Antenatal and postpartum depression: effects on infant and young child health and feeding practices

SS Madlala* and SM Kassier*

*Corresponding author, email: ssmadlala@gmail.com

Dietetics and Human Nutrition, University of KwaZulu-Natal, Pietermaritzburg, South Africa

Introduction
The perinatal period is a physically and emotionally stressful time for women. If the additional burden of depression is present, it can have a serious impact on the wellbeing of mother and infant by contributing to preterm delivery and having an impact on the mother and infant bond. The latter can result in suboptimal physical, social and cognitive development. Anxiety and depression is the third leading cause of disease burden for women 14 to 44 years of age. The World Health Organisation (WHO) reports that 15 to 57% of women in developing countries experience symptoms of depression. Maternal mental illness has a negative impact on infant and young child (IYC) growth, development and care, having serious health implications in terms of physical, cognitive and emotional well-being during crucial stages of the life span, such as the first 1000 days and early childhood. Various studies conducted in both developed and developing countries, have shown that maternal depression is associated with negative health outcomes such as: low birth weight, developmental delay, incomplete immunisation schedules, acute or chronic diarrhoea, somatic symptoms, disrupted sleep patterns and child abuse, as well as psychiatric and neuro-behavioural disorders. In addition, maternal depression impairs IYC care practices related to breastfeeding, health care, safety and development. It also contributes to inadequate nutrition during pregnancy as well as that of offspring during infancy and childhood, resulting in suboptimal brain development and inadequate growth. Infants with depressed mothers are not only vulnerable to becoming underweight, but also being stunted.

Keywords: antenatal depression, feeding practices, infant height, infant weight, maternal depression, postpartum depression

Globally, anxiety and depression is the third leading cause of disease burden for women 14 to 44 years of age. The World Health Organisation reports that 15 to 57% of women in developing countries experience symptoms of depression. Maternal mental illness has a negative impact on infant and young child (IYC) growth, development and care, having serious health implications in terms of physical, cognitive and emotional well-being during crucial stages of the life span, such as the first 1000 days and early childhood. Various studies conducted in both developed and developing countries, have shown that maternal depression is associated with negative health outcomes such as: low birth weight, developmental delay, incomplete immunisation schedules, acute or chronic diarrhoea, somatic symptoms, disrupted sleep patterns and child abuse, as well as psychiatric and neuro-behavioural disorders. In addition, maternal depression impairs IYC care practices related to breastfeeding, health care, safety and development. It also contributes to inadequate nutrition during pregnancy as well as that of offspring during infancy and childhood, resulting in suboptimal brain development and inadequate growth. Infants with depressed mothers are not only vulnerable to becoming underweight, but also being stunted.

Introduction
The perinatal period is a physically and emotionally stressful time for women. If the additional burden of depression is present, it can have a serious impact on the wellbeing of mother and infant by contributing to preterm delivery and having an impact on the mother and infant bond. The latter can result in suboptimal physical, social and cognitive development. Anxiety and depression is the third leading cause of disease burden for women 14 to 44 years of age. The World Health Organisation (WHO) reports that 15 to 57% of women in developing countries experience symptoms of depression. Maternal mental illness has a negative impact on infant and young child (IYC) growth, development and care, having serious health implications in terms of physical, cognitive and emotional well-being during crucial stages of the life span, such as the first 1000 days and early childhood. Various studies conducted in both developed and developing countries, have shown that maternal depression is associated with negative health outcomes such as: low birth weight, developmental delay, incomplete immunisation schedules, acute or chronic diarrhoea, somatic symptoms, disrupted sleep patterns and child abuse, as well as psychiatric and neuro-behavioural disorders. In addition, maternal depression impairs IYC care practices related to breastfeeding, health care, safety and development. It also contributes to inadequate nutrition during pregnancy as well as that of offspring during infancy and childhood, resulting in suboptimal brain development and inadequate growth. Infants with depressed mothers are not only vulnerable to becoming underweight, but also being stunted.

Keywords: antenatal depression, feeding practices, infant height, infant weight, maternal depression, postpartum depression

Evidence from randomised controlled trials and cohort studies shows that depressed mothers are inadequate care givers, as PPD is associated with inadequate mother-infant interaction, poor infant attachment and impairment of several parental care practices that include: sleep routines, child clinic visits and vaccinations, as well as increasing the risk of infant and maternal mortality. Failure to attain the Millennium Development Goal (MDG) four and five, is partially related to untreated maternal mental illness. There is a paucity of data regarding the screening and/or treatment of antenatal depression and PPD in the South African primary health care system. This is cause for concern as the most effective method for determining the risk for PPD and the treatment thereof is screening for its presence. Figure 1 illustrates the association between maternal depression and infant care, growth and development, as well as the factors that affect this association.

Methods
English, peer-reviewed papers published from 1996 to 2016 were accessed by using electronic databases. These databases were: Medline via PubMed, ScienceDirect, Google Scholar and Wiley Online Library. A secondary search was performed by scrutinising the reference list of papers. Keywords and/or combinations thereof used for electronic searches included: maternal depression, maternal mental health, maternal anxiety, antenatal depression, PPD, risk factors for antenatal depression and PPD, IYC feeding practices, IYC nutritional status and breastfeeding. The majority of studies used for the review were prospective cohort studies. Studies that primarily focused on chronic maternal depression and children older than five years were excluded. Table 1 outlines key focus points in this review.
The global prevalence of antenatal depression and PPD is between an estimated 12% and 18%, while one in eight women experience symptoms of depression within two weeks after delivery. An estimated 12 to 20% of first-time mothers develop PPD. However, maternal mental disorders are three times more prevalent in low- and middle-income countries (LMICs) than high-income countries (HICs). South African studies have shown that many women experience depression during the antenatal and postnatal period, with the prevalence of depression and anxiety during the perinatal period being three to four times higher in South Africa than HICs. In addition, mental illness is generally more prevalent in urban than rural areas. A study conducted among rural pregnant women in KwaZulu-Natal found that 47% of women were depressed and 45% of those who were depressed had a HIV-positive status. In contrast, in a peri-urban settlement outside Cape Town, the prevalence of antenatal depression and PPD was 39% and 34.7%, respectively. A national study investigating the prevalence of PPD among HIV positive women reported a 45.1% prevalence of PPD symptomatology, while a study conducted at a primary health care facility in Pretoria reported a 49% prevalence of PPD. Apart from breastfeeding cessation, maternal depression can result in the introduction of breastmilk substitutes and early introduction of complementary foods and liquids. Prospective cohort studies reported that high levels of anxiety during pregnancy were associated with a maternal intention to formula feed. A Middle-Eastern cohort study found that the majority of women who formula fed were more likely to be diagnosed with PPD, possibly due to its association with a quieter infant and longer duration of sleeping at night. Women diagnosed with depression and formula feed may use unhygienic feeding practices, thereby increasing the risk of infectious diseases in their infants.

Prevalence of maternal depression

The global prevalence of antenatal depression and PPD is between an estimated 12% and 18%, while one in eight women experience symptoms of depression within two weeks after delivery. An estimated 12 to 20% of first-time mothers develop PPD. However, maternal mental disorders are three times more prevalent in low- and middle-income countries (LMICs) than high-income countries (HICs).

South African studies have shown that many women experience depression during the antenatal and postnatal period, with the prevalence of depression and anxiety during the perinatal period being three to four times higher in South Africa than HICs. In addition, mental illness is generally more prevalent in urban than rural areas. A study conducted among rural pregnant women in KwaZulu-Natal found that 47% of women were depressed and 45% of those who were depressed had a HIV-positive status. In contrast, in a peri-urban settlement outside Cape Town, the prevalence of antenatal depression and PPD was 39% and 34.7%, respectively. A national study investigating the prevalence of PPD among HIV positive women reported a 45.1% prevalence of PPD symptomatology, while a study conducted at a primary health care facility in Pretoria reported a 49% prevalence of PPD.

Table 2 provides an overview of local and global risk factors for the maternal development of depression, as well as maternal outcomes during the antenatal and postpartum period. Infant outcomes are also reported. Epidemiologic studies report that the major risk factors for antenatal depression include: having a viral infection and/or chronic diseases, pregnancy resulting from rape, micronutrient deficiencies and unhealthy eating habits. The leading risk factors for PPD include: history of childhood abuse and developmental problems, as well as high parity and existing maternal illness. Domestic violence during pregnancy is rated as a low risk factor for PPD.

Maternal depression and infant feeding practices

An estimated one-third of IYC malnutrition is caused by inappropriate and inadequate feeding practices. Apart from being the best way to ensure infant growth and health, breastfeeding enhances mother-infant attachment and bonding through interaction and increasing maternal self-esteem. The latter results in enhanced maternal mental health, reduced stress levels and inflammatory responses. PPD is associated with a shorter duration of EBF, lack of initiation or delay of breastfeeding, as well as early cessation of breastfeeding. A study conducted in the United States found that first-time mothers with PPD practice EBF for 3.6 weeks, while those without PPD breastfed for 4.7 weeks. Delayed initiation of breastfeeding is associated with increased neonatal mortality, recurrent infant diarrhea, and unsuccessful breastfeeding. A summary of studies regarding the relationship between breastfeeding and PPD are presented in Table 3.
as not suffering from depression.\textsuperscript{55,56} Depression could impair the ability of mothers to provide nutritious meals for IYC, resulting in underweight or overweight IYC as convenience foods that are high in sugar and fat were offered.\textsuperscript{50} As an estimated 57\% of women of child-bearing age suffer from depression, maternal depression can contribute to the global increase in childhood obesity due to inappropriate feeding practices.\textsuperscript{57}

Evidence from several prospective cohort studies (see Table 3) indicate that breastfeeding can decrease the risk of developing PPD. Despite a lack of evidence regarding an association between maternal depression and breastfeeding duration, a systematic review reported that seven out of ten studies found no relationship between antenatal anxiety, initiation of breastfeeding and continuation thereof.\textsuperscript{18} Epidemiological studies provide evidence that maternal depression is associated with breastfeeding difficulties.

\textbf{Maternal depression, infant and child growth}

The environment into which a child is born or grows up, has an important influence on the risk for stunted growth and mental development.\textsuperscript{69} Prospective cohort studies have reported that infants with mothers who suffer from depression, are at risk of becoming underweight and/or having a low height-for-age,\textsuperscript{15,16} with stunting being the outcome of under-nutrition and infection in utero and since birth.\textsuperscript{70} In LMICs, approximately 40\% of depressed versus non-depressed mothers are more likely to have an underweight or stunted child.\textsuperscript{3,26} A longitudinal study conducted in a South African urban township found that women with PPD at six months post-delivery, were more likely to have stunted children by two years of age.\textsuperscript{71} These findings concur with that of a randomised controlled trial in rural Bangladesh, where 36.9\% of infants with depressed mothers were stunted at 12 months.\textsuperscript{72} It has been

\begin{table}
\centering
\begin{tabular}{|c|c|c|c|}
\hline
\textbf{Risk factors associated with maternal depression} & \textbf{South Africa} & \textbf{Global risk factors: antenatal depression} & \textbf{Global risk factors: PPD} \\
\hline
\textbf{A} & – & Presence of viral infections and/or chronic diseases\textsuperscript{30} & History of childhood abuse and developmental problems\textsuperscript{49} \\
\hline
\textbf{B} & Unplanned pregnancies\textsuperscript{34} & Micronutrient deficiencies and unhealthy eating habits\textsuperscript{49} & High parity\textsuperscript{49} \\
\hline
\textbf{C} & Delivery of female child\textsuperscript{32} & Poverty\textsuperscript{37} & Lack of social support\textsuperscript{33} \\
\hline
& Lack of social support\textsuperscript{22,36,29} & Lack of education\textsuperscript{37} & Stress\textsuperscript{37} \\
& Positive HIV status\textsuperscript{32,38,31} & Single marital status\textsuperscript{37} & Use of anti-depressant during pregnancy\textsuperscript{37} \\
& Teenage pregnancy\textsuperscript{37} & Unhappy marriage\textsuperscript{37} & Poverty\textsuperscript{37} \\
& Young maternal age\textsuperscript{30} & Difficult in-laws \textsuperscript{37} & \\
& Domestic violence\textsuperscript{31} & Lack of social support\textsuperscript{37} & Lack of education\textsuperscript{30} \\
& Suicidal thoughts\textsuperscript{31} & Substance abuse\textsuperscript{37} & Young maternal age\textsuperscript{86} \\
& Monthly household income <$R2000\textsuperscript{32} & Young maternal age\textsuperscript{36} & History of depression\textsuperscript{30} \\
& Stigma, discrimination and lack of social support in HIV positive women\textsuperscript{11} & History of miscarriage and abortion\textsuperscript{36} & \\
& Negative paternal attitude towards child\textsuperscript{19} & Pre-conception obesity\textsuperscript{49} & \\
& Presence of diabetes, hypertension and/or anaemia\textsuperscript{15,26} & & \\
\hline
\textbf{D} & – & Stress\textsuperscript{39} & Domestic violence during pregnancy\textsuperscript{32} \\
\hline
\textbf{Maternal depression outcomes} & During pregnancy\textsuperscript{19} & Postpartum\textsuperscript{19} & Infant outcomes\textsuperscript{19} \\
\hline
\textbf{D} & Nausea & ↓ social interaction & Low birth weight \\
& Headache & ↓ emotional withdrawal & Increased risk of: \\
& Stomach cramps & ↓ suicidal thoughts & • low Apgar score \\
& Shortness of breath & ↓ irritable bowel syndrome & • lack of breastfeeding \\
& Increased risk of: & & • poor mother-infant bonding \\
& • pre eclampsia & & • failure to thrive \\
& • gestational diabetes & & • delay in developmental milestones \\
& • suicide & & • poor motor tone activity \\
& • miscarriage & & • low irritative behaviour \\
& • haemorrhage & & • disrupted sleep patterns & irritability \\
& • delivery via caesarean section & & • infant illness \\
& • preterm delivery & & \\
\hline
\end{tabular}
\caption{Table 2: Risk factors associated with the development of maternal depression and the outcomes for mother and infant}
\end{table}
It has also been suggested that maternal depression is a risk factor for childhood overweight/obesity. This is due to mothers with depression having inappropriate feeding practices (including early cessation of breastfeeding), an inability to propose that if maternal depression is eradicated, IYC stunting can be reduced by 23 to 29%. Epidemiologic studies show positive associations between maternal depression and IYC underweight and stunting.

| Table 3: Level of evidence of studies that report that breastfeeding may protect against PPD and the association between breastfeeding difficulty and maternal depression |
|-----------------------------------------------|
| **Level** | **Studies on how breastfeeding decreases risk of PPD** | **Association between breastfeeding difficulties and maternal depression** |
| A | • Skin to skin contact before breastfeeding initiation lowers maternal cortisol levels, thereby decreasing prevalence of depression.59 | • Nipple pain when breastfeeding associated with high depression scores.64 |
| B | • Breastfeeding protects against PPD.48 • EBF for at least three months can reduce prevalence of PPD.61 • Early breastfeeding cessation results in a loss of maternal-infant bond, thereby increasing the risk for PPD.62 | |
| C | • Nipple pain and breast inflammation are stressors increasing the risk of PPD, due to the bidirectional relationship between inflammation and depression.63,64 • Depressed women have low levels of prolactin and oxytocin which increase the likelihood of nipple pain and restricts the milk-ejection reflex, resulting in low milk production.60 |
| D | • Breastfeeding protects against PPD.63 | • Depressed women have low levels of prolactin and oxytocin which increase the likelihood of nipple pain and restricts the milk-ejection reflex, resulting in low milk production.60 |

A: Meta-analysis/systematic review/randomised control trial.  
B: Cohort study.  
C: Cross sectional surveys.  
D: Review.

| Table 4: Summary of studies on the effects of untreated antenatal and postpartum depression on foetus and IYC |
|---------------------------------------------------------------|
| **Level** | **Formula feeding** | **Malnutrition (underweight/overweight)** | **Stunting** | **Poor infant care and development** | **Illness** |
| A | – | Depressed mothers more likely to have an underweight infant.14,20 | Depressed mothers more likely to have a stunted infant1,34,72 | PPD associated with poor mother-infant attachment, disturbed infant sleep and incomplete immunisation schedules17,18 | – |
| B | Maternal depression associated with formula feeding and early introduction of complementary foods.12-15 | Infants with depressed mothers at greater risk of becoming underweight.14,20 Maternal depression associated with risk for childhood overweight/obesity.24 | Infants with depressed mothers at a greater risk of low height-for-age.14,24 Women with PPD more likely to have stunted children by two years of age.21 | Antenatal depression associated with negative effects on physical, cognitive and emotional development of foetus and IYC.17 Women with PPD less likely to engage in parenting or caregiving practices.79 | – |
| C | – | Maternal depression associated with IYC under-nutrition.14. Depressed women may be unable to provide nutritious meals for IYC, resulting in an increased risk for malnutrition.20 Maternal depression associated with lower infant birth weight and shorter length.73 Maternal depression is associated with poor growth at three to six months.76 | Maternal depression associated with infant stunting.71 | Infants with depressed mothers had incomplete vaccination schedules.73 | PPD associated with more episodes of diarrhoea.75 |
| D | – | Antenatal depression associated with low birth weight and PPD associated with underweight infant.14 | Infants born to depressed mothers have double the risk of becoming stunted19 | Antenatal depression and PPD associated with impaired cognitive development12,63,64 | PPD associated with development of infectious and atopic diseases in infants.43 |

A: Meta-analysis/systematic review/randomised control trial.  
B: Cohort study.  
C: Cross sectional surveys.  
D: Review.
recognise satiety cues, failure to provide nutritionally-balanced meals, and not engaging in physical activities with the child.\textsuperscript{7,24} However, evidence regarding maternal depression and childhood overweight/obesity is limited.

Table 4 provides an overview of studies that investigated the effects of untreated antenatal and PPD on the foetus and IYC.

**Conclusion**

Maternal depression may have a significant impact on IYC growth, health and nutritional status. Maternal depression could impair the ability of expectant mothers to adopt a healthy lifestyle, compromise breastfeeding and disrupt the caregiving roles of mothers during the postpartum period.

**Recommendation**

Evidence suggests that breastfeeding can prevent PPD. Therefore, expectant mothers should be encouraged to breastfeed as it facilitates the mental well-being of the mother and child. Based on the amount of evidence, it is recommended that women should be screened for antenatal depression and PPD to curb potential breastfeeding difficulties. Epidemiologic studies show positive associations between maternal depression and IYC malnutrition. Hence, identified mothers at risk for depression should receive more support and education, be encouraged to lead a healthy lifestyle during pregnancy, and to practice safe infant feeding and care. This may decrease the prevalence of IYC underweight, stunting and overweight/obesity. Further research regarding the relationship between maternal depression, formula feeding and IYC illnesses is needed, as there is a paucity of data regarding these aspects.

**References**

1. United Nations Population Fund. Maternal Mental health and child health and development in low and middle income countries. Geneva: World Health Organization; 2008.
2. Mayosi BM, Fisher AJ, Laliroo DG, et al. The burden of non-communicable diseases in South Africa Lancet. 2009;574(9693):934–47. https://doi.org/10.1016/S0140-6736(09)61087-4
3. Surkan PJ, Kennedy CE, Hurley KM, et al. Maternal depression and early childhood growth in developing countries: systematic review and meta-analysis. Bull WHO 2011;89:607–15.
4. Honikman S, van Heyningen T, Field S, et al. Stepped care for maternal mental health: a case study of the Perinatal Mental Health Project in South Africa. PLoS Med. 2012;9(5):e1001222. https://doi.org/10.1371/journal.pmed.1001222
5. Cummings EM, Kourou CD. Maternal depression and its relation to children’s development and adjustment. In: Tremblay RE, Kouros RG, Peters RDV, Boivin M, editors. Encyclopedia on early childhood development and adjustment. In: Tremblay RE, Kouros RG, Peters RDV, Boivin M, editors. Encyclopedia on early childhood development in developing countries: systematic review and meta-analysis. Geneva: World Health Organization; 2008.
6. Hopper K. Rethinking social recovery in schizophrenia: what a capabilities approach might offer. Soc Sci Med. 2007;65:868–87. https://doi.org/10.1016/j.socscimed.2007.04.012
7. Talge NM, Neal C, Glover V. Antenatal maternal stress and long-term effects on child neurodevelopment: how and why? J Child Psychol Psychiatry 2007;48(3–4):245–61. https://doi.org/10.1111/j.1469-7610.2007.01148.x
8. Prince M, Patel V, Saxena S, et al. No health without mental health. Lancet 2007;370(9595):859–77. https://doi.org/10.1016/S0140-6736(07)61238-0
9. Melissa K, Kang E, Leu CS, et al. Longitudinal study of mental health and psychosocial predictors of medical treatment adherence in mothers living with HIV Disease. AIDS Patient Care and STDS 2003;17:407–18. https://doi.org/10.1089/108729103322277420
10. Meintjes I, Field S, Sanders L, et al. Improving child outcomes through maternal mental health interventions. J Child Adoles Mental Health 2010;22(2):73–82. https://doi.org/10.28997/18205853.2010.528576
33. Peltzer K, Shikwane ME. Prevalence of postnatal depression and associated factors among HIV positive women in primary care in Nkangala District, South Africa, South Africa J HIV Med. 2011;12(4):24–8.

34. Ramchandani PG, Richter LM, Stein A, et al. Predictors of postnatal depression in an urban South African cohort. J Affect Disord. 2008;113:279–84.

35. Kagee A. Symptoms of depression and anxiety among a sample of South African patients living with a chronic illness. J Health Psych. 2008;13:547–55. https://doi.org/10.1177/1359105308088527

36. Myer L, Smit J, Roux LL, et al. Common mental disorders among HIV-infected individuals in South Africa: Prevalence, predictors, and validation of brief psychiatric rating scales. AIDS Patient Care STDs 2008;22:147–58. https://doi.org/10.1089/apc.2007.0102

37. Raisanen S, Lehto SM, Nielsen HS, et al. Risk factors for and perinatal outcomes of major depression during pregnancy: a population-based analysis during 2002–2010 in Finland. BMJ Open 2014;4(11):1–9.

38. Choi KW, Sikkema KJ. Childhood maltreatment and perinatal mood disorders: a systematic review. Trauma, Violence, & Abuse 2015;1–27.

39. Barker ED, Kirkham N, Ng J, et al. Prenatal maternal depression and associated factors among HIV-infected individuals in South Africa: Prevalence, predictors, and validation of brief psychiatric rating scales. AIDS Patient Care STDs 2008;22:147–58. https://doi.org/10.1089/apc.2007.0102

40. Gagliardi L, Petrozzi A, Rusconi F. Symptoms of maternal depression immediately after delivery predict unsuccessful breast feeding. Arch Pediatr. 2014;30(1):102–9. https://doi.org/10.1177/0890334413504244

41. Claesson I, Josefsson A, Sydsjö G. Prevalence of anxiety and depressive symptoms among obese pregnant and postpartum women: An intervention study. BMC Public Health 2010;10(7661):1–10.

42. Minich S, Craske M, Walkowiak J. Depression and anxiety in women undergoing in vitro fertilization treatment. J Obstet Gynaecol Can. 2011;33(7):530–5. https://doi.org/10.1016/j.jogcc.2011.06.013

43. Kirkan TS, Aydin N, Yazici E, et al. The depression in women in pregnancy and postpartum period: A follow-up study. Int J Soc Psychiatry 2015;61(4):343–49. https://doi.org/10.1177/0021383X14534713

44. Soni M, Singh S, Bharti S, et al. Postpartum depression: A prospective cohort study in Sabah. Malaysian J Hum Lact. 2016;32(2):277–81. https://doi.org/10.1186/s40591-015-0024-2

45. Tashakori A, Behbahani AZ, Irani RD. Comparison of prevalence of postpartum depression in married and single women. J Reprod Infertil 2013;14(2):63–7. https://doi.org/10.1186/1688-1576-9-17

46. McElnally HL, Hepworth AR, Garbin CP, et al. Nipple pain during breastfeeding with or without visible trauma. J Hum Lact. 2012;28(4):511–21. https://doi.org/10.1177/0890344412444464

47. Gagliardi L, Petrozzi A, Rusconi F. Symptoms of maternal depression immediately after delivery predict unsuccessful breastfeeding. J Pediatr (Rio J). 2013;89(4):332–8. https://doi.org/10.1016/j.jped.2012.12.002

48. Gagliardi L, Petrozzi A, Rusconi F. Symptoms of maternal depression immediately after delivery predict unsuccessful breastfeeding. J Pediatr (Rio J). 2013;89(4):332–8. https://doi.org/10.1016/j.jped.2012.12.002

49. Gagliardi L, Petrozzi A, Rusconi F. Symptoms of maternal depression immediately after delivery predict unsuccessful breastfeeding. J Pediatr (Rio J). 2013;89(4):332–8. https://doi.org/10.1016/j.jped.2012.12.002

50. Gagliardi L, Petrozzi A, Rusconi F. Symptoms of maternal depression immediately after delivery predict unsuccessful breastfeeding. J Pediatr (Rio J). 2013;89(4):332–8. https://doi.org/10.1016/j.jped.2012.12.002

51. World Health Organisation. Essential Nutrition Actions: improving maternal, newborn, infant and young child health and nutrition. Geneva: World Health Organization; 2013.

52. Hamdan A, Tamim H. Psychosocial risk and protective factors for postpartum depression in the United Arab Emirates. Arch Women's Ment Health 2008;11(4):253–5. https://doi.org/10.1007/s10463-008-9037-0

53. Hamdan A, Tamim H. Psychosocial risk and protective factors for postpartum depression in the United Arab Emirates. Arch Women's Ment Health 2008;11(4):253–5. https://doi.org/10.1007/s10463-008-9037-0

54. Hamdan A, Tamim H. Psychosocial risk and protective factors for postpartum depression in the United Arab Emirates. Arch Women's Ment Health 2008;11(4):253–5. https://doi.org/10.1007/s10463-008-9037-0

55. Hamdan A, Tamim H. Psychosocial risk and protective factors for postpartum depression in the United Arab Emirates. Arch Women's Ment Health 2008;11(4):253–5. https://doi.org/10.1007/s10463-008-9037-0

56. Hamdan A, Tamim H. Psychosocial risk and protective factors for postpartum depression in the United Arab Emirates. Arch Women's Ment Health 2008;11(4):253–5. https://doi.org/10.1007/s10463-008-9037-0

57. Hamdan A, Tamim H. Psychosocial risk and protective factors for postpartum depression in the United Arab Emirates. Arch Women's Ment Health 2008;11(4):253–5. https://doi.org/10.1007/s10463-008-9037-0

58. Hamdan A, Tamim H. Psychosocial risk and protective factors for postpartum depression in the United Arab Emirates. Arch Women's Ment Health 2008;11(4):253–5. https://doi.org/10.1007/s10463-008-9037-0

59. Hamdan A, Tamim H. Psychosocial risk and protective factors for postpartum depression in the United Arab Emirates. Arch Women's Ment Health 2008;11(4):253–5. https://doi.org/10.1007/s10463-008-9037-0
79. Bergman K, Sarkar P, O’Connor T, et al. Maternal stress during pregnancy predicts cognitive ability and fearfulness in infancy. J Am Acad Child Adolesc Psych. 2007;46:1454–63. https://doi.org/10.1097/chi.0b013e31814a62f6

80. Field T. Prenatal depression effects on early development. Rev Infant Behav Dev. 2011;34(1):1–14. https://doi.org/10.1016/j.infbeh.2010.09.008

81. Johnson SB, Riley AW, Granger DA, et al. The science of early life toxic stress for pediatric practice and advocacy. Pediatrics 2013;131:319–27. https://doi.org/10.1542/peds.2012-0469

Received: 30-12-2016 Accepted: 14-05-2017