

The Relationship between Maternal Biosocial Determinants and Infant Birth Weight

Mohammad Zare Neyestanak (MSc)¹, Masoud Gholamali Lavasani (PhD)^{2*}, Gholamali Afrooz (PhD)³

¹ PhD Student, Department of Psychology and Exceptional Children Training, Islamic Azad University, Science and Research Branch, Tehran, Iran

² Associate Professor, Department of Psychology and Training Sciences, Tehran University, Tehran, Iran

³ Professor, Department of Psychology and Training Sciences, Tehran University, Tehran, Iran

ARTICLE INFO	ABSTRACT
<p><i>Article type:</i> Original article</p>	<p>Background & aim: Low birth weight (LBW) is the center of focus as a cause of many social, emotional, and mental deficiencies. The identification of the probable causes of LBW is considered as an important measure in reducing the prevalence of this health problem. Regarding this, the present study was carried out to compare some of the mental and social traits in the mothers of normal weight newborns and those with LBW neonates.</p> <p>Methods: This cross-sectional study was conducted on the parents of 400 neonates selected by the proportional sampling technique in Isfahan, Iran. The participants were assigned into two groups of mothers including 200 subjects with LBW neonate and 200 cases with normal birth weight newborns. The data were collected using the Depression, Anxiety, and Stress Scale (DASS-42) developed by Lavibond and Lavibond in 1995 and the couple satisfaction index.</p> <p>Results: According to the results of the study, there was a significant difference between the two groups of mothers in terms of depression, stress, anxiety, age, medicine consumption, level of education, and marital satisfaction ($P < 0.001$). However, the history of urinary tract infection was not significantly different between the two groups.</p> <p>Conclusion: As the findings of this study revealed, different aspects of maternal mental health can affect the pregnancy outcome through many pathways. Regarding this, the implementation of the interventions improving the maternal mental health might be useful in the reduction of the neonatal and pediatric mortality and morbidity.</p>
<p><i>Article History:</i> Received: 30- Aug-2016 Accepted: 25- Oct -2016</p>	
<p><i>Key words:</i> Anxiety Birth weight Depression Level of couple satisfaction Stress</p>	

► Please cite this paper as:

Zare Neyestanak M, Gholamali Lavasani M, Afrooz Gh. The Relationship between Maternal Biosocial Determinants and Infant Birth Weight. Journal of Midwifery and Reproductive Health. 2017; 5(3): 935-941. DOI: 10.22038/jmrh.2017.8324

Introduction

The term low birth weight (LBW) is used to identify those neonates with a weight under 2,500 g. Birth weight is considered as an important health index since the newborns with low weight are more vulnerable to death and immaturity (1). The LBW is caused by premature delivery or intrauterine growth limitations (2). The LBW is a major risk factor for the neonatal and pediatric mortality, and the children with this condition face more growth and developmental problems, such as cognitive impairment, and chronic adult health issues (3, 4). Annually, about 18 million low weight neonates are born worldwide (5), which

constitutes 14% of the total birth rate and contributes to 80% of the neonatal mortality (6).

The LBW rate is estimated to be about 10% in Iran (7). According to the literature, despite the improvement of many health statistics in Iran in the recent decades (8), the LBW rate has not decreased (9). Due to the high burden and serious consequences of LBW, it is of crucial importance to the public health and policy makers to determine the probable causes of this problem and implement some programs to reduce the number of the involved neonates.

One of the World Health Organization's goals

* Corresponding author: Masoud Gholamali Lavasani, Associate Professor, Department of Psychology and Training Sciences, Tehran University, Tehran, Iran. Tel: +982161117405; Email: Lavasani@ut.ac.ir

is the achievement of a birth weight of 2,500 g or more for 90% of the newborns in the developing countries, which can be fulfilled through the implementation of community-based interventions (10). Maternal factors may have direct and indirect impacts on the neonatal birth weight (11). Among these factors, the genetic, socio-cultural, demographic, and environmental determinants, medical and behavioral conditions, as well as the biological, mental, and emotional traits have been evaluated (12).

Studies have shown that the poor maternal mental health may result in the impaired motor growth, behavioral changes, digestive problems, and growth retardation in the infants (13). In a study conducted by Gracka, the mothers suffering from negative feelings and emotions or high levels of anxiety and depression experienced some problems in their fetal growth and had a high probability of having a LBW neonate (14).

There is a body of literature supporting the association between the maternal mental state and various pregnancy outcomes. Nevertheless, it is generally believed that the strength of the adverse effects of mental health disorders on pregnancy outcomes might be affected by the socioeconomic status of the parents as well as the community. These effects are different in the low- and middle-income countries, compared to the high-income countries. Accordingly, a number of studies have revealed the differences between the developed and developing countries, as well as rural and urban areas (15, 16).

The mental health services are considered as a preventive measure delivered during the antenatal period. However, prior to the dedication of the respective resources for each community, some evidence is needed. With this background in mind, the present study was conducted to investigate some of the mental and social traits of the mothers and determine their association with the birth weight of their newborns.

Materials and Methods

This cross-sectional study was conducted on the parents of 400 neonates in Isfahan province, Iran, within September 22, 2012-September 21, 2014. The study was approved by the Department of Psychology and Exceptional

Children Training of Islamic Azad University, Tehran, Iran. Based on the previous studies and Cochran method and considering the rate of total LBW occurrence (10%) in the province under investigation, the sample size was determined to be 400 cases.

The participants were assigned into two groups of mothers, including 200 subjects with LBW neonate and 200 cases with normal birth weight newborns. The evaluated variables were maternal stress, anxiety, depression, age, and level of marital satisfaction. The sampling was performed using the proportionate random sampling method. To this aim, the samples were randomly selected from each of the towns of Isfahan province (i.e., Naein, Isfahan, Khomeinishahr, Kashan, Shahreza, Golpayegan, Falavarjan, Mobarake, and Najafabad) in proportionate to the entire population. The data were analyzed in the SPSS version 17, using the descriptive statistics, t-test, and Chi-square test.

The psychological wellbeing of the participants was evaluated using the Depression, Anxiety, and Stress Scale (DASS-42) developed by Lavibond and Lavibond in 1995. This scale consists of 42 items to measure the depression, anxiety, and stress. This instrument is presented in form of a multiple-choice self-completion questionnaire (17).

This scale is rated on a four-point Likert scale ranging from normal to extremely severe. Lavibond and Lavibond (1995) reported the test-retest reliability values of 0.81, 0.79, and 0.71 for stress, anxiety, and depression subsections of this questionnaire, respectively. The concurrent validity of this scale was estimated using both Beck's Anxiety and Depression Questionnaires, rendering the values of 0.81 and 0.74, respectively (18, 19). The psychometric properties of the Persian version of the questionnaire have also been tested in the previous studies (20).

The couple satisfaction was evaluated by an instrument developed by Afrooz et al. This questionnaire has 51 items evaluating 10 scales, and its construct validity and internal consistency has been previously studied (21). The patients were also asked about the history of urinary tract infection during pregnancy and the use of any kind of medication (either with or without prescription).

Prior to the administration of the questionnaire, the researcher ensured the participants about the confidentiality of their data, and provided them with detailed information on the study objectives. The questionnaires were filled out after obtaining the participants' written informed consent. The data were analyzed using the descriptive (e.g., mean and standard deviation) and analytical statistics, including independent t-test, Chi-square test, and correlational analysis.

Results

According to the results, the mean ages of the mothers were 28.5 ± 6.37 and 25.7 ± 6.34 years in the LBW and normal weight groups, respectively ($P < 0.001$). As indicated in Table 1, the mean scores of maternal depression, anxiety, stress, and marital satisfaction were significantly higher in the LBW group than those of the normal weight group ($P < 0.001$, $P = 0.001$, $P < 0.001$, and $P < 0.001$, respectively) (Table 1).

Table 1. Comparison of depression, anxiety, stress, marital satisfaction, and age between the two study groups

	Mothers of low weight neonates	Mothers of normal weight neonates	T	P-value
Depression	10.66±4.56	6.53±4.46	9.16	<0.001
Anxiety	9.45±3.44	6.17±2.76	10.53	0.001
Stress	17.75±7.22	13.10±10.07	5.31	<0.001
Marital satisfaction	36.24±32.37	44.26±93.33	-5.63	<0.001

Furthermore, 28 (7%) and 11 (2.7%) participants reported to use medicine in the LBW and normal weight groups, respectively ($P = 0.004$).

According to Table 2, 6.5% and 5% of the mothers in the LBW and normal weight groups had elementary education, respectively.

Furthermore, 13% and 19% of the participants in the LBW and normal weight groups had academic degrees, respectively (i.e., bachelor's or higher education levels). There was a significant relationship between the maternal education level and their newborns' LBW ($P = 0.012$).

Table 2. Comparison of educational status between the two study groups

Level of education	Mothers of low weight neonates N(%)	Mothers of normal weight neonates N(%)
Illiterate	0(0)	5(1.2)
Elementary	26(6.5)	20(5)
Diploma	119(29.7)	97(24.2)
Academic degree	55(13.7)	78(19.5)

Additionally, 9 (2.2%) and 2 (1%) mothers in the LBW and normal weight groups had the history of urinary infection, respectively. Nonetheless, no significant relationship was observed between this factor and birth weight ($P = 0.276$).

Discussion

As the findings of this study indicated, the mothers of the LBW neonates demonstrated higher levels of depression, anxiety, and stress as well as lower level of marital satisfaction. In a cohort study conducted by Patel and Prince, the maternal psychological morbidity was reported to have adverse effect on the neonatal birth

weight, even after adjusting for the maternal age, education status, and family income (22).

The adverse effects of depression on birth outcome have also been documented in a study carried out by Chen and Lin (23). A depressed mother ignores the required cares during antenatal period due to the consumption of antidepressants on one hand, and low energy level, negative attitude, and feeling disappointed on the other hand (23). The consumption of antidepressant medications, especially during the second and third trimester of pregnancy, increases the risk of premature delivery and LBW (24).

Nonetheless, some studies conducted in the

developed countries have not confirmed the adverse obstetric or neonatal effect of depression (25), highlighting the importance of detailed evaluation of causal relationships in this context. In the present study, the mothers in the LBW group had higher anxiety level, compared to those in the normal weight group. It is believed that the maternal anxiety increases epinephrine and norepinephrine levels, which in turn increases arterial contractions and leads to a slower intrauterine growth, LBW, and preeclampsia.

The effect of such altered physiology can continue throughout the neonatal course of life (26). Although this pathway is acceptable according to many researchers, the degree of impact might be different based on many intermediate variables at each step and even diminishes as highlighted in other studies.

The increased risk of the LBW is also observed with other mental morbidities (27). The psychological morbidity not only increases the chance of LBW, but also continues to adversely affect the child development and growth (28). This effect is shown to hinder the emotional, cognitive, and behavioral development of the children even in the high-income countries (29). It is essential to conduct studies highlighting the variables that may hinder or accelerate such impacts.

The mental stress, whether caused by the strains emanated from inside or outside of the family, can have an adverse impact on the maternal and neonatal health (30, 31). Researchers have shown that the maternal stress during pregnancy, which is caused by financial, emotional, trauma, and marital problems, has a determining impact on premature delivery and LBW (32). On the other hand, some studies demonstrated that the association between maternal mental health and pregnancy outcome is not consistent in different populations (25, 33, 34). Accordingly, these effects fade or even diminish in the healthier samples or those living in more developed countries.

In the present study, the mothers in the LBW group had lower marital satisfaction, compared to those in the normal weight group. The previous studies conducted in other countries and Iran have also obtained similar findings

(35). Low satisfaction with the partner strongly affects the maternal emotional distress during pregnancy, which in turn, increases the risk of poor pregnancy outcomes (36).

Some researchers have reported that dissatisfaction with marital life tends to increase the anxiety, and consequently the feeling of failure, disappointment, and depression in the family environment. These changes consequently result in negative outcomes such as LBW, premature delivery, and other abnormalities in the neonates (37). There was a significant difference between the two groups in terms of the maternal age at pregnancy. The previous studies showed a significant relationship between the maternal age and neonatal weight (38).

Based on the American College of Obstetrics and Gynecology statistics, the dangers caused by maternal age include fetal growth disorder, premature delivery, and multi-fetal pregnancy (39). It has been suggested that the maternal level of health is decreased through aging, which results in LBW and premature delivery. However, the previous studies have demonstrated that the effects of mental disorders are persistent after adjusting the maternal age (22).

We also observed the history of different medication use during pregnancy in our participants, which might indicate different perceived or actual health status between the two groups. Antidepressants might be one of the probable effective medications, which are consumed during the antenatal period, which have been reported to correlate with LBW (24). In the present study, there was a significant association between the maternal literacy level and LBW, which is in line with the findings of the studies conducted in Brazil (40, 41), England (42), Bangladesh (43), and Iran (44).

In a study conducted by Matin et al. in Bangladesh, 50% of the mothers with low weight newborns were illiterate (43). Prenatal cares are insured by high levels of parents' knowledge, qualified individuals for delivering health care, and suitable services in the health care centers for high risk mothers. A rise in the parental knowledge is expected to happen parallel with the increase in their education level. That is why the parents' educational status affects their knowledge of prenatal cares.

Although the number of mothers with

urinary tract infection in the LBW group was almost twice as the normal weight group, the difference was not statistically significant. Likewise, the urinary infection was also demonstrated to have a direct relationship with premature delivery and LBW (45, 46). Despite the general idea, some recent nationwide studies have not reported any increased risk of adverse pregnancy outcomes in the women experiencing urinary tract infection (47).

It might be assumed that the improved coverage of maternal care during pregnancy in our country and existing health education programs (which leads to increased knowledge of the general population about warning signs in pregnancy) might have resulted in on-time diagnosis and treatment of urinary tract infection in pregnant women and diminishing its negative effects on fetus.

We should distinguish between the history of urinary tract infection during pregnancy and untreated or recurrent infection as a probable risk factor.

It should be taken into consideration that pregnancy is accompanied by various degrees of distress (48). According to the literature, antenatal depression, pregnancy-related anxiety, marital satisfaction, and socioeconomic status are interrelated (49). On the other hand, untreated antenatal mental disorders may increase the risk of postpartum problems and seriously threaten the neonatal health and development (50).

In a systematic review conducted by Ding et al. in 2014, the association between anxiety and LBW was stronger in the Asian women, compared to those in the European countries (51). Antenatal depression is a public health concern both due to its short/long-term effects on pregnancy outcome and underutilization of pregnancy health care services (50).

Conclusion

As the findings of the present study indicated, there was an association between the maternal mental health and pregnancy outcomes. This relationship can be explained through different pathways and considered as a critical intervention point for the health programs, which intend to reduce the neonatal and pediatric mortality and morbidity.

Acknowledgements

We sincerely appreciate the management of hospitals for their cooperation and support.

Conflicts of Interest

The authors declare no conflicts of interest.

References

1. World Health Organization. International statistical classification of diseases and related health problems. 10th ed. Geneva: World Health Organization; 2010.
2. Smith GC, Lees CC. Disorders of fetal growth and assessment of fetal well-being. 8th ed. New York: Dewhurst's Textbook of Obstetrics & Gynaecology; 2008. P. 200-207.
3. Lucas AO, Stoll BJ, Bale JR. Improving birth outcomes: meeting the challenge in the developing world. Washington, DC: National Academies Press; 2003.
4. Vahdaninia M, Tavafian SS, Montazeri A. Correlates of low birth weight in term pregnancies: a retrospective study from Iran. *BMC Pregnancy and Childbirth*. 2008; 8(1):12.
5. Lawn JE, Cousens S, Zupan J, Lancet Neonatal Survival Steering Team. 4 million neonatal deaths: when? Where? Why? *The Lancet*. 2005; 365(9462):891-900.
6. Talebian MH, Afrooz GA, Hooman HA, Aghaei A. The relationship between biological cognitive and psychosocial characteristics of parents and the weight of infant at the time of birth in Isfahan. *Journal of Education and Health Promotion*. 2013; 2:43.
7. Wardlaw TM. Low birth weight: country, regional and global estimates. Geneva: UNICEF; 2004.
8. Movahedi M, Haghdoost AA, Pournik O, Hajarizadeh B, Fallah MS. Temporal variations of health indicators in Iran comparing with other Eastern Mediterranean Region countries in the last two decades. *Journal of Public Health*. 2008; 30(4):499-504.
9. Jafari F, Eftekhari H, Pourreza A, Mousavi J. Socio-economic and medical determinants of low birthweight in Iran: 20 years after establishment of a primary healthcare network. *Public Health*. 2010; 124(3):153-158.
10. Bryce J, el Arifeen S, Pariyo G, Lanata CF, Gwatkin D, Habicht JP. Reducing child mortality: can public health deliver? *The Lancet*. 2003; 362(9378): 159-164.
11. Shin YH, Choi SJ, Kim KW, Yu J, Ahn KM, Kim HY, et al. Association between maternal characteristics and neonatal birth weight in a Korean population living in the Seoul metropolitan area, Korea: a birth cohort study (COCOA). *Journal of Korean*

- Medical Science. 2013; 28(4):580-585.
12. Nazari F, Vaisi Z, Sayehmiri K, Vaisani Y, Esteki T. Prevalence and trends of low birth weight in Iran: a systematic review and meta-analysis study. *Advances in Nursing & Midwifery*. 2013; 22(79):45-52. (Persian)
 13. Field T, Diego M, Hernandez-Reif M, Schanberg S, Kuhn C, Yando R, et al. Pregnancy anxiety and comorbid depression and anger: effects on the fetus and neonate. *Depression and Anxiety*. 2003; 17(3):140-151.
 14. Gracka-Tomaszewska M. Psychological factors during pregnancy correlated with infant low birth weigh. *Pediatric Endocrinology, Diabetes, and Metabolism*. 2009; 16(3):216-219.
 15. Faisal-Cury A, Araya R, Zugaib M, Menezes PR. Common mental disorders during pregnancy and adverse obstetric outcomes. *Journal of Psychosomatic Obstetrics & Gynecology*. 2010; 31(4):229-235.
 16. Farahani M. The association of personality traits and marital satisfaction and determinants of dissatisfaction in married students of Tehran University Islamic Azad University. [Master Thesis]. Tehran, Iran: Tehran University Islamic Azad University; 2008.
 17. Lovibond PF, Lovibond SH. The structure of negative emotional states: comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*. 1995; 33(3):335-343.
 18. Beck AT, Steer RA, Carbin MG. Psychometric properties of the beck depression inventory: twenty-five years of evaluation. *Clinical Psychology Review*. 1988; 8(1):77-100.
 19. Beck AT, Epstein N, Brown G, Steer RA. An inventory for measuring clinical anxiety: psychometric properties. *Journal of Consulting and Clinical Psychology*. 1988; 56(6):893.
 20. Afzali A, Delavar A, Borjali A, Mirzamani M. Psychometric properties of DASS-42 as assessed in a sample of Kermanshah High School students. *Journal of Research in Behavioral Sciences*. 2007; 5(2):81-92. (Persian)
 21. Ghodrati-Ali A, Ghodrati M. Developing and normalization of Afroz Marital Satisfaction Scale (AMSS) (short-form). *Psychology & Educational Science*. 2011; 41:1-9. (Persian)
 22. Patel V, Prince M. Maternal psychological morbidity and low birth weight in India. *The British Journal of Psychiatry*. 2006; 188(3):284-285.
 23. Chen CH, Lin HC. Prenatal care and adverse pregnancy outcomes among women with depression: a nationwide population-based study. *The Canadian Journal of Psychiatry*. 2011; 56(5):273-280.
 24. Huybrechts KF, Sanghani RS, Avorn J, Urato AC. Preterm birth and antidepressant medication use during pregnancy: a systematic review and meta-analysis. *PLoS One*. 2014; 9(3):e92778.
 25. Larsson C, Sydsjö G, Josefsson A. Health, sociodemographic data, and pregnancy outcome in women with antepartum depressive symptoms. *Obstetrics & Gynecology*. 2004; 104(3):459-466.
 26. Kinsella MT, Monk C. Impact of maternal stress, depression & anxiety on fetal neurobehavioral development. *Clinical Obstetrics and Gynecology*. 2009; 52(3):425.
 27. Miller RL, Pallant JF, Negri LM. Anxiety and stress in the postpartum: is there more to postnatal distress than depression? *BMC Psychiatry*. 2006; 6(1):12.
 28. Patel V, Rahman A, Jacob K, Hughes M. Effect of maternal mental health on infant growth in low income countries: new evidence from South Asia. *BMJ*. 2004; 328(7443):820-823.
 29. Murray L, Cooper PJ. Effects of postnatal depression on infant development. *Archives of Disease in Childhood*. 1997; 77(2):99-101.
 30. Rondo PH, Ferreira RF, Nogueira F, Ribeiro MC, Lobert H, Artes R. Maternal psychological stress and distress as predictors of low birth weight, prematurity and intrauterine growth retardation. *European Journal of Clinical Nutrition*. 2003; 57(2):266-272.
 31. Kay R. Maternal Stress and Infant Outcomes: the impact of perinatal anxiety on pregnancy and delivery outcomes. [Master Thesis]. Michigan: University of Michigan; 2009.
 32. Borders AE, Grobman WA, Amsden LB, Holl JL. Chronic stress and low birth weight neonates in a low-income population of women. *Obstetrics & Gynecology*. 2007; 109(2):331-338.
 33. Andersson L, Sundström-Poromaa I, Wulff M, Åström M, Bixo M. Neonatal outcome following maternal antenatal depression and anxiety: a population-based study. *American Journal of Epidemiology*. 2004; 159(9):872-881.
 34. Berle JQ, Mykletun A, Daltveit AK, Rasmussen S, Holsten F, Dahl AA. Neonatal outcomes in offspring of women with anxiety and depression during pregnancy. *Archives of Women's Mental Health*. 2005; 8(3):181-189.
 35. Fallah MH, Afrouz GA, Heidari GA. Examining the factors effective on birth weight among babies of Yazd Province in 2007. *Toloo-E-Behdasht*. 2008; 7(3-4):57-64. (Persian)
 36. Røysand GM, Slinning K, Eberhard-Gran M, Røysamb E, Tambs K. Partner relationship satisfaction and maternal emotional distress in early pregnancy. *BMC Public Health*. 2011; 11(1):161.
 37. Witt WP, DeLeire T, Hagen EW, Wichmann MA,

- Wisk LE, Spear HA, et al. The prevalence and determinants of antepartum mental health problems among women in the USA: a nationally representative population-based study. *Archives of Women's Mental Health*. 2010; 13(5):425-437.
38. Tough SC, Newburn-Cook C, Johnston DW, Svenson LW, Rose S, Belik J. Delayed childbearing and its impact on population rate changes in lower birth weight, multiple birth, and preterm delivery. *Pediatrics*. 2002; 109(3):399-403.
39. Tabcharoen C, Pinjaroen S, Suwanrath C, Krisanapan O. Pregnancy outcome after age 40 and risk of low birth weight. *Journal of Obstetrics and Gynaecology*. 2009; 29(5):378-383.
40. de Souza Buriol VC, Hiraakata V, Goldani MZ, da Silva CH. Temporal evolution of the risk factors associated with low birth weight rates in Brazilian capitals (1996-2011). *Population Health Metrics*. 2016; 14(1):15.
41. Silva AA, Silva LM, Barbieri MA, Bettiol H, Carvalho LM, Ribeiro VS, et al. The epidemiologic paradox of low birth weight in Brazil. *Revista de Saúde Pública*. 2010; 44(5):767-775.
42. Chevalier A, O'Sullivan V. *Mother's education and birth weight*. London: University College London; 2007.
43. Matin A, Azimul S, Matiur AK, Shamianaz S, Shabnam JH, Islam T. Maternal socioeconomic and nutritional determinants of low birth weight in urban area of Bangladesh. *Journal of Dhaka Medical College*. 2008; 17(2):83-87.
44. Eghbalian F. Low birth weight causes survey in neonates. *Iranian Journal of Pediatrics*. 2007;17(Suppl 1):27-33.
45. Dimetry SR, El-Tokhy HM, Abdo NM, Ebrahim MA, Eissa M. Urinary tract infection and adverse outcome of pregnancy. *The Journal Of The Egyptian Public Health Association*. 2007; 82(3-4):203-218.
46. Rafati S, Borna H, Akhvirad MB, Fallah N. Maternal determinants of giving birth to low-birth-weight neonates. *Archives of Iranian Medicine*. 2005; 8(4):277-281.
47. Chen YK, Chen SF, Li HC, Lin HC. No increased risk of adverse pregnancy outcomes in women with urinary tract infections: a nationwide population-based study. *Acta Obstetrica et Gynecologica Scandinavica*. 2010; 89(7):882-888.
48. Buist A, Morse CA, Durkin S. Men's adjustment to fatherhood: implications for obstetric health care. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*. 2003; 32(2):172-180.
49. Rwakarema M, Premji SS, Nyanza EC, Riziki P, Palacios-Derflingher L. Antenatal depression is associated with pregnancy-related anxiety, partner relations, and wealth in women in Northern Tanzania: a cross-sectional study. *BMC Women's Health*. 2015; 15(1):68.
50. Bennett HA, Einarson A, Taddio A, Koren G, Einarson TR. Prevalence of depression during pregnancy: systematic review. *Obstetrics & Gynecology*. 2004; 103(4):698-709.
51. Ding XX, Wu YL, Xu SJ, Zhu RP, Jia XM, Zhang SF, et al. Maternal anxiety during pregnancy and adverse birth outcomes: a systematic review and meta-analysis of prospective cohort studies. *Journal of Affective Disorders*. 2014; 159:103-110.