

# Maternal mental health and preterm infant development

Katarzyna Kniaziew-Gomoluch<sup>1</sup> (ABDEF), Tomasz Łosień<sup>2</sup> (ABDE), Beata Kita<sup>3</sup> (DEF), Urszula Sioma-Markowska<sup>4</sup> (DE), Anna Brząk<sup>1</sup> (DE)

<sup>1</sup> Physiotherapy Division, Department of Physiotherapy, School of Health Sciences in Katowice, Medical University of Silesia in Katowice

<sup>2</sup> Medical Rehabilitation Division, Department of Physiotherapy, School of Health Sciences in Katowice, Medical University of Silesia in Katowice

<sup>3</sup> Faculty of Applied Sciences, Department of Health Science, WSB in Dąbrowa Górnicza

<sup>4</sup> Division of Nursing in Gynecology and Obstetrics, Department of Women's Health, School of Health Sciences in Katowice, Medical University of Silesia in Katowice

**AUTHORS' CONTRIBUTION:** (A) Study Design · (B) Data Collection · (C) Statistical Analysis · (D) Data Interpretation · (E) Manuscript Preparation · (F) Literature Search · (G) Funds Collection

## SUMMARY

Pregnancy and childbirth are risk factors for postnatal depression and/or symptoms of post-traumatic stress disorder in the mother. Preterm birth carries a particular risk of mental problems in both parents. The mental state of the mother of a preterm infant may adversely affect the child's development. Postpartum depression and post-traumatic stress syndrome create conditions that are not conducive to the personal development of mothers as well as to the development of their children. Early detection and treatment of depression or symptoms of postnatal stress help avoid harmful consequences for both mothers and children, especially those born prematurely.

**Keywords:** postpartum depression; post-traumatic stress disorder; preterm birth; prematurity; mother-child relationship/bonding; developmental support

**Address for correspondence:** Anna Brząk  
Physiotherapy Division, Department of Physiotherapy  
School of Health Sciences in Katowice  
Medical University of Silesia in Katowice  
12 Medyków Street, 40-754 Katowice  
Phone +48 32 2088721, e-mail: abrzek@sum.edu.pl  
ORCID: 0000-0002-2321-2888

**Word count:** 2259 **Tables:** 0 **Figures:** 0 **References:** 32

**Received:** 10.10.2019

**Accepted:** 11.11.2019

**Published:** 27.12.2019

## INTRODUCTION

Over the last two decades, the survival rate of prematurely born children has greatly improved in technologically developed countries. According to the statistical data, preterm births represent between 9% and 13% of births in the USA, 12% in Europe and 5–9% in other developed countries. On average, one in ten children in the world is born prematurely [1–4]. The etiology of preterm birth is most often associated with the complicated course of pregnancy, especially hypertension in pregnancy, eclampsia, multiple pregnancy, age of the mother and mental health disorders [3,4]. The lower the birth weight of a newborn child, the higher the risk of neurobehavioral impairment in early childhood [5]. Moreover, the child's development in the situation of the prematurity burden may be significantly influenced by the mother's mental health as well as the mother-baby relationship [6].

## AIM OF THE STUDY

The aim of the study was to analyze the databases with reports on the health of the mother and her prematurely born child. The PubMed, Medline and Up to Date databases were searched using MeSH terms and the following keywords: „maternal depression,” „postpartum depression,” „maternal posttraumatic stress disorder,” „maternity of preterm babies,” „maternal mental health,” „preterms development,” and „mother infant bonding.” The „free full texts” filter was used for the years from January 2000 to January 2018, with no linguistic restrictions. Additionally, the authors searched databases in medical libraries in the Silesia region. There were only few studies on the analysis of the mother's mental state and its influence on the development of the premature

child. There were no studies directly related to the issue presented in this paper.

The problem of mental health of mothers is usually considered only in terms of birth of a healthy, term child, and this is not enough to prevent clinical implications, in terms of the health of both the mother and the premature child.

## POSTNATAL MENTAL DISORDERS IN THE MOTHER OF A PREMATURELY BORN CHILD

Mothers of preterm infants are at a higher risk of postpartum depression (PPD) compared to mothers of term children. Preterm birth remains a major risk factor for infant mortality and morbidity, including neurodevelopmental delays and disabilities. Studies suggest that postnatal depression has a significant yet selective impact on the mother–baby relationship, body height and psychomotor development of the child. Children of mothers diagnosed with postnatal depression have much greater cognitive, behavioral and interpersonal problems than those of healthy mothers [5–7]. In the aspect of growth and emotional development, studies confirm the early negative effect of maternal postnatal depression on the infant. Children exposed to episodes of maternal depression or recurrent maternal depression may present worse development until adolescence. Early detection of this condition in the mother and the consequences of the mother–child relationship in this situation has its practical implications in the selection of effective treatment models.

There are still only few scientific studies concerning the influence of stressogenic factors on the mental health of the mother of a preterm child, and the relationship between the mother’s mental disorders as a result of preterm birth and the awareness of possible disability of the child has not been thoroughly described yet.

Postpartum depression is a serious mental illness, which also affects the newborn and then growing child. Studies suggest that both maternal–fetal bonds, measured by the scale of maternal–fetal attachment, and PPD are important predictors of postnatal attachment between the mother and her child [8,9].

Postpartum depression and posttraumatic stress disorder (PTSD) after preterm birth as well as the relationship between the symptoms of the mother’s mental condition and the child require further research and analysis. Approxi-

mately 3.3% of pregnant women experience PTSD and 4% of women suffer from PTSD after childbirth.

The DSM-V (Diagnostic Statistical Manual-V) classification (American Psychiatric Association, APA, 2013) accurately lists symptoms that may indicate depression, by strictly determining the number of symptoms over time. Depression can be overlooked because of the variety of symptoms that may occur after a natural birth or due to a new life situation, for instance: uncertainty, permanent sleep deprivation and concentration on the newborn baby, leading to the lack of interest in the environment or worse self-esteem. It is therefore important to educate women and their families and to raise awareness about the incidence of perinatal depression as a serious problem.

Being confronted with a situation that is reminiscent of a traumatic event can lead to its recurrence in the form of intrusive daytime memories (so-called *flashbacks*) and nightmares in combination with some or all of the dangerous symptoms of post-traumatic stress disorder, including suicidal thoughts or attempts.

## MENTAL STATE OF THE MOTHER AND THE QUALITY OF INFANT DEVELOPMENT

There is a mutual relationship between the motivation for movement and motor development. These findings have important clinical implications for children with motor delays, including premature babies. Motivation assessment may be considered a part of the diagnostic procedure, so that treatment, including support for motivation by building appropriate parental attitudes and expectations, can be adjusted accordingly [10]. It is justified to support mothers who, due to emotional or cognitive disorders, do not cooperate with specialists for the benefit of the child. The published literature data confirm that the lower the birth age of a child (and consequently the lower the birth weight) and the longer the treatment duration in the clinical conditions, the higher the probability of serious maternal emotional disorders, including depression [5–7,11–13]. In a study conducted by researchers from the University of Basra, PPD was diagnosed in the weeks following birth using standard questionnaires and clinical interviews. In addition, the socio-economic status, social support, risk during pregnancy and psychiatric diagnoses were

also assessed. A model of multiple random factors was used to simultaneously examine the predictors of postnatal depression in both parents. The analyses emphasized a significant influence of preterm birth on the occurrence of postpartum depression [14]. Other studies on early mother–child bonding using the MIBQ-Mother-Infant Bonding Scale, covering 50 dyadic relationships of depressed mothers and their children and 29 pairs of babies and their mothers with no symptoms of depression, showed that it was possible to predict the subsequent mother–baby bonding 12 months after childbirth [22].

## PREVENTION OF MATERNAL MENTAL PROBLEMS AND DEVELOPMENTAL DISORDERS IN PREMATURELY BORN CHILDREN

Physiotherapists and neurologists are particularly interested in the motor development of prematurely born children, which is highly dependent on parental attitudes, including the involvement of the mother as the primary carer. The confinement and possible postnatal problems of the mother as well as the stress associated with the stay of the prematurely born child in an intensive care unit may become too large emotional and cognitive burden for her. The result of this situation is often a long-term, bad, «depressive» mood, which may last for several weeks or more, thus becoming, by definition, the basis of depressive disorders, not only in the emotional and behavioral zone, but also in the somatic zone, which altogether is misinterpreted as symptoms of a possible diseases, causing an additional increase in anxiety and lowering the sense of ability and dexterity. Postpartum depression affects about 10–15% of women and is one of the most common complications of the postpartum period. PPD may also disturb the interaction between the mother and baby. Too late reaction to permanent symptoms, which results in their fixation, also affects the quality of care for preterm infants at home. Mothers with depressive symptoms may not be sufficiently involved or motivated to stimulate their children in their development as indicated by a physiotherapist; this includes motor development and the related need for physiotherapy, nursing and medical check-ups.

Special care provided by medical staff to the patient during the premature labor and to the

postpartum patient is essential, as the mother's mental health remains one of the most consistent factors of infant development. Depression is of great interest in the medical literature, but has only recently been brought to the attention of researchers in terms of it being a risk factor for preterm birth, attachment impairment and delayed infant development, and some of the consequences of this situation, such as PTSD.

Few studies have confirmed the role of PTSD in mother–child attachment disorders, but it is not clear whether preterm infants, children of mothers experiencing PTSD at birth, are more likely to have problems with motor development. The interaction between the mother and infant is influenced by preterm infancy as well as the mother's mental health. Home interventions that stimulate infant development and, at the same time, encouraging the mother–child relationship seem to be key elements in preventing the effects of postnatal depression and post-traumatic syndrome.

Targeted developmental interventions and support for early strengthening of the mother–child relationship provided by the midwife, psychologist or physiotherapist can be beneficial for infants, as they may potentially reduce depression and symptoms of PTSD in the mother. The earlier the therapeutic response to the child's developmental disorder, the less developmental abnormalities are observed in the school age. The interaction of early intervention in the mother–child relationship with the individual developmental pathway of a preterm infant can minimize the effects of abnormalities resulting from preterm birth, both in terms of physical and social health.

Research has shown that PTSD in the mother during pregnancy and after birth is associated with a low birth weight and a lower percentage of breastfeeding. The evidence of a link between maternal PTSD and preterm birth, fetal growth, head circumference, mother–infant interaction, mother–infant relationship or child development is contradictory. However, the relationship between maternal PTSD and cortisol levels in infant saliva, as well as eating and sleeping difficulties seems unreasonable. The study of a group of mothers with bipolar disorder and their relationship with children found that mothers with predominant depressive symptoms had less expressive children in terms of their needs and emotions [23].

## PREVENTION OF MENTAL DISORDERS IN MOTHERS AND DEVELOPMENT OF PREMATURELY BORN CHILDREN

There are a number of ways to care for a baby, including therapeutic ones, with simultaneous prevention or reduction of emotional disorders. One way of preventing emotional disturbances, including separation anxiety, in a child that stays in an isolated clinical environment and of establishing a relationship with the guardian is to kangaroo the child in the intensive care unit. This method involves contact between the child and the parent's chest (skin-to-skin), where the smell, heat, voice and action of the mother's/father's heart have a beneficial effect on the child's vital signs and development. The kangaroo method also reduces the mother's stress resulting from the fear of inappropriate, in her opinion, care for a child with low body weight. Moreover, placing toys or pieces of fabric with the smell of the mother in incubators or playing back recordings of the mother's voice can also be applied.

Reading to children has been shown to reduce stress levels in the mothers of children in the clinical ward and to increase the bond with the child. Long-term hospital stays, lasting sometimes up to 12 months, become the time to build a bond between the parent and the child and to reduce possible consequences of trauma, which is a preventive measure of disorders such as PPD and/or PTSD in the mother that experiences stress due to premature birth and awareness of the threat to the child's life.

### CLINICAL IMPLICATIONS

Clinical implications of postnatal depression and/or PTSD may require appropriate management for mothers at risk of premature birth and their prematurely born children. Encouraging adequate prenatal care among all pregnant women and assessing the risk factors of depression during pregnancy and after childbirth are appropriate procedures, which are also included in the standard of organizing perinatal care (Regulation of the Minister of Health of 16 August 2018. Journal of Laws of 2018. item 1756). Cooperation of all health care profes-

sionals, including obstetricians, midwives, pediatricians and mental health specialists, which includes routine assessment of mothers for PPD or PTSD risk during their child's stay in the intensive care unit, will allow early detection of postpartum symptoms and the overlapping of depression with acute stress from traumatic births, and enable the implementation of the most effective care plan. The assessment of the mother's and infant's bond and the offer of systemic assistance and support should become the first elements of advanced treatment of mothers with post-traumatic stress disorder and postnatal depression.

### CONCLUSIONS

Effective intervention in the child's development and improvement of the psychophysical condition of the child in the intensive care unit confirms the mothers at risk of postnatal depression in the sense of efficiency in this traumatic situation for the family.

Scientific research confirms that early intervention to improve the quality of the mother-child relationship can also help alleviate the symptoms of post-traumatic stress. Further research is needed to establish how the effectiveness of interventions focused on infant stimulation and motor development can improve the mother's mental state, health and attachment to the child, thereby providing better conditions for development and quality of life. It can also be assumed that a better quality of mother-preterm infant relationship will help to ensure that the child has access to specialist care after leaving the clinical ward.

The WHO has evaluated several studies of variable quality on the therapies employed to treat mothers with PPD. The impact of interventions, such as home visits, telephone advice, interactive coaching, group interventions and massage, have been described. Preliminary results of these studies are still insufficient and should be interpreted with caution due to a variety of interfering factors.

Well-planned and controlled longitudinal studies should be carried out to reliably measure the child's development and the relationship between the mother with PPD and/or PTSD and the newborn/infant.

## REFERENCES

1. <https://www.who.int/news-room/fact-sheets/detail/preterm-birth>
2. <https://www.who.int/reproductivehealth/global-estimates-preterm-birth/en/>
3. Global, regional, and national estimates of levels of preterm birth in 2014: a systematic review and modelling analysis. *Lancet Glob Health* 2018 Published online October 29, 2018 [http://dx.doi.org/10.1016/S2214-109X\(18\)30451-0](http://dx.doi.org/10.1016/S2214-109X(18)30451-0).
4. Goldenberg RL, Culhane JF, Iams JD, Romero R. Epidemiology and causes of preterm birth. *Lancet* 2008; 371:75–84.
5. Nordhov SM, Ronning JA, Ulvund SE, Dahl LB et al. Early intervention improves behavioral outcomes for preterm infants: Randomized controlled trial. *Pediatrics* 2012;129(1): 9-16. doi:10.1542/peds.2011-0248.
6. Boyce LK, Cook G, Simonsmeier V, Hendershot, SM. Academic outcomes of very low birth weight infants: The influence of mother-child relationships. *Infant Mental Health Journal* 2015;36(2):156-166. doi:10.1002/imhj.21495/
7. [https://www.who.int/mental\\_health/prevention/suicide/lit\\_review\\_postpartum\\_depression.pdf](https://www.who.int/mental_health/prevention/suicide/lit_review_postpartum_depression.pdf).
8. Cranley MS. Development of a tool for the measurement of maternal attachment during pregnancy. *Nurs Res.* 1981;30:281–284.
9. Dubber S et al. Postpartum bonding: the role of perinatal depression, anxiety and maternal–fetal bonding during pregnancy. *Arch Womens Ment. Health* 2014;18:187–195.
10. Atun-Einy O, Berger SE, Scher A. Assessing motivation to move and its relationship to motor development in infancy. *Infant Behav Dev.* 2013;36(3):457-69. doi: 10.1016/j.infbeh.2013.03.006. Epub 2013 May 7.
11. Anderson C, Cacula P. Implications of preterm birth for maternal mental health and infant development. *MCN Am J Matern Child Nurs.* 2017;42(2):108-14.
12. Vigod S, Villegas L, Dennis C-L, Ross L. Prevalence and risk factors for postpartum depression among women with preterm and low-birth-weight infants: a systematic review. *BJOG* 2010;117:540–550.
13. Helle N, Barkmann C, Bartz-Seel J et al. Very low birth-weight as a risk factor for postpartum depression four to six weeks postbirth in mothers and fathers: Cross-sectional results from a controlled multicentre cohort study. *Affect Disord.* 2015;15:180:154-61. Epub 2015 Apr 10.
14. Abdulbaqi MA, Manthar A. Postpartum depression in mothers of hospitalized premature babies in Basra Maternity and Children Hospital. *Ejpmr, World Journal of Pharmaceutical and Medical Research* 2018;4(8): 236-241, ISSN 2455-3301.
15. Bornstein MH. Human Infancy and the rest of the lifespan. *Annual Review of Psychology* 2014;65:121–158. <https://doi.org/10.1146/annurev-psych-120710-100359>.
16. Grote NK, Bridge JA, Gavin AR et al. A meta-analysis of depression during pregnancy and the risk of preterm birth, low birth weight, and intrauterine growth restriction. *Archives General Psychiatry* 2010; 67(10):1012-1024.
17. Ferrero DM, Larson J, Jacobsson B et al. Cross-country individual participant analysis of 4.1 million singleton births in five countries with very high human development index confirms known associations but provides no biologic explanation for 2/3 of all births. *PLoS ONE* 2016;11(9):e0162506. doi:10.1371/journal.pone.0162506.
18. <https://www.who.int/news-room/fact-sheets/detail/preterm-birth>
19. <https://www.who.int/reproductivehealth/global-estimates-preterm-birth/en/>
20. Chawanpaiboon S, Vogel JP, Moller A et al. Global, regional, and national estimates of levels of preterm birth in 2014: a systematic review and modelling analysis. *Lancet Glob Health* 2018; Published online October 29, 2018 [http://dx.doi.org/10.1016/S2214-109X\(18\)30451-0](http://dx.doi.org/10.1016/S2214-109X(18)30451-0).
21. Veddovi M, Gibson F, Kenny DT et al. Preterm behaviour, maternal adjustment, and competencies in the newborn period: what influence do they have at 12 months postnatal age? *Infant Ment Health J* 2004;25:580.581–599.
22. O'Higgins M, Roberts IS, Glover V, Taylor A. Mother-child bonding at 1 year; associations with symptoms of postnatal depression and bonding in the first few weeks. *Archives of Women's Mental Health* 2013;16(5):381–389. <https://doi.org/10.1007/s00737-013-0354-y>.
23. Anke TMS, Slinning K, Moe V et al. Mothers with and without bipolar disorder and their infants: group differences in mother-infant interaction patterns at three months postpartum. *BMC Psychiatry* 2019;19(1):292. doi: 10.1186/s12888-019-2275-4. PMID: 31533800.
24. Cook N, Ayers S, Horsch A. Maternal posttraumatic stress disorder during the perinatal period and child outcomes: A systematic review. *Affect Disord.* 2018;225:18-31. doi: 10.1016/j.jad.2017.07.045. Epub 2017 Jul 27.
25. Borghini A, Habersaat S, Forcada-Guex M, et al. Effects of an early intervention on maternal post-traumatic stress symptoms and the quality of mother-infant interaction: the case of preterm birth. *Infant Behav Dev.* 2014;37(4):624-31. doi: 10.1016/j.infbeh.2014.08.003. Epub 2014 Sep 15.
26. Habersaat S, Borghini A, Nessi J. Posttraumatic stress symptoms and cortisol regulation in mothers of very preterm infants. *Stress Health.* 2014;30(2):134-41. doi: 10.1002/smi.2503. Epub 2013 Jul 4. PMID: 23824604.
27. Habersaat S, Borghini A, Nessi J et al. Effects of perinatal stress and maternal traumatic stress on the cortisol regulation of preterm infants. *J Trauma Stress.* 2014; 27(4):488-91. doi: 10.1002/jts.21939. PMID: 25158643.
28. Newport DJ, Hostetter A, Arnold A, Stowe ZN. The treatment of postpartum depression: minimizing infant exposures. *Journal of Clinical Psychiatry* 2002;63 Suppl 7:31-44.
29. [https://www.who.int/mental\\_health/prevention/suicide/lit\\_review\\_postpartum\\_depression.pdf](https://www.who.int/mental_health/prevention/suicide/lit_review_postpartum_depression.pdf).
30. Onozawa K, Glover V, Adams D et al. Infant massage improves mother-infant interaction for mothers with postnatal depression. *Journal of Affective Disorders* 2001;63:201-207.
31. Nadeem S, Rafique G, Chachar YS. Maternal depression: A major risk factor for psychosocial wellbeing among preschoolers. *Asian J Psychiatr.* 2018;37:85-89. doi: 10.1016/j.ajp.2018.08.018. Epub 2018 Aug 19. PubMed PMID: 30170198.
32. Swartz HA, Cyranowski JM, Cheng Y, Amole M. Moderators and mediators of a maternal depression treatment study: Impact of maternal trauma and parenting on child outcomes. *Compr Psychiatry.* 2018;86:123-130. doi:10.1016/j.comppsy.2018.08.001. Epub 2018 Aug 3. PubMed PMID: 30118995; PubMedCentral PMCID: PMC6142810.