, pregnancy with trisomy 13, mother's age under 20 years and over 35 years, multiparity and hydatidiform mole (13-16).

Hypertension disorders in pregnancy can affect the health of the mother and the fetus in the short and long term. The risks include a 2- to 4-fold increase in developing hypertension in the long term, a 2-fold increase in cardiovascular death, and a 15-fold increase in the risk of stroke. For the fetus, these risks include intrauterine growth restriction, premature birth, oligohydramnios, placental abruption, fetal distress, and fetal death. In women with severe preeclampsia or eclampsia, the risk of severe pregnancy complications such as placental abruption, disseminated intravascular coagulation, pulmonary edema, and aspiration pneumonia is 3 to 25 times higher (17, 18).

Preeclampsia and its associated complications currently place a significant financial burden on healthcare systems (20). At present, the only definitive treatment for preeclampsia involves the removal of the placenta and fetus, which is often associated with preterm birth. To address this issue and enhance outcomes for both mothers and infants, ongoing research is focused not only on developing treatments for preeclampsia but also on its prevention (19). Meanwhile, dysmenorrhea, or menstrual pain, is recognized as the most prevalent gynecological complaint among women and adolescents, affecting an estimated 60 to 90% of females (21, 22).

Dysmenorrhea, or painful menstruation, is the feeling of unusual pain in the abdomen during menstruation. Usually, 50 to 70 percent of women experience pain in the lower abdomen and uterus during menstruation, but if this pain is too much to stop the person's daily activities, it is called dysmenorrhea or painful menstruation. The cause of this pain is painful menstruation. Prostaglandin F2α causes severe vasoconstriction and contraction of the myometrium, which leads to uterine ischemia and pain (23, 24).

Nitric oxide plays a role in controlling the onset and continuation of menstrual bleeding. Nitric oxide deficiency in patients with magnesium deficiency has been associated with dysmenorrhea and hypertension disorders; Therefore, it seems that vasoactive compounds play a role in the pathogenesis of dysmenorrhea (26, 25). Women with gestational hypertension and preeclampsia are at higher risk of future metabolic syndrome, which is associated with central obesity, high body mass

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index, hypertension, insulin resistance, and dyslipidemia. An irregular menstrual cycle is a common symptom of polycystic ovary syndrome and metabolic syndrome (27-29). Also, other menstrual disorders that originate from hormonal disorders can cause hypertension in pregnancy (28, 29). For example, estrogen can play a role in cardiovascular diseases including hypertension by dilating blood vessels (28, 29). While androgens may increase blood pressure and thus contribute to the pathogenesis of hypertension (30, 31).

Based on this, the hypothesis is that menstrual disorders could be a predictor of hypertension disorders in pregnancy. As mentioned earlier, hypertension disorders in pregnancy are considered the main causes of perinatal complications and maternal mortality, and the focus of studies is not only on treatment but also on prevention, Also, because limited studies have been conducted on this field and only abroad, and there is recommendation to conduct more studies, we decide to investigate and relationship between dysmenorrhea and menstrual disorders with type and severity of hypertension disorders in pregnant women who hospitalized in Bandar abbas hospital in 2024.

Methods

This research is a descriptive-analytical cross-sectional study. The statistical population of this research was all pregnant women who were hospitalized in the third trimester of pregnancy due to hypertension. The patients enrolled in this study were admitted due to hypertension, willingness to participate in the study, age 18 to 40, third trimester of pregnancy, and singleton pregnancy. Exclusion criteria were the patient's unwillingness to cooperate in the study, fertility with assisted reproductive techniques, history of chronic diseases, history of chronic kidney disease, history of hypertension and cardiovascular disease, history of long-term use of corticosteroids, history of pre-eclampsia and eclampsia, antiphospholipid syndrome. The blood pressure of pregnant women was measured during hospitalization (By doctor). The checklist was prepared by the researcher and the demographic and medical information was extracted from the medical records and lab tests of patients. After that, the Dysmenorrhea Verbal Multidimensional Scoring System questionnaire was given to all pregnant women participating in the research and completed by them, and they were also asked about other menstrual cycle disorders such as hypermenorrhea and menstrual irregularity. The Dysmenorrhea Verbal Multidimensional Scoring System questionnaire is a rating system for evaluating the prevalence and severity of Dysmenorrhea. This questionnaire was designed by Andersch & Milsom in 1982. In this system, Dysmenorrhea is divided into four degrees. Grade zero: no dysmenorrhea, grade one: mild dysmenorrhea, grade two: moderate dysmenorrhea, grade three: severe dysmenorrhea. Each degree is determined based on the intensity of pain and its effect on daily activities, systemic symptoms, and the need for pain relief (32). It was validated and reliable in Iran by Shah Hosseini et al. in 2005. Cronbach's alpha for this questionnaire was 0.899, Spearman-Brown's coefficient was 0.836, and Gottman's coefficient was 0.528. Also, the test-retest method was used, and using statistical tests, the correlation coefficient was 0.49 (33). After collecting data, percentages, and numbers were used to describe qualitative variables, and mean, standard deviation, median, and interquartile range were used to describe quantitative variables. Then, Pearson's test was used to examine the quantitative variables of the study together. SPSS version 26 software was used to analyze the data.

Results

The results of the variables of age (years), body mass index, history of abortion, diabetes mellitus, gestational diabetes, polycystic ovary syndrome, thyroid problems, age of marriage, number of pregnancies, number of deliveries, gestational age, and number of live children were presented in Tables 1.

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Table 1. Demographic-medical characteristics of pregnant women

Variable	Specifications	Abundance (number)	F(requency (percentage
Aeg (year) (18-40)	18-24.9	73	18.1
	25-34.9	221	54.7
	35-40	110	27.2
BMI	< 19	6	1.5
	19-24.9	161	39.6
	25-29.9	173	42.6
	30-34.9	64	16/3
History of abortion	Yes	288	71.3
	NO	116	28.7
Polycystic ovary syndrome	NO	380	15(50)
	Yes	24	15(50)
Thyroid problems	Yes	328	81.2
	NO	76	18.8

The variable under consideration	*Mean ± S.D*	The variable under consideration	*Mean ± S.D*
Age	30.43 ± 5.82	Gravida	2.47 ± 1.24
Marriage age	21.51 ± 5.50	Number of births	1.97 ± 0.92
Gestational age	36.31 ± 3,65	Number of living children	1 ± 0.89

Of the 404 participants, all of whom had hypertension in pregnancy, 307 subjects reported gestational hypertension, 78 subjects preeclampsia, 1 subject eclampsia, and 18 subjects superimposed. The number of menstrual disorders from this number was reported in Table 2.

Table 2. Frequency of menstrual disorders in the participants

Variable	Healthy	Dysmenorrhea		Menstrual disorders	Hypermenorrhea
		Secondary	Primitive		
	N(%)	N(%)	N(%)	N(%)	N(%)
Gestational hypertension N (307)	98 (31.9)	24 (7.8)	76 (24.7)	83 (27)	26 (8.4)
Preeclampsia N (78)	11 (14.10)	16 (20.51)	21 (26.9)	17 (21.7)	12 (15.3)
Eclampsia (N)	0	0	1 (100)	0	0
Superimposed N (18)	3 (16.6)	5 (27.7)	6 (33.3)	2 (11.11)	2 (11.11)

Because of non-normality, Spearman's test was used to determine the relationship between dependent and independent variables. According to Table 3, there is a significant positive correlation between primary and secondary dysmenorrhea with gestational hypertension pregnancy and preeclampsia and superimposed. The strength of this correlation according to the r index is presented in the table. There is also a significant and positive relationship between menstrual irregularity gestational hypertension and pre-eclampsia. The direction of this positive correlation and its strength according to the r index are presented in the table below.

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Table 3. Investigating the correlation between hypertension disorders in pregnancy and menstrual disorders

Variable		Gestational hypertension		Preeclampsia		Eclampsia		Superimposed	
Dysmenorrhea (149)	**Primitive N (104)**	**r**	**P**	**r**	**P**	**r**	**P**	**r**	**P**
	Secondary N (45)	**0.207**	**0.001**	**0.421**	**0.041**	**0.421**	**0/02**	**0.321**	**0.031**
		0.165	**0.011**	**0.542**	**0.039**	**-**	**-**	**0.321**	**0.032**
Menstrual disorders (102)		0.511	0.027	0.951	0.034	0.427	0.03	0.127	0.06
Hypermenorrhea (40)		0.654	0.02	0.315	0.06	0.415	0.06	0.614	0.02

Discussion

The current study was done to determine relationship between dysmenorrhea and menstrual disorders with hypertension in pregnancy in women who were hospitalized in Bandar Abbas Hospital of Bandar Abbas City in 2024. The results of this study indicated, that there is a significant positive correlation between primary dysmenorrhea and gestational hypertension ($r = 0.207$), preeclampsia ($r = 0.421$), eclampsia ($r = 0.421$), and superimposed ($r = 0.321$) ($p < 0.05$). There is a significant positive correlation between secondary dysmenorrhea and gestational hypertension ($r = 0.165$), preeclampsia ($r = 0.542$), and superimposed ($r = 0.321$) ($p < 0.05$). There is a significant positive correlation between menstrual disorders and gestational hypertension ($r = 0.511$), preeclampsia ($r = 0.951$), eclampsia ($r = 0.427$), and superimposed ($r = 0.321$) ($p < 0.05$). There is a significant positive correlation between hypermenorrhea and gestational hypertension ($r = 0.645$) and superimposed ($r = 0.614$) ($p < 0.05$).

The study by Froscalzo et al. was done in 2009 on the topic of menstrual disorders and the prediction of hypertension disorders related to pregnancy. 255 women with hypertension disorders during pregnancy and 237 women with normal pregnancy were included in the study. The results of this study showed that hypertension disorders in pregnancy are related to dysmenorrhea, hypermenorrhea, and irregular menstruation ($P < 0.05$) (17). Some of the results of this study are in line with the results of our study. It has been reported that women with dysmenorrhea produce higher levels of prostaglandin, which in turn causes excessive contraction of the uterine muscle (23) and the resulting ischemia causes the symptoms of dysmenorrhea (24). In the case of hypermenorrhoea, the hormonal disorders caused by it will play a role in hypertension during pregnancy and in the development of hypermenorrhoea before pregnancy. In our study, the lack of correlation between hypermenorrhea and hypertension disorders in pregnancy can be due to the small sample size of participants regarding hypermenorrhea ($N = 42$).

About the significant relationship found between irregular menstruation and hypertension disorders in pregnancy in a meta-analysis study, pregnant women with polycystic ovary syndrome have a higher prevalence of gestational diabetes, hypertension disorders in pregnancy, and preeclampsia (25). One of the clinical features of polycystic ovary syndrome is irregular menstrual cycles due to relative hyperandrogenism (56). Women with polycystic ovary syndrome are expected to be at higher risk of developing hypertension disorders in pregnancy due to their metabolic and vascular status (25).

In another study, it was seen that, compared to women without polycystic ovary syndrome, pregnant women with polycystic ovary syndrome were more likely to have impaired carotid artery elasticity in ultrasound (27). In 2020, Nakayama et al., in a cohort study, reported on 193 pregnant women that 26 had hypertension disorders during pregnancy, and in this study, the relationship between pre-pregnancy dysmenorrhea and hypertension disorders became significant and a significant increase in the prevalence of hypertension disorders in pregnancy was observed in patients who had dysmenorrhea around the age of 20. Considering that this study was conducted

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with a small number of samples, the correlation between the two variables is clear and undeniable. Therefore, this study is also in line with the results of our study and it seems that if this study is conducted in a larger volume, it will obtain more relevant results (18).

The study by Feng Chong and colleagues on the topic of "Relationship between menstrual symptoms and hypertension in young women" was conducted in 2024. 7729 women between the ages of 22 and 27 were included in the study and were followed up every three years. The results of this study showed that after more than 15 years of follow-up, 757 people, i.e. 9.8% of women, developed chronic hypertension. Among 4473 pregnant women, 483 people (10.8%) had hypertension during pregnancy. Women who had menorrhagia were at higher risk of chronic hypertension (RR 1.53, 1.13-2.09). A bidirectional relationship was found between menorrhagia and chronic hypertension, but no clear relationship was found between any of the menstrual symptoms and pregnancy hypertension (19). The results of this research are inconsistent with the results of the current research, which is due to the type of study and its sample size.

In another study conducted in 2015 by Benson et al. in Denmark. Disorders related to menstruation and its relationship with preeclampsia and low birth weight in pregnant women were investigated. In this retrospective cohort study, 3440 Danish women with menstrual cycle disorders were included in the study. The results of this study showed that the presence of menstrual irregularity before pregnancy increases the risk of preeclampsia and low birth weight ($P < 0.05$). Preeclampsia was confirmed in 7.9% of women with menstrual irregularities and 5.2% in control subjects. Researchers in this study concluded that the presence of menstrual irregularities before pregnancy increases the risk of preeclampsia (50).

The results of this study are also consistent with the results of our study. Abnormal menstrual patterns caused by hormonal imbalance may mediate the risk of hypertension. For example, estrogen can play a role in cardiovascular diseases including hypertension by dilating blood vessels (28, 29). While androgens may increase blood pressure and thus contribute to the pathogenesis of hypertension (30, 31). Also, low estrogen levels can lead to longer or irregular periods (34). Therefore, decreased estrogen may explain the mechanism of association between irregular menstrual cycle and hypertension. In a retrospective case-control study conducted on 414 Brazilian women, it has been shown that irregular menstruation is associated with arterial hypertension (35).

A study by Hui Shu et al titled "Obesity as a Modifier of the Relationship between Menstrual Disorders and Hypertension in Young Women" was conducted in China in 2018. In this cross-sectional study, 178,205 healthy women were used. The results showed that the normal length of the menstrual cycle (OR = 1.21, 95%CI = 1.03-1.41), oligomenorrhea (OR = 1.54, 95% CI = 1.12-2.07), irregular cycle (OR = 1.54, 95%CI = -1.22 1.93) and mild menstrual bleeding (OR = 1.36, 95% CI = 1.06-1.72) was associated with hypertension among overweight or obese women, but not in normal-weight women. Prolonged menstrual bleeding (OR = 1.44, 95% CI = 1.06-1.72) and dysmenorrhea (OR = 1.20, 95% CI = 1.14-1.41) were associated with an increased prevalence of hypertension in all young women. As a result, the prevalence of hypertension is higher in women with menstrual disorders, and this relationship is corrected with overweight and obesity (21). The results of this study are somewhat in line with the current study.

The study by Chong Xin Yeh et al., a retrospective cohort study titled "Risk of Ischemic Heart Disease Associated with Primary Dysmenorrhea", was conducted in Taiwan in 2022. In this study, 18,455 women with primary dysmenorrhea and 36,910 healthy women were selected as the control group. Subjects were followed until 2013 to assess ischemic heart disease events. In 75% of the study population who were in the age group of 15 to 29 years, the incidence of ischemic heart disease was higher in

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the dysmenorrhea group than in the control group (HR = 1.60, 95% CI = 1.38-1.85). The incidence of ischemic heart disease increased with age, and this increase was higher in the dysmenorrhea group than in the control group. Analysis in the dysmenorrhea group showed that the risk of ischemic heart disease is associated with hypertension (OR = 2.50, 95% CI = 1.64-3.81) and arrhythmia (OR = 3.30, 95% CI = 2.25-4.86) (22). The results of this study were in line with the results of our study.

Conclusion

In general, it can be concluded that there is a significant relationship between some menstrual disorders and gestational hypertension. In this way, a detailed history of the patient in the field of menstrual disorders can give us an alarm about predicting hypertension in pregnancy.

Limitation

Considering that this study was cross-sectional, it cannot show the relationship between menstrual disorders and hypertension in pregnancy as clearly as longitudinal studies. Also, due to the nature of the study, which is conducted at one point in time and the patients are not followed up, there is a possibility of a change in their hypertension status in the future, which is not included in the study.

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Conflict of interests

The authors declare that they have no competing interests.

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Ethical considerations

The code of ethics was obtained from the Hormozgan University of Medical Sciences (IR.HUMS.REC.1403.156). Informed consent was obtained from participants before entering the study. The information of the participants in the study remained confidential. The principles of ethics in human research were observed. Withdrawal from the study was completely free in this study. During the study, 31 ethical codes related to medical science studies were observed.

Code of ethics

IR.HUMS.REC.1403.156

Authors' contributions

All authors read and approved the final manuscript. All authors take responsibility for the integrity of the data and the accuracy of the data analysis.

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