

Relation between Antenatal Maternal Depression and Anxiety during Pregnancy and Neonatal Outcomes

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Abstract

Background: The presence of psychological problems, including maternal depression and anxiety may harm fetal and neonatal growth. Depression and anxiety in pregnancy increase the liability for adverse fetal and newborn outcomes, including preterm birth. It was accompanied by abnormal infant development that extended to cognitive problems and psychopathology. **This study aimed** to analyze relation between antenatal maternal depression and anxiety during pregnancy and neonatal outcomes by assessing depression levels among pregnant women, identifying anxiety levels among pregnant women, and investigating the relation between antenatal maternal depression and anxiety during pregnancy and neonatal outcomes. **Methods:** A cross-sectional descriptive study included 216 pregnant women and their newborns from the Obstetrics and Gynecology ward at Sohag University Hospital and the Maternal and Child Health Center (Dar El-Salam Abed- Allah Health Center) at Sohag City. **Tools:** 1- A structured self-administered questionnaire, anthropometric measurement tool, the Edinburgh Postnatal Depressive Scale (EPDS), the Beck Anxiety Inventory (BAI), and Apgar score sheet, were utilized for collecting the data. **Results:** Considering depression approximately one quarter of pregnant women had moderate depression symptoms during pregnancy, while three fifth had no depression symptoms and 16.0 of them had severe depression symptoms during pregnancy. As regard less than one fifth of pregnant women had mild level of anxiety, while three quarter of them had a moderate level of anxiety and less than one fifth of them had severe anxiety level during pregnancy. Statistically significant relationships were found between severe depression symptoms scores, anxiety and birth weight, weight-for-GA and length, prematurity less than one fifth, need for resuscitation one quarter, and need for admission to neonatal intensive care near one fifth. **Conclusion:** Pregnant women who are suffering from severe depression and anxiety symptoms during pregnancy, their babies were more liable to increase the need for neonatal resuscitation, increase the chance of preterm birth, have a low birth weight, and are small for gestational age. **Recommendation:** Providing pregnant women health educational programs about the effects of depression and anxiety on them and on their neonates, non pharmacological interventions are important treatments for depression or anxiety that focus on promoting a healthy lifestyle with adequate nutrition, exercise and sleep.

Keywords: Pregnancy, maternal depression, maternal anxiety, neonatal outcomes.

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Introduction

In low and middle-income countries, the incidence rate of either major or mild depression is more severe. Depression

during pregnancy is quite common, with up to 30% of pregnant women experiencing significant depressive symptoms (Fadzil et al., 2017). The rate of incidence for anxiety disorder diagnoses during pregnancy is 15.2%, and anxiety disorder diagnoses are

9.9%. According to a study involving 221,974 women from 34 countries, anxiety symptoms observed in the perinatal period were 18.2% in the first trimester among women (Dennis et al., 2017).

Many mechanisms are proposed through which maternal antenatal depression may affect fetal and child development. These include changes to the hypothalamic pituitary adrenal (HPA) axis, the role of the placenta, and the contribution of genes in the ability of stress responses and epigenetic mechanisms (Alhusen et al., 2016).

Many factors may act as effect modifiers of the association between maternal antenatal depression and childbirth outcomes. These factors include the persistence and severity of depression (moderate vs. severe), socioeconomic factors (for example maternal education), and child sex (Coll et al., 2017).

These factors have already been shown to act as moderators of the association between postnatal depression and a wide range of child development domains (Netsi et al., 2018). There is now accumulating evidence about risk factors that have also been associated with suboptimal birth outcomes such as low birth weight and intrauterine growth restriction (Sadovsky et al., 2016).

Antenatal depression and anxiety are associated with pregnancy adverse effects and adverse neonate outcomes. Depression associated with pregnancy not only damages the physical and mental health of the pregnant woman but also has an important impact on the future psychological and intellectual development of the fetus (Accortt et al., 2015). A number of studies have evaluated the impact of depressive symptoms on low birth weight LBW, which is associated with an increased risk of infant mortality and morbidity (Kim et al., 2016).

Many observational studies report an increased risk of preterm birth (PTB), and LBW (Jarde et al., 2016), and intrauterine growth restriction for women who experience depression during pregnancy including alterations in brain development to infants exposed to prenatal maternal depression (Posner et al., 2016).

Birth outcomes that may be influenced by maternal antenatal depression, such as LBW, being small for gestational age (SGA) and PTB are known predictors of poorer long-term health; increasing the risk for delayed neurodevelopment, poor linear growth, obesity, diabetes, hypertension, and cardiovascular disease as well as entailing a loss of human capital (Murray et al., 2015). In addition, the incidence of LBW and PTB is higher where approximately 1 in 5 infants are born SGA (Lawn et al., 2014).

The management of perinatal depression involves the additional considerations of the pregnancy, the infant, and the mother-infant relationship, but interventions are similar to depression at other stages of life as mild depression is managed with behavioral and psychological interventions along with additional support for the mother and family as well as including behavioral activation, e.g. re-engaging with friends, family and social activities – exercise, a healthy diet and optimizing sleep – relaxation, meditation, and mindfulness – avoiding alcohol and drugs – cognitive-behavioral therapy (CBT) or other psychological therapies (Posner et al., 2016).

Non pharmacological interventions are the first-line treatment for depression or anxiety. These several studies as that of Dennis et al., (2017), which focus on promoting a healthy lifestyle with adequate nutrition, exercise, and sleep and providing psycho-education. Women with severe or psychotic symptoms should be referred to a secondary mental health service, and the

patient's thoughts and concerns should be explored to identify contributing factors, e.g. a perceived failure to meet expectations, problems with the physical limitations of pregnancy and childbirth, financial concerns or social isolation.

The nurse plays an important role as a health care provider to maintain and improve the physical and psychological health of pregnant women in prenatal care. As a health care provider has to know the evidence about the state of maternal mental health and neonatal health to plan counseling and behavioral strategies for pregnant women that help in promoting mental health. Consequently, nurses need to listen with compassion, provide appropriate education and information, and make referrals to mental health care providers and support groups as indicated (**Alqahtani et al., 2018**).

Additionally, the holistic nursing approach may be better to reduce pregnant anxiety as well as prevent depression during the antenatal period which comes in priority for the sole purpose of assurance (**National Institute for Health and Care Excellence, 2014**). It provides emotional support by including the pregnant woman and her family, and provides care and health education about a better pregnancy and delivery that will take place (**Alqahtani et al., 2018**).

Significance of the Study

In Egypt, a strong association was detected between maternal depressive symptoms and anxiety during pregnancy and various fetal growth and developmental problems. Therefore, the early detection and management of depressive symptoms and anxiety during pregnancy is important and should be provided routinely for all pregnant women. Thus, antenatal screening for maternal depression should be taken into consideration in the routine of primary

antenatal care. Newborn's future growth is considered an important determinant because it has a significant association with a high risk of neonatal morbidity and mortality. Antenatal depression and anxiety are associated with pregnancy adverse effects and adverse neonate outcomes. Neonatal adverse outcomes may occur as a result of maternal antenatal depression, including LBW, being SGA and increasing the risk for delayed neurodevelopment, obesity, diabetes, hypertension, and cardiovascular disease.

Health information about maternal psychiatric problems during pregnancy and their offspring in Egypt is still lacking, and more accurate health information about maternal mental health status during pregnancy and its effects on birth outcomes are needed and very important. Hence, this study aims to analyze the relation between antenatal maternal depression and anxiety during pregnancy and neonatal outcomes by, assessing depression levels among pregnant women, identifying anxiety levels among pregnant women, and investigating the relation between antenatal maternal depression and anxiety during pregnancy and neonatal outcomes.

Aim of the study:

The study aimed to analyze the relation between antenatal maternal depression and anxiety during pregnancy and neonatal outcomes through:

1. Assessing depression levels during pregnancy among pregnant women.
2. Identify anxiety levels during pregnancy among pregnant women.
3. Investigate the relation between antenatal maternal depression and anxiety during pregnancy and neonatal outcomes.

Research questions:

1. What is the depression level during pregnancy among pregnant women?

2. What is anxiety level during pregnancy among pregnant women?

3. What is the relation between antenatal maternal depression and anxiety during pregnancy and neonatal outcomes?

Subjects and methods

Research design:

A cross-sectional descriptive design was used during the period from beginning of September 2019 to end of February 2020. In the cross-sectional study, the investigators measured the outcome and the exposures in the study participants at the same time. This type of research can be used to describe characteristics that exist in a community, but not to determine cause-and-effect relations between different variables. This method is often used to make inferences about possible relations or to gather preliminary data to support further research and experimentation.

Research settings:

These study settings included the Obstetric and Gynecology ward at Sohag University Hospital and the Maternal and Child Health Center (Dar El-Salam Abed-Allah Health Center) at Sohag City.

Subjects:

Sample of convenience of 216 newborns and their pregnant women and their newborns was recruited from the previously mentioned settings over a period of 6 months. The inclusion criteria were all mothers who did not have any disease, were available at the time of study both educated and non-educated mothers, and all live newborns from both sexes (male & female), who did not have congenital malformations or any abnormalities. Newborns with congenital anomalies were excluded from the study.

Tools of the study:

There were five tools used in the present study as follows:

Tool (I):- A structured self-administered questionnaire: It is composed of three parts:

Part (1): It displays the sociodemographic characteristics of pregnant women; it includes 6 items related to age, educational level, occupation, type of delivery, parity, and residence.

Part (2): It deals with the obstetrical history of pregnant women; it includes 4 questions about gravida, past medical history, history of abortion, and gestational weeks.

Part (3): It presents the sociodemographic characteristics of newborns; it includes 5 items related to gender, birth order, the infant showing any health problems (No/Yes), the infant admitted to the intensive care unit (No/Yes) and gestational age.

Tool (II):- Anthropometric measurement tool: The anthropometric measurements of newborns used to record weight, height, and head circumference was also included.

Tool (III):- The Edinburgh Postnatal Depressive Scale (EPDS):

The Edinburgh Postnatal Depression Scale (EPDS) was used to assess maternal depressive symptoms. The EPDS is a self-reported scale composed of 10 items on a four-point Likert scale, rated 0–3 on each item and ranging from 0 to 30. The scale rates the intensity of depressive symptoms. The items assessed dysphoric mood (five items), anxiety (two items), guilt (one item), ability to cope with everyday life (one item), and suicidal thoughts (one item). The

Cronbach's alpha of the scale was 0.85 (Cox et al., 1787).

Scoring system:

The total score is calculated by finding the sum of the 10 items.

Score of <13 = mild depression.

Score of 13–16 = moderate depression.

Score of ≥ 17 = severe depression.

Tool (IV):- Beck Anxiety Inventory (BAI)

The BAI was used as a data collection device in this study. Adopted by Beck et al. (1988), it was developed to determine the severity of anxiety symptoms, and consists of 21 questions and total scores range between 0 and 63. It measures physical, emotional, and cognitive aspects of anxiety and fear of losing control. The score for each item ranges from 0 to 3. Beck's original version had internal consistency with a Cronbach's alpha of 0.92, and a retest reliability co-efficiency of $r = 0.75$.

Validity and reliability:

The BAI was correlated with the revised Hamilton Anxiety Rating Scale (.51) and mildly correlated with the Hamilton Depression Rating Scale (.25) (Beck et al., 1988).

Scoring system:

The total score is calculated by finding the sum of the 21 items.

Score of 0-21 = mild anxiety

Score of 22-35 = moderate anxiety

Score of $36 \geq$ severe anxiety

Tool (5):- Apgar score sheet:

The Apgar score sheet was used to assess neonatal condition after delivery. It is a quick test performed on a baby at 1 and 5 minutes after birth. The assessment may be repeated if the score remains low.

The five criteria of the Apgar score are activity, pulse, appearance, grimace, and respiration. Each of these criteria has scores ranging from zero to two, and then summing up of the five criteria was obtained. The Apgar score ranged from zero to 10 (neonatal complications such as; prematurity, birth weight, need for resuscitation, and admission to the NICU). Overall test-retest reliability coefficients had Cronbach's alpha values of 0.87 (Veronesi et al., 2009).

Tool validity and reliability:

The content validity of the tools was determined through an extensive review of the literature about the relations between antenatal maternal depression and anxiety during pregnancy and neonatal outcomes. The content of the data collection tools was submitted to a panel of five experts in the pediatric nursing field, psychiatric nursing, obstetrics and gynecology, and community health nursing with more than ten years of experience in the field. Modifications on the tools were performed according to the panel judgment on the clarity of sentences, appropriateness of the content, sequence of items, and accuracy of scoring and recording of the items. Reliability was assessed through Cronbach's alpha reliability test which revealed that reliability of tool one was 0.89, tool two was 0.87, tool three was 0.85, tool four was 0.92, and tool five was 0.87.

Pilot study:

It was carried out on 10% of pregnant women and their newborns for

modification, clarification and estimation of the time needed for filling in the study tools, and testing the feasibility of the research process. The designed tools were tested on pregnant women and Their newborns. While filling in the sheets, unclear items were clarified, unnecessary items were omitted, and new items were added. Those who shared in the pilot study were excluded from the main study sample

Administrative and Ethical consideration:

The official letters from the responsibilities of the selected settings were obtained from the authorities of the faculty of nursing, Sohag University to conduct the study. The researchers explained the aim of the study at the beginning for all participants i.e. the newborn mothers or caregivers, who were reassured that all collected information would be treated confidentially. The study was conducted in the previously mentioned settings for a period of six months (from September 2019 to February 2020).

The researchers first introduced themselves to the pregnant women and then explained the aim of the study at the beginning of the interview, so the pregnant women were reassured that all gathered information would be treated confidentially. The researchers informed them that participants in the study are voluntary; that they have the right to withdraw from the study at any time, without giving any reason and that their responses would be held confidentially.

Data collection:

- Official permissions were obtained from Sohag University Hospital administrators and the Manager of the Obstetrics and Gynecology ward. Permission was also obtained from the Head Nurse of the Obstetrics and

Gynecology ward at Sohag University Hospital and the authorities of the Maternal and Child Health Center (Dar El-Salam Abed- Allah health center) at Sohag City. Written informed consent was obtained from each pregnant woman who agreed to participate in the study. The researchers visited the pregnant women's places of childbirth to assess the child.

- The researchers attended to the previous settings of the study two times/a week from 9.00 am to 1.00 pm. The subjects at first were determined through previous inclusion criteria, and the data were collected by using the study tools. The participants took approximately 20-30 minutes to complete the questionnaire.

- The evaluation was performed using the Edinburgh Postnatal Depression Scale (EPDS) to assess maternal depressive symptoms.

- The evaluation was performed through the Beck Anxiety Inventory (BAI), which was developed to determine the severity of anxiety symptoms.

- The evaluation was done through the Apgar score sheet to assess neonatal condition after delivery.

- All measurements such as the baby's weight, and length were measured by the researchers in the previously mentioned settings. Newborn weights were measured using an electronic weighing scale, and the scale records weights in kilograms. It was adjusted to zero before each reading.

- The baby's length was measured in centimeters using a metal anthropometric linear rule fixed to a horizontal flat board. It was recorded with the baby in the supine position, an assistant held the baby in a position, making sure that knee fully extended and straight and soles of the feet held firmly against the footboard and head touching the fixed board.

Statistical analysis:

The data obtained were reviewed, prepared for computer entry, coded and scored, then analyzed and tabulated. Data entry and analysis were performed using the statistical package for social sciences SPSS (a software package) version 17.0. Data are expressed as the means, SD, and percentage distribution. Person's correlation is used for the numeric variables. $P > 0.05$ was considered not significant, while $P \leq 0.05$ was used as a cutoff for significance and $P \leq 0.001$ for highly significant differences. **Results**

The study sample consisted of 216 pregnant women, their age ranged from 18 - 30 years and less than three fifth pregnant women (57.0%) age ranged between 23 - 27 years. Concerning educational level, the highest percentage of them (31.0%) was in secondary education. Additionally, 68.0% for newborns were born by vaginal delivery, and the parity of the (80.0%) pregnant women ranged from 2 to 4 (Table 1). Approximately two-thirds of pregnant women (65.0%) were from urban areas, and 35.0% were from rural areas (Figure 1). The majority of them (85.0%) were housewives (Figure 2).

A sample of 216 newborns participated in this study of whom more than half (57.5%) were male, less than half (46%) of them was the second birth order, and approximately two-thirds of them had gestational ages ranging from 33 < 36 (Table 2).

There was an increased risk of newborns being born for women to be their weight between 2 < 2.5 among (28.0%) of them. More than one quarter (27.0%) of them were small weight for gestational age, and 35.0% were shorter length < 1.60 and lower 10th centile for length (Table 3).

As a result of the study, 24.0% of the respondents had no depression symptoms during pregnancy, 60.0% had moderate depression symptoms and 16.0% had severe depression symptoms during pregnancy (Figure 3).

Of all the subjects, 12.0% of pregnant women had mild levels of anxiety, 75.0% of them had a moderate level of anxiety and 13.0% had severe anxiety levels during pregnancy (Figure 4).

Table 4 shows that Apgar scores of zero to six in the first and five minutes were found among 48.0% and approximately one third (35.0%) respectively. (11.0%) of them were premature, more than one-quarter of them (29.2%) needed resuscitation, while 15.4% of them needed admission to the neonatal ICU.

Table (5) reveals that 52.5% of the women between 23 < 27 years had severe anxiety. A total of 85.0% of housewives suffered from severe anxiety, whereas 38.4% of them had moderate anxiety levels, while 66.7% have mild anxiety observed among employed women. Additionally, 100% of women with severe level of anxiety were from rural areas. Highly statistically significant differences were found between sociodemographic characteristics and different anxiety levels ($P= 0.000$, $p= 0.001$, $p= 0.000$ & $p=0.00$) respectively (Table 5).

Considering the relation between anxiety levels during pregnancy and neonate outcomes, pregnant women with anxiety are liable to having an increased risk of born their newborns have adverse birth outcomes such as low birth weight, small for gestational age, and shorter length. Statistically significant differences were found between anthropometric measurements of newborns with regard to birth weight, weight-for-GA and length ($P=$

0,000, $p= 0.000= &p= 0, 00$) respectively (Table 6).

In table (6) 77.5% and 71.2% of neonates, their Apgar scores from zero to six in the first and fifth minutes, respectively, were affected by the severity of their mothers' anxiety. There were statistically significant relations between severe anxiety and prematurity (76.9%), the need for resuscitation (65.0%), and the need for admission to neonatal intensive care (78.8%).

There were highly statistically significant relations between all sociodemographic characteristics and total depression symptom scores among pregnant women ($P= 0.000$, $P= 0.00$, $p= 0.001$ & $p= 0.000$) (Table 7).

Concerning the relation between depression symptom scores and neonate outcomes as clarified in table (8), pregnant women with severe depression symptom scores were liable to have an increased risk of newborns having adverse birth outcomes such as low birth weight, small for gestational age, and shorter length. Statistically significant differences were found between anthropometric measurements of newborns with regard to birth weight, weight-for-GA and length ($P= 0,000$, $p= 0.000= p= 0, 00$) respectively. In table (8) 57.5% and 41.2% of neonates, their Apgar scores from zero to six in the first and fifth minutes, respectively, were affected by the severity symptoms of their mothers' depression symptoms. Statistically significant relations found between severe depression symptom scores, and prematurity (16.9%), the need for resuscitation (25.0%), and the need for admission to neonatal intensive care unit (18.8%).

Table (9) shows a statistically significant relation found between maternal

depression and anxiety during pregnancy, and neonatal outcomes ($p= 0.000$).

Discussion

In the present study, anxiety, and symptoms of depression during pregnancy significantly increased the risk of low birth weight, small for gestational age, shorter length, prematurity, need for resuscitation, and need for admission to neonatal intensive care units. An association was observed between antenatal maternal depression symptoms and low birth weight. Women with significantly higher EPDS scores were more likely to have low birth weight infants.

The present study results, revealed that less than three fifth of the pregnant women age between 23 < 28 years had severe anxiety. This is because pregnancy is considered to be a period of psychological changes and challenges to pregnant women. This finding was in accordance with that of a study carried out in Malaysia by **Nagandla et al., (2016)**, who studied Prevalence and associated risk factors of depression, anxiety, and stress in pregnancy and reported that anxiety and depression are associated with identifiable socio-economic characteristics.

The present study finding reported that all of the women with severe level of anxiety were from rural areas. This may be a result of a knowledge deficit and a decrease in social support about health care.

According to the levels of anxiety among employed pregnant women, the current study result mentioned that the majority of housewives suffered from severe anxiety level, whereas two-thirds of employed women had mild anxiety level. This may be because housewife pregnant women have more responsibility for household wealth and lack of other support, but working women may speak with their friends and discuss

pregnancy topics as obtaining more support from them. This result was congruent with that of a study performed in Ethiopia by **Gefinet et al., (2018)** while found that antenatal anxiety and depression symptoms were significantly associated with women's occupation.

The current study result indicated that highly statistically significant differences were found between sociodemographic characteristics and different anxiety levels. This means that anxiety levels may be high among pregnant women in the middle age group, unemployed, low education, and reside rural areas. Therefore, health care providers should take into consideration these results as a vital foundation in assessment, planning, investigation, prevention, treatment, education, research, and developing mental health educational programs. This result was similar to that of the study conducted in New Zealand by **Signal et al., (2017)**, who clarified that antenatal mental health requires special attention in the prenatal period.

As highlighted by **Szegda et al., (2013)**, and reported the support of others may be considered an important factor among pregnant women because it can decrease the symptoms of antenatal anxiety and depression; however, it was improving for intervention to pregnancy outcomes. This result can make attention to how nurses can be included with health care providers in helping to reduce or antenatal maternal health-related issues, and increase pregnant women's awareness.

Furthermore, **Yang et al., (2017)**, mentioned that anxiety among pregnant women was related to low maternal self-esteem, which may reduce their fetal growth throughout physiologic changes. Therefore, nurses' awareness about changes in maternal mental health status among pregnant women is very important for

applying appropriate policies and providing measures that promote mental health during pregnancy as much as possible. This finding was also in line with that of **Noor et al., (2015)**, in their study in Iran, which revealed that maternal anxiety increases with pregnancy age.

The current study result reflected the relationship between anxiety levels and neonate outcomes, as pregnant women with severe anxiety were more liable to have increased risk newborns having adverse birth outcomes such as low birth weight, small for gestational age, and shorter length.

This result was in agreement with that of the study carried out by **Grote et al., (2010)**, which detected the relationship between anxiety and depression on birth outcomes that included fetal growth, delivery complications, low birth weight, and SGA at the time of delivery, and maternal postpartum depression. In this result **Kumari and Joshi (2014)**, in India, detected that maternal anxiety and depression during pregnancy have been associated with shorter gestation and higher incidence of preterm birth, low birth weight and increased risk of miscarriage

The current study result showed that nearly three-quarters of the studied women were 23 < 28 years old, approximately two-thirds of them were working, slightly more than one-quarter of them had a university education, and most of them reside rural areas, these women had severe depressive symptoms. Additionally, highly statistically significant relationships were detected between all socio-demographic characteristics and total depression symptom scores among pregnant women ($r= 0.000$, $r= 0.00$, $p= 0.001$, & $p= 0.000$) respectively. This might be related to a lack of knowledge about health care during pregnancy.

The present study finding reported that antenatal depression symptoms were more common among rural residents than urban ones. This may be related to immigration factors, such as dialect, social isolation, life adaption, unfair opportunities, economic problems, or the lack realization of sufficient health care in these rural areas.

The current result study revealed a relation between depression symptom scores and neonate outcomes, as pregnant women with severe depression symptom scores are more liable to have an increased risk of newborns having adverse birth outcomes such as, low birth weight, small for gestational age, and shorter length. Significant differences were found between anthropometric measurements of newborns with regard to birth weight, weight-for-GA and height ($r=0.000$, $r=0.000$ and $p=0.000$) respectively.

This study result was in agreement with that of the study conducted by **Netsi et al., (2018)**, who mentioned that depression severity is associated with higher risks for child outcomes both in the antenatal and postnatal periods.

Similarly, **Elena et al. (2020)** who studied female newborns whose mothers experienced more severe depression during pregnancy found an increased risk of having lower weight scores, being SGA and in the lower 10 the centile for length. Additionally, **Horta et al. (2017)** reported similar findings. These results were similar to those of a very recent study conducted by **Li et al. (2020)**, who found that pregnant women with severe antenatal depressive symptoms had a higher rate and elevated risk of LBW and SGA.

However, the previous results were in disagreement with **Al-Azri et al. (2016)**, who studied the prevalence and risk factors of antenatal depression among

the studied Omani women in a previous care setting in comparison to findings from other Arab countries.

The current study finding revealed that Apgar scores zero to six in the first and fifth minutes are related to severe depression symptoms, and statistically, significant relationships were found between severe depression symptom scores and prematurity, need for resuscitation, and need for admission to neonatal intensive care unit. These results may indicate that newborns need medical assistance and indicated the negative impact of mothers' depression on their neonates.

Similarly, **Raisanen et al. (2014)** and **Upadhyaya, (2016)** reported that pregnant women suffering from depression symptoms have adverse neonatal outcomes such as, low birth weight, Apgar score <7 at 5 min, admission to neonatal intensive care unit, stillbirth, and preterm birth. **Buss et al. (2010)** detected an association between antepartum depression and the risk of preterm birth and a range of altered physical and physiological fetal outcomes. On the other hand, **Staneva et al. (2015)**, in a systematic review in Australia, that there was a modest relations between depression during pregnancy and low birth weight and preterm birth.

In contrast to the result study finding **Grigoriadis et al. (2013)**, revealed that there was no association between antepartum depression and other adverse outcomes such as low birth weight (LBW), admission to a neonatal (NICU), and low Apgar score. Additionally, a study carried out by **Glover (2014)** in Germany, found no relationship between antenatal depression and anxiety and neonatal outcome. There may be using different tools as well as different cultural and financial factors.

In a similar study **Yang et al. (2017)** found that women with

depression, assessed at < 29 weeks gestational age, had 71% an increased risk of LBW among 583 women in Bangladesh. As well, **Accortt et al. (2015)** suggested that depression, especially in early pregnancy, may be a risk factor for LBW.

The current result study revealed a statistically significant relationship

Table (1): Frequency and Percentage Distribution of Studied Pregnant Women According to their Sociodemographic Characteristics (n=216)

Socio-demographic characteristics		No. (216)	%
Age in years			
-	18 -< 23	35	16.0
-	23 -< 28	123	57.0
-	28 < 30	58	27.0
	Range	18 - 30 years	
Education			
-	Illiterate	11	5.0
-	Read and write	65	30.0
-	Primary education	30	14.0
-	Secondary education	67	31.0
-	University education	43	20.0
Type of delivery:			
-	Vaginal delivery	147	68.0
-	Cesarean delivery	69	32.0
Parity:			
-	1	32	15.0
-	2- 4	173	80.0
-	5+	11	5.0

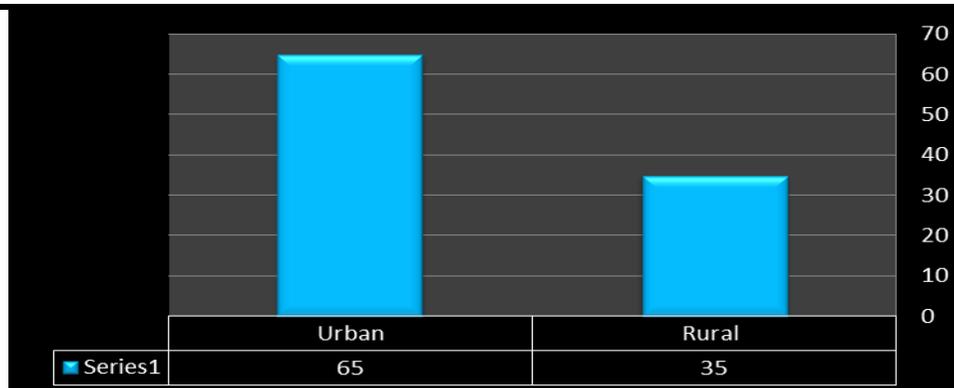


Figure (1): Percentage Distribution of Studied Pregnant Women According to their Residence (n=216)

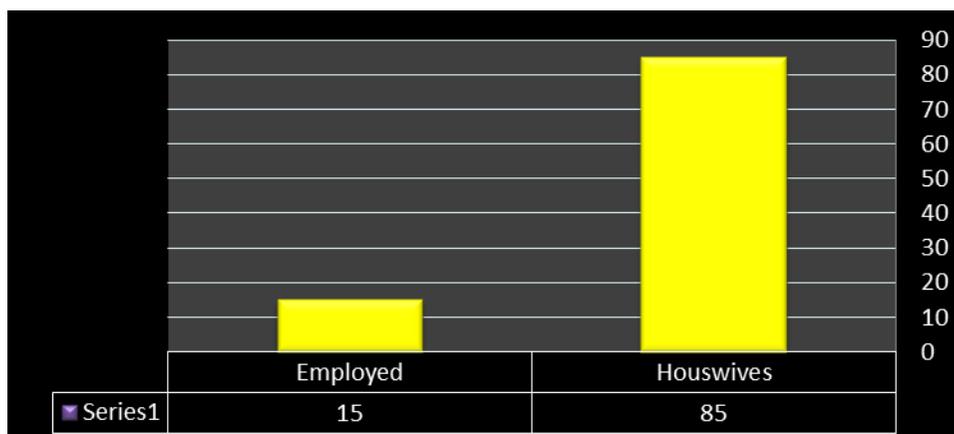


Figure (2): Percentage Distribution of Studied Pregnant Women According to their Occupation (n=216)

Table (2): Frequency and Percentage Distribution of Studied Newborns According to their Socio-demographic Characteristics (n=216)

Socio-demographic characteristics	No. (216)	%
Gender		
- Male	124	57.5
- Female	92	42.5
Birth order		
- First birth	43	20.0
- Second birth	100	46.0
- Third birth	73	34.0
Gestational age at birth		
- 28 - 33	39	18.0
- 33 - 37	140	65.0
- 37 - 42	37	17.0

Table (3): Frequency and percentage distribution of studied newborns according to their anthropometric measurements (n=216)

Anthropometric measurements	No. (216)	%
Birth weight		
- 2 -< 3	60	28.0
- 3 -< 4	145	67.0
- 4 - 4.5	11	5.0
Weight for gestational age		
- SGA	58	27.0
- AGA	137	63.0
- LGA	21	10.0
length		
- < 1.60	76	35.0
- \geq 1.60	140	65.0

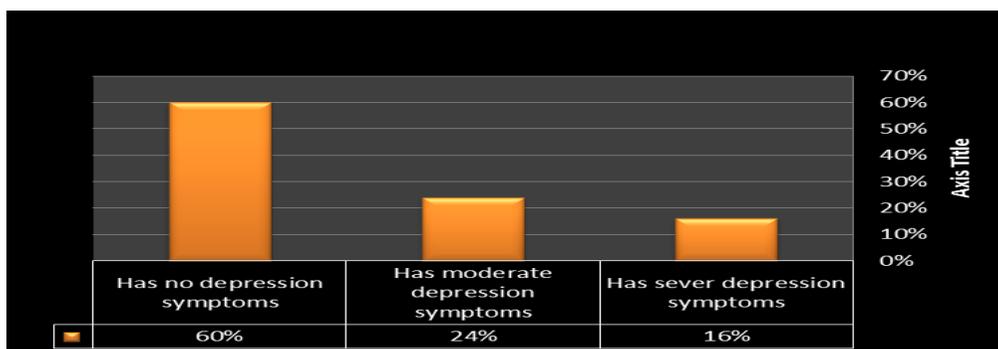
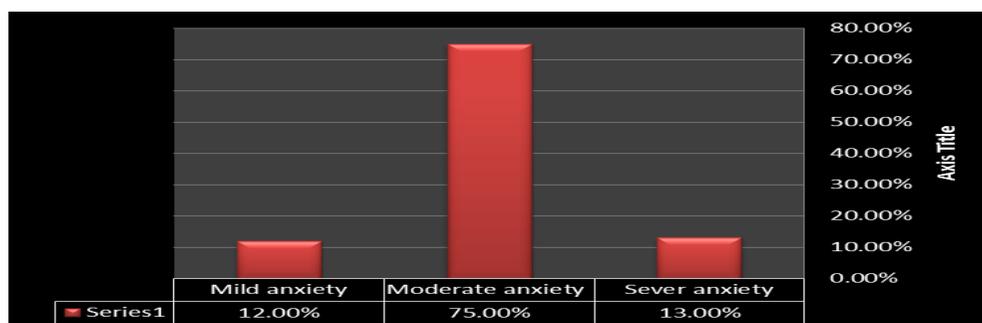
**Figure (3):** Percentage Distribution of Studied Pregnant Women According to their Edinburgh Postnatal Depressive Scale (EPDS) Levels (n=216)**Figure (4):** Percentage Distribution of Studied Pregnant Women According to their Beck Anxiety Inventory (BAI) Levels (n=216).

Table (4): Frequency and Percentage Distribution of Studied Newborns Regarding their Apgar Score Assessment (n=216)

Neonatal outcomes	No. (216)	%
Total Apgar score at 1st minute:		
- (0-6)	104	48.0
- (7-10)	112	52.0
Total Apgar score at 5th minute:		
- (0-6)	76	35.0
- (7-10)	140	65.0
Prematurity:		
- Yes	24	11.0
- No	192	89.0
Need for resuscitation:		
- Yes	64	29.2
- No	152	70.8
Admission to neonatal ICU:		
- Yes	33	15.4
- No	183	84.6

Table (5): Relation between Anxiety Levels during Pregnancy and Sociodemographic Characteristics of Studied Women (n=216).

Socio-demographic characteristics	Anxiety levels						X2	P-value
	Mild anxiety (n=26)		Moderate anxiety (n=162)		Sever anxiety (n=28)			
	No	%	No	%	No	%		
Pregnant women age (in years.):								
- 18 < 23	5	16.0	95	58.6	10	37.5	0.652	0.000
- 23 < 27	14	57.0	51	31.4	15	52.5		
- 28 < 30	7	27.0	16	10.0	3	10.0		
Education							0.953	0.001
- Illiterate	1	5.0	21	13.0	1	5.0		
- Read and write	8	30.0	26	16.0	6	20.0		
- Primary education	3	14.0	24	15.0	5	19.0		
- Secondary education	9	31.0	63	39.0	12	41.0		
- University education	5	20.0	28	17.0	4	15.0		
Occupation :							0.753	0.000
- Employed	17	66.7	100	61.6	4	15.0		
- Housewives	9	33.3	62	38.4	24	85.0		
Residence:							0.607	0.00**
- Rural	9		159	98.3	28	100		
- Urban	17	65.0	3	1.7	0.0	0.0		

Table (6): Relation between Anxiety Levels during Pregnancy and Neonate Outcomes among Studied Newborns (no=216)

Anthropometric measurements	Anxiety levels						X2	P= value
	Mild anxiety (n= 26)		Moderate anxiety (n=162)		Sever anxiety (n= 28)			
	No	%	No	%	No	%		
Birth weight								
- 2 < 3	7	28.0	62	38.0	14	48.0	0.678	0.000***
- 3- < 4	18	67.0	84	52.0	10	37.0		
- 4 - 4.5	1	5.0	16	10.0	4	15.0		
Weight for gestational age								
- SGA	7	27.0	60	37.0	13	47.0	0.967	0.000***
- AGA	16	63.0	70	43.0	10	35.0		
- LGA	3	10.0	32	20.0	5	18.0		
length								
- < 1.60	9	35.0	89	55.0	20	75.0	0.543	0.00**
- ≥ 1.60	17	65.0	73	45.0	7	25.0		
Neonatal outcomes								
Total Apgar score at 1st minute:								
- 0-6	5	22.2	56	34.5	22	77.5	0.654	0.00**
- 7-10	21	77.8	106	65.5	6	22.5		
Total Apgar score at 5th minute:								
- 0-6	4	16.7	22	13.8	20	71.2	0.556	0.00**
- 7-10	22	83.3	140	86.2	8	28.8		
Prematurity:								
- Yes	0	0.0	37	23.0	22	76.9	0.879	0.000***
- No	26	100.0	125	77.0	6	23.4		
Need for resuscitation:								
- Yes	2	11.1	18	11.2	18	65.0	0.967	0.000***
- No	24	88.9	144	88.8	10	35.0		
Admission to neonatal ICU:								
- Yes	1	5.6	10	6.0	22	78.8	0.606	0.00**
- No	25	94.4	152	94.0	6	21.2		

Table (7): Relation between Total Depression Symptom Scores among Pregnant Women during Pregnancy and their Sociodemographic Characteristics

Socio-demographic characteristics	Depression symptoms						r-value	P-value
	Has no depression symptom <13 (52)		Has moderate depression symptoms 13–16 (130)		Has severe depression symptoms ≥17 (34)			
	No	%	No	%	No	%		
Pregnant women age (in years.):								
- 18 < 23	8	16.0	121	93.1	6	17.0	0.972	0.000***
- 23 < 28	30	57.0	6	4.9	25	73.0		
- 28 < 30	14	27.0	3	2	3	10.0		
Education							0.652	0.00**
- Illiterate	3	5.0	7	5.0	3	9.1		
- Read and write	16	30.0	26	20.0	3	10.0		
- Primary education	7	14.0	25	19.0	3	10.0		
- Secondary education	16	31.0	53	41.0	16	45.0		
- University education	10	20.0	19	15.0	9	25.9		
Occupation :							0.564	0.001**
- Employed	35	66.7	105	81.0	22	65.4		
- Housewives	17	33.3	25	19.0	12	34.6		
Residence:							0.987	0.000***
- Rural	18	35.0	121	93.1	33	96.9		
- Urban	34	65.0	9	6.9	1	3.1		

Table (8): Relation between Total Depression Symptom Scores during Pregnancy and Neonatal Outcomes (n-216)

Anthropometric measurements	Depression symptoms						r-value	P= value
	Has no depression symptoms <13(52)		Has moderate depression symptoms<13 (130)		Has severe depression symptoms<13 (34)			
	No	No	No	No	No	No		
1-Birth weight							0.963	0.000***
- 2- < 3	14	28.0	49	38.0	16	48.0		
- 3 < 4	35	67.0	68	52.0	13	37.0		
- 4 - 4.5	3	5.0	13	10.0	5	15.0		
2- Weight for gestational age							0.953	0.000***
- SGA	14	27.0	48	37.0	16	47.0		
- AGA	33	63.0	56	43.0	12	35.0		
- LGA	5	10.0	26	20.0	6	18.0		
3- Length							0.675	0.00**
- < 1.60	18	35.0	71	55.0	25	75.0		
- ≥ 1.60	34	65.0	59	45.0	9	25.0		
Neonatal outcomes							0.589	0.00**
Total Apgar score at 1st minute:	12	22.2	45	34.5	20	57.5		
- 0-6	40	77.8	85	65.5	14	42.5		
- 7-10								
Total Apgar score at 5th minute							0.606	0.00**
- (0-6)	9	16.7	18	13.8	14	41.2		
- 7-10	43	83.3	112	86.2	20	58.8		
Prematurity:							0.853	0.000***
- Yes	0	0.0	30	23.1	6	16.9		
- No	52	100.0	100	76.9	28	83.1		
Need for resuscitation:							0.933	0.000***
- Yes	6	11.1	15	11.2	9	25.0		
- No	46	88.9	115	88.8	25	75.0		
Admission to neonatal ICU							0.678	0.00**
- Yes	3	5.6	8	6.0	6	18.8		
- No	49	94.4	122	94.0	28	81.2		

Table (9): Relation between Maternal Depression and Anxiety during Pregnancy and Neonatal Outcomes (n=216)

Neonatal Outcomes	Maternal depression	Maternal anxiety	r-value	p-value
Birth weight	2.1 ± 1.58	2.65 ± 1.60	0.893	0.000
Weight for gestational age	38.57± 1.50	38.80± 1.40	0.693	
length	48.18± 2.35	48.43± 2.27	0.768	
Total Apgar score at 1 st minute	94.1± 8.00	99.15± 4.85	0.574	
Total Apgar score at 5th minute	64.18± 2.05	72.18± 2.05	0.745	
Prematurity	22.18± 2.05	21.18± 3.05	0.936	
Need for resuscitation	52.18± 8.35	58.18± 2.35	0.607	
Admission to neonatal ICU	28.19± 4.35	30.18 ± 2.35	0.875	

Conclusion:

Based on the current study findings, conclude that, there is a relationship between anxiety levels and depression symptom scores of the pregnant women and neonate outcomes that are represented in liability to have an increased risk of newborns having adverse birth outcomes such as, low birth weight, small for gestational age, shorter length, prematurity, need for resuscitation and need for admission to neonatal intensive care unit.

Recommendations:

- Providing pregnant women health educational programs about the effects of depression and anxiety on them and on their neonates. Nonpharmaco-logical interventions are important treatments for depression and anxiety that focus on promoting a healthy lifestyle with adequate nutrition, exercise and sleep.
- Providing psychoeducation for pregnant women during their follow up of visit in the MCH and antenatal clinics for routine care to enable these mothers to benefit from interventions targeted at improving pregnancy and neonatal outcomes.
- Researches should be conducted to detect other common mental health problems during pregnancy.

- Further studies could be conducted to explore the effects of both maternal depression and anxiety on other topics of fetal-neonatal behaviors and maturation.

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- No

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