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Original Article

Screening prenatal depression to assess childbirth and neonatal complications: a cohort study

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Abstract

***Background & Aims*:** The prevalence of the mood or anxiety disorders during pregnancy is reported to be 18.2 %. This study aimed to investigate the effect of prenatal depression on childbirth and neonatal complications.

***Materials & Methods*:** This cohort study selected 600 pregnant mothers who were referred to Kamali Alborz hospital in 2021 as the participants. These 600 pregnant women were classified into three groups including: the group of pregnant mothers without depression whose Beck score was below 10, the group of pregnant mothers with untreated prenatal depression whose Beck score was above 16, and the group of pregnant mothers with prenatal depression who were treated with selective serotonin reuptake inhibitors (SSRIs). There were 200 participants in each of the above-mentioned groups. These groups were compared with each other in terms of preterm labor, cesarean section, abortion, preeclampsia, birth weight, Apgar, and NICU hospitalization status.

***Results*:** In our study, the number of infants with low birth weight in the group of mothers with untreated prenatal depression was higher than the number of these infants in the group of normal mothers ($P < 0.05$). Nonetheless, there was not a significant difference between the groups in terms of the premature births ($P = 0.092$). The rate of cesarean section was higher in the group of mothers with untreated prenatal depression compared to the group of mothers who were treated with SSRIs. Moreover, this rate in both of these groups was higher than cesarian section rate in the group of the normal mothers ($P < 0.05$). The number of the infants who were hospitalized in the NICU was significantly higher in the SSRIs group ($P < 0.05$) compared to the other groups. Finally, the number of infants with 1-minute Apgar < 7 was significantly higher in the group of mothers who were treated with SSRIs than the group of normal mothers ($P = 0.126$).

***Conclusion*:** According to the results, cesarean section, premature birth, birth weight, and abortion were more satisfactory in the group of non-depressed mothers and the group of the depressed mothers who were treated with SSRIs in comparison with the group of the depressed mothers with untreated depression.

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Introduction

The prevalence of the various types of mood disorders or anxiety disorders during pregnancy has been reported to be 18.2%. Generalized anxiety disorder, obsession, panic disorder, and coexistence with other anxiety disorders during pregnancy are more prevalent than the other disorder types. Pregnant women may be at increased risk of depression and anxiety disorders (1). The disorders, which are developed in this important period, will be problematic not only for the mother but also for the fetus and even the child. Stressful life processes, unpleasant events, maternal anxiety, and depression symptoms increase the child's risk of experiencing a wide range of emotional, behavioral, or cognitive problems in his/her future life (2). Major depressive disorder (MMD) is one of these important disorders which are developed during pregnancy. This disorder is considered to be a risk factor for the child, and has a relatively high prevalence during this period (3, 4). Major depression is common in women, especially in women of reproductive age. About 20% of women aged 18 and over experience symptoms of depression, which often include insomnia, hopelessness, and low energy. These symptoms and the other related symptoms reduce the individuals' quality of life and can lead to other social and health problems in the society. Depression increases the risk of suicide as well as the risk of death from medical problems such as cardiovascular diseases (5). According to surveys, up to 12.7% of women have reported depression or symptoms of depression during their pregnancy (6). Despite the critical importance of depression, little screening is provided for it. This issue is regarded as an obstacle to its treatment and the efforts to prevent the aggravation of its symptoms and its consequences (7). Moreover, depression during pregnancy can also explain more than 50% of postpartum depressions (8, 9). The effects of depression on the development of the fetus and the newborn infants are more serious and can be recognized as the factors which may change the pregnancy outcomes (10, 11). SSRIs have a direct effect on the prenatal depression. Moreover, their use during pregnancy is associated with increased risks of premature birth, miscarriage, low birth weight, and behavioral disorders throughout life. Studies have shown that the non-depressed pregnant women's fetuses show a higher heart rate in response to speech stimuli than the depressed pregnant mothers' fetuses (3, 12-18). The depression during a mother's pregnancy makes her child more irritable and results in the child's growth delay (3, 4). Reducing mothers' stress and dealing with their mental health problems during their pregnancy can be effective strategies to solve the children's behavioral problems (19). Most of the previous studies have been conducted in the field of postpartum depression and its effects on the neonates and children's health. These studies have shown that maternal mental illness can negatively affect the children's development and may have serious physical, cognitive, and emotional health consequences during critical stages of their life (20). Considering the above-mentioned issues and the relatively high prevalence of perinatal depression, this study aimed to investigate pregnant mothers' depression before their childbirth. Therefore, the study focused on the pregnant mothers with depression who underwent medical treatment and the pregnant mothers with depression who were not treated with antidepressant.

Materials & Methods

This study was a cohort study. It was approved by the ethics committee of Alborz University of Medical Silences (#IR.ABZUMS.REC.1400.049). It used convenience sampling to select the pregnant women with depression and without depression who were referred to Kamali Alborz Hospital in 2021 as the participants. In order to conduct the study, first, the pregnant women who consented to participate in the study completed the written consent form and the demographic and depression questionnaires. Second, the researchers examined the participants' depression during their pregnancy and at the time of their delivery. More specifically, the information on the participants' miscarriage, pre-eclampsia, premature birth, low birth weight, and possible syndromes was collected in the

mothers' files, and was compared with the mothers' information in the other groups. In general, the inclusion criteria involved: being in the first or the second trimester of pregnancy (5 to 24 weeks of pregnancy), being in the age range of 20 to 35, and being pregnant for the first time. Moreover, the specific inclusion criteria for assigning the participants to the group of pregnant mothers with untreated depression were: having a score higher than 16 on the depression questionnaire, and not taking any type of psychiatric medication in the previous 3 months. Furthermore, the specific inclusion criteria for assigning the participants to the group of the pregnant mothers with depression who underwent drug treatment were reporting of this disorder (by a psychiatrist) in the patient's file and using SSRI (fluoxetine, citalopram, sertraline, fluvoxamine) for at least 30 days before conception. In addition, the specific inclusion criterion for assigning the participants to the group of pregnant mothers without depression was having a score of 10 and below 10 on the depression questionnaire. Finally, the exclusion criteria were being in the third trimester of pregnancy, being pregnant multiple times, smoking, using alcohol, suffering from cognitive and other psychiatric disorders, suffering from physical disorders, and having medical problems. Third, based on the determined criteria, the pregnant women were assigned to three groups. The first group included the mothers whose depression was confirmed by a psychiatrist and who received drug treatment. The second group involved the depressed mothers who did not receive depression treatment. Finally, the third group involved the pregnant mothers without depression and other mental and physical problems. The total sample size was 600 pregnant mothers. There were 200 participants in each of the above-mentioned groups. The sample size (i.e. 200 participants) in each group was determined considering the effect size of at least 0.21, the significance level of 0.05, the power of 0.95, and the existence of 3 comparison groups (21). The data were analyzed using chi-square and one-way analysis of variance (ANOVA) on SPSS 22.

Results

As shown in Table 1, there were not any significant differences between the groups in terms of the patients' education (P = 0.946). Regarding the participants' marital status, in the group of patients without depression, four participants had separated from their spouse or their spouse had died during their pregnancy. In the group of participants whose depression was treated with SSRIs, four subjects had separated from their spouses or their spouses had died during their pregnancy. On the other hand, in the group of participants with untreated depression, six subjects had separated from their spouses during their pregnancy or their spouses had died (P = 0.838). Considering the lack of the difference between the groups in terms of the participants' age (P = 0.061) and their gestational week (P = 0.290), it can be stated that the groups were similar to each other and were comparable in the intergroup analysis (Table 2).

Table 1. Comparisons between the groups in regard to the participants' educational level and marital status

Variable		Group			
		Normal	SSRIs	Without treatment	*p* value
Education	Illiterate, N (%)	16 (8)	14 (7)	15 (7.5)	0.946
	Under diploma, N (%)	60 (30)	72 (36)	65 (32.5)	
	Diploma, N (%)	75 (37.5)	70 (35)	73 (36.5)	
	Collage, N	49 (24.5)	44 (22)	47 (23.5)	
Marital status	Married, N (%)	196 (98)	196 (98)	194 (97)	0.838
	Separated/died, N (%)	4 (2)	4 (2)	6 (3)	

Table 2. Comparisons between the groups in terms of the participants' mean age and gestational week

Variable	Group	Minimum	Maximum	Mean	SD	*p* value
Age (year)	Normal	20	35	27.08	4.99	0.061
	SSRIs	20	35	28.06	4.78	
	Without treatment	20	35	27.05	4.81	
Gestational week	Normal	6	23	15.04	5.07	0.290
	SSRIs	7	23	15.59	4.83	
	Without treatment	8	23	14.86	4.72	

Table 3 shows the mean and the standard deviation for Beck's depression score in the groups of the study. As shown in this table, the differences between the groups were significant ($P < 0.001$). In the group of participants with untreated depression, Beck's depression score (with a mean of 29.23) was higher than this score in the other two groups.

Table 3. Comparisons between the groups in terms of the mean Beck's depression score

Beck's depression score	Minimum	Maximum	Mean	SD	*p* value
Normal	0	10	6.01	2.56961	<0.001
SSRIs	3	27	14.145	6.68336	
Without treatment	17	43	29.23	7.15634	

Regarding the clinical findings, in the group of normal participants, the group of participants who were treated with SSRI, and the group of participants with untreated depression, 0 cases out of 200 participants, 1 case out of 200 participants, and 2 cases out of 200 participants had abortions respectively ($P = 0.771$). Moreover, the number of premature births in the group of normal participants, in the group of participants who were treated with SSRI, and in the group of participants with untreated depressions was 7 participants (3.5%), 11 participants (5.5%), and 20 participants (10%) respectively ($P = 0.092$). The neonates' weight was divided into three categories: less than 2500 grams, between 2500 grams and 4 kg, and more than 4 kg. In the group of normal participants, four neonates weighed more than 4 kg, 184 neonates were in the normal weight range, and 11 neonates weighed less than 2500 grams. In the group of depressed participants who were treated with SSRIs, three neonates weighed more than 4 kg, 183 neonates were within the normal weight range, and 13 neonates weighed less than 2500 grams. In the group of participants with untreated depression, three neonates weighed more than 4 kg (1.5%), 170 neonates were in the normal weight range, and 27 neonates weighed less than 2500 grams ($P < 0.05$). In the group of normal participants, the group of participants who were treated with SSRI, and the group of participants with untreated depression, 30 participants (15%), 53 participants (26.5%), and 76 participants (38%) had a cesarean section ($P < 0.001$). In this study, four participants (2%), five participants (2.5%), and six participants (3%) suffered from preeclampsia in the group of normal participants, in the group of depressed participants who were treated with SSRIs, and in the group of depressed participants with untreated depression respectively (p=0.815). Six neonates (3%), 24 neonates (12%), and 20 neonates (10%) in the group of normal participants, the group of participants who were treated with SSRIs, and the group of participants with untreated depression had been admitted to NICU. The comparisons between the groups in terms of the admission to NICU variable showed the existence of significant differences between them ($P < 0.05$). More specifically, the number of neonates that were admitted to NICU in the group of depressed participant who

were treated with SSRI was more than the number of the neonates that were admitted to NICU in the group of participants with untreated depression (P = 0.523). Moreover, the comparison between the group of participants who were treated with SSRIs and the group of normal participants showed that this difference was significant (P <0.05). Likewise, the comparison between the group of participants with untreated depression and the group of normal participants highlighted the significance of this difference (P < 0.05). In terms of Apgar score below 7 (in the 1-minute Apgar score), there were two neonates (1%), 11 neonates (5.5%), and 5 neonates (2.5%) in the group of normal participants, the group of participants who were treated with SSRIs, and the group of participants with untreated depression respectively. The number of the neonates who were born with Apgar score below 7 in the first minute was higher in the group of depressed participants who were treated with SSRIs than this number in the group of depressed participants with untreated depression. Nonetheless, this difference was not significant (P = 0.126). Regarding the fifth minute Apgar score, the difference between the groups was not significant (P = 0.098). Regarding the drug withdrawal syndrome, only 3 neonates (1.5%) out of the neonates of 200 participants in the group of participants who were treated with SSRIs showed symptoms of drug withdrawal syndrome (P = 0.110) (Table 4).

Table 4. Clinical findings of the participants in the three groups of the study

Variable		Normal, N (%)	Treated with SSRIs, N (%)	Not treated with SSRIs, N (%)	
Cesarean section		30 (15)	53 (26.5)	76 (38)	<0.001
Preeclampsia		4 (2)	5 (2.5)	6 (3)	0.815
Admission to NICU		6 (3)	24 (12)	20 (10)	<0.05
Weight	> 4 kg	4 (2)	3 (1)	3 (1)	<0.05
	< 2500 g	11 (6)	13 (7)	27 (14)	
	between 2500 g and 4 kg	184 (92)	183 (92)	170 (85)	
Abortion		0 (0)	1 (0.5)	2 (1)	0.771
Premature births		7 (3.5)	11 (5.5)	20 (10)	0.092
1-minute Apgar		2 (1)	11 (5.5)	5 (2.5)	0.126
5-minute Apgar		6 (3)	10 (5)	20 (10)	0.098

Discussion

Our study was a cohort, prospective, and observational-comparative study which compared birth and neonatal complications in three groups of mothers including the mothers without depression, the depressed mothers who were treated with SSRIs, and the depressed mothers with untreated depression. The obtained results showed that the rate of premature birth in the group of depressed participants with untreated depression was higher than this rate in the group of normal participants and the group of depressed participants who were treated with SSRI. Premature delivery is the most important cause of infant and fetal mortality and is associated with neurological disabilities in surviving infants (22). Several of the previous studies have reported an increased risk of preterm birth which is associated with SSRI use during pregnancy (23, 24). Nonetheless, our results were not in line with these results. The SSRIs are usually prescribed for maternal depression and anxiety disorders. Nonetheless, only a few studies have focused on these drugs and the obtained results are contradictory (25, 26). Orr et al. (2002) stated that untreated depression can increase the number of premature births. Likewise, our study showed that the treatment of pregnant women's depression can lead to

the reduction in the premature births in this population (27).

Moreover, our findings indicated that the rate of caesarean section in the group of normal participants was significantly lower than this rate in the group of depressed mothers with untreated depression, and the group of depressed mothers who were treated with SSRIs. The results of the study by Ogunyemi et al. (2018), showed that the cesarean rate in the depressed mothers with untreated depression was higher than this rate in the treated depressed mothers. In this study, prenatal anxiety and depression in the untreated group were associated with adverse consequences including increased cesarean delivery compared to the treated group. Both of the groups with prenatal anxiety and depression were compared with the group without anxiety and depression. In these groups, anxiety and depression were associated with an increased risk of cesarean delivery in comparison with the normal group (28).

A number of researchers have highlighted the existence of a higher rate of cesarean section in the depressed mothers in comparison with the normal mothers (29, 30). These mothers show a desire to have a cesarean section for giving birth to their infants. These findings suggest that there is a need to pay more attention to the women's ongoing psychological assessment, especially the women who request a cesarean section since this issue is a worrisome public health problem and increases the number of cesarean sections (31).

The studies which have been conducted in the field of preeclampsia incidence, have not reported significant differences between the above-mentioned three groups of mothers. The previous studies have highlighted the existence of an association between prenatal depression and preeclampsia. This result can be ascribed to the fact that depression is a known risk factor for cardiovascular diseases. These diseases constitute the risk factors and pathophysiological features of preeclampsia (32). The study by Kurki et al. showed that depression was associated with a 2.5 times increase in the risk of preeclampsia in the experimental group compared to the control group (33). This finding does not support the results of our study. The results of a study, which was conducted in Finland, showed that there was not an increased risk of preeclampsia in women with mild depression compared to normal women. However, the women with moderate depression had a 2.3 times increased risk of preeclampsia. Moreover, the moderate-to-severe depression was associated with a 3.2 times increased risk of preeclampsia (34).

Contrary to these reports, in our study, prenatal depression was not significantly associated with preeclampsia. Furthermore, there was not a significant difference regarding the abortion variable between the three groups including the depressed group that was treated with SSRI, the depressed group with untreated depression, and the non-depressed group. The study which was conducted by Kjaersgaard et al. (2013) indicated that spontaneous abortion was not significantly related to the use of SSRIs. This result supports our results (35). Low birth weight has important long-term health consequences for the child. Neonates with low birth weight are likely to suffer from physical growth retardation as well as the decreased mental development during their life time (36).

In our study, the number of children who weighed less than 2,500 gr in the group of participants with untreated depression was higher than the number of these children in the group of normal participants ($P<0.05$). The SSRI-treated group did not differ significantly from the normal group. Notwithstanding, the study which was conducted by Rahman et al. (2007) indicated that in developing countries, prenatal depression was associated with low birth weight. This result supports the results of our study. Depression is associated with poverty, poor physical health, and unhealthy lifestyle and can be identified as a risk factor for low birth weight infants (37).

Hermon et al. reported that the use of SSRIs was associated with the increased risk to the infant, including a low Apgar score and the increased need for admission to the neonatal intensive care unit. These

results are consistent with the results of our study (38). In our study, there was a significant difference between the group of depressed participants who were treated with SSRIs and the group of normal participants in terms of the Apgar score of the first minute. That is the number of the children who were born with an Apgar score below 7 in the first minute in the group of participants who were treated with SSRIs was higher than the number of these children in the group of normal participants. Nonetheless, in this study, there was not a significant difference between the three groups in the fifth minute Apgar. The study which was conducted by Pawluski et al. (2011) indicated that there was a significant decrease in Apgar score in the first minute of the children of the mothers who were treated with SSRIs compared to children of mothers without depression. This result may stem from the increase in cortisol (39). The last variable which was investigated in this study was drug deprivation syndrome. Drug deprivation syndrome occurs more often in mothers who take SSRIs in their third trimester (40). In our study, the infants of mothers who took SSRIs were examined. Based on the results, three infants (1.5%) out of 200 infants suffered from this syndrome. The study which was conducted by Levinson-Castiel et al. (2006), showed that drug withdrawal syndrome occurred in 30% of infants who were exposed to SSRIs in utero (41).

Conclusion

This study indicated that cesarean section, premature birth, birth weight, and abortion in the group of non-depressed mothers and the group of depressed mothers who were treated with SSRIs were more satisfactory in comparison with the group of the depressed mothers with untreated depression. Only two variables including Apgar score below 7 in the first minute and hospitalization in NICU in the group of the depressed participants with untreated depression were more satisfactory compared to the group of depressed mothers who were treated with SSRIs. Notwithstanding, in general, the examination of all of the variables in the three groups, indicated that the depressed pregnant mothers who were treated had better results in terms of both delivery and their child's health.

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Conflict of interest

The authors declare that they have no conflicts of interest.

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Data availability

The raw data supporting the conclusions of this article are available from the authors upon reasonable request.

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