Research Article

Predictive Role of Maternal Depressive Symptoms and Perceived Quality of Life on Postnatal Mother-Infant Bonding

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Abstract

This cross-sectional study was focused on the predictive role of maternal depressive symptoms and perceived quality of life on postnatal mother-infant bonding. Research show that impaired postnatal bonding has a negative long-term effect on child's development. Relevant literature also acknowledges a scientific gap in the understanding of the relationship between maternal mental health and the quality of postnatal mother-infant bonding. Respondents were 162 women in the first 12 months after childbirth, advising with gynecologist in maternity hospitals in the Republic of North Macedonia. Edinburgh postnatal depression scale, subscales of psychological and environmental domain of the WHO Quality of Life Scale-brief, and Postpartum Bonding Questionnaire were applied to measure study variables. Results from hierarchical binary logistic regression showed that psychological domain of quality of life significantly predicted quality of postnatal bonding in the first and second block. However, its effect was suppressed in the third block when depressive symptoms variable was entered. The presence of depressive symptoms and environmental domain of the perceived quality of life significantly predicted postnatal mother-infant bonding. Findings confirmed the significant predictive relationship of maternal depressive symptoms and of environmental domain of mother's perceived quality of life on the quality of postnatal boding. This gives reason for increased attention on development of mother–infant dyads during the postnatal period and on the importance of social support.

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One of the dominant themes in contemporary research is that the family is a system in which there is active, dynamic and mutual influence between parents and children (as cited in Lamb & Lewis, 2015). Taking from Bronfenbrenner's perspective, individual's development is happening in the context (not in social vacuum), so the complex interactions between various systems need to be considered when studying parent-child relationship. Another aspect relevant for understanding this relationship, is the role of behavior genetics which distinguish genetic influences from the effects of environmental factors. Some recent data on the relation between child-care experiences and child's psychosocial development indicate that there is high plasticity in the genetic factors that direct children's development (Gunnar et al., 2015).

Having in mind that the focus of this research is on postnatal mother-infant boding, only this relationship will further be considered and discussed. According to different authors (as cited in Roxanne et al., 2022), mother-infant bonding usually defines through the feelings mother has towards the child and the motherhood, that is, when the bond is established and positive, the mother has positive feelings and thoughts over motherhood and provides warmth, affection, care, protection and comfort to her child, while if there is an imbalance in motherhood or a mother is not efficient in practicing this role, it can jeopardize the quality of postnatal bonding.

Attachment and mother-infant bonding

According to Bowlby (1969) there are four phases in development of parent-infant attachment: 1) "orientation and signals with limited discrimination of figure" (from birth usually to 12 weeks); 2) "orientation and signals directed towards one (or more) discriminated figure(s)" (up until 6 months or later depending on circumstances); 3) "maintenance of proximity to a discriminated figure by means of locomotion as well as signals" (commonly begins between 6-7 months and probably continues throughout the 24 months); and 4) "goal-corrected partnership" (2-3 years and later). Since not all parents/caregivers are equally responsive to child's signals and needs, such differences shape the, so called, internal working models of them. Some research data have shown that the disturbed maternal mental health during early postnatal period, may negatively impact later attachment formation (see McNamara et al., 2019).

However, attachment and bonding are not the same processes. While the first is defined to be a bidirectional, dynamic connectedness in which the child considers the parent/caregiver as a secure base to explore the world, the second is unidirectional process which develops in pregnancy and up until early childhood (). Some studies indicate that when mother-infant bonding is adequate it largely influence development of children on a long-term basis. In other words, if mother-infant bond is healthy and functional, it will result in positive child's development, good health and functional interpersonal relationships. On the contrary, if the bonding is somehow impaired, it will negatively affect children's behavior by mediating the link between maternal postpartum depression and child's behavioral problems (Fransson et al., 2020). In addition, it was reported that maternal depressive symptoms had negative consequences on mother-child security attachment in toddlers (Beeghly et al., 2017). Related to this, as cited by McNamara et al. (2019) there have been findings showing that maternal distress is associated with impaired cognitive, behavioral and emotional development of children.

Maternal mental health and its relation to postnatal mother-infant bonding

According to a scientific brief released by the World Health Organization (World Health Organization, 2022a), data show that in the first year after COVID-19 pandemic was announced, there was an increase of 25% in prevalence of anxiety and depression globally.. It is also confirmed that women have been more severely impacted than men. Recent data from the study of Liu et al. (2022) indicated that postpartum depressive symptoms of mothers were related to lower quality of mother–infant bonding, as was also the grief related to

COVID-19. Same was not true for the anxiety symptoms. However, pandemic's full impact on people's mental health and wellbeing is yet to be seen. As recently stated in American Psychological Association's special report, "the urgent need for mental health services will be a trend for years to come" (Spiner, 2022).

In the WHO's latest publication (World Health Organization, 2022b), it is noted that anxiety and depression during the perinatal period are common, affecting 1 in 10 women in high-income countries and 1 in 5 in low- and middle-income countries. Shorey et al. (2018) reported in their meta-analysis, that the incidence of postpartum depression was 12%, while the overall prevalence of depression among healthy mothers without a prior history of depression was 17%. In addition, the highest prevalence was registered in the Middle-East (26%), while the lowest was in Europe (8%).

Previously mentioned WHO's publication (2022b) further highlights that women who were facing mental health issues prior to perinatal period, may experience worsening of their symptoms, while others may experience it for the first time. Worsening of a maternal mental health during the perinatal period may affect her wellbeing, but also that of her child and other family members. Poor mental health of mothers may lead to various negative outcomes, such are lower infant weight, difficulty in feeding, poor bonding, higher risk for physical illnesses and emotional and behavioral difficulties in childhood. Moehler et al. (2006) have concluded that even mild and unrecognized depressive symptoms among mothers might have negative effect on the bonding between the mother- and her child, particularly during the first four months after birth giving. Moreover, maternal postpartum depression was related to long lasting consequences on child's development, in both cognitive and emotional aspects (Moehler, 2006).

In their study on concurrent and longitudinal predictors of postnatal mother-infant bonding, Doyle et al. (2022) found that, after controlling of child's age, younger age of the mother, the level of education, infant's temperament characterised as more difficult, social support perceived as higher and stronger symptoms of postnatal depression were all significant predictors of poorer mother-infant bonding when the child was 5-11-months old. A longitudinal study authored by Hildingsson & Rubertsson (2022) revealed that those women who had depressive symptoms and were facing fear of birth during pregnancy and after the child's birth, were under highest risk to face negative consequences on bonding afterwards. In another longitudinal study, Rusanen et al. (2022) found that when first measured at three months and then for the second time at eight months after birth, the difficulties that mothers

experienced in bonding with their child, followed by what they expected of their unborn baby as well as the quality of the relationships they had in the family and in the broader context, were all connected to the social and emotional difficulties children faced when they reached the age of two.

Goecke et al. (2012) in their study on how the quality of attachment during pregnancy and certain perinatal factors are connected with pre- and postpartum depression in women who became mothers for the first time in their lives, have concluded that the mother will probably experience less symptoms of depression during the last term of pregnancy and postpartum, if she is prenatally attached to her child. The meta-analysis of the relation of depression and postnatal mother-infant bonding, conducted by McNamara et al. (2019) showed that in four studies higher depression in maters was connected to lesser quality of bonding with their child after giving birth. Same authors also reported that six out of seven analyzed studies on relationship between perceived social support and prenatal maternal-fetal attachment, found positive relationship between these two variables. In other words, the more social support received, the higher the quality of maternal-fetal attachment. Such findings shed light on the importance of social support as a protective factor in various (particularly stressful) situations. Furthermore, two studies that were included in mentioned meta-analysis examining the impact of wellbeing on maternal-fetal attachment, reported results indicating that respondents whose psychological wellbeing was rated higher had higher global scores on maternal-fetal attachment and also had higher scores on measured quality of such attachment (Goecke et al., 2012). Mikulincer & Florian (1999) found positive correlation between maternal wellbeing and maternal-fetal attachment, as well as negative correlation between maternal wellbeing and distress of the mothers during the first three months of pregnancy. However, same was not found for the remaining trimesters. Following all this, it is obvious that maternal psychological wellbeing, both during pregnancy and postpartum, is very important for the quality of postnatal mother-infant bonding.

The aim of the study

Relevant literature acknowledges a scientific gap in the understanding of the relationship between maternal mental health and the quality of postnatal mother-infant bonding. Thus, the purpose of current study was to examine maternal depressive symptoms and subjective quality of life in two domains - psychological and environmental - and to analyze their predictive role on postnatal mother-infant bonding. In the research procedure women were asked to rate their experienced feelings (both positive and negative), their self-esteem, to

evaluate thinking, learning, and concentration, as well as to express their beliefs and satisfaction with their body image. Environmental domain included evaluations of financial resources, access to information and health care services, physical safety, and home and physical environment. Depressive symptoms were assessed on the base of their prevalence during the postnatal period.

It was hypothesized that psychological and environmental aspects of maternal subjective quality of life will predict postnatal bonding in a negative direction (highly assessed psychological and environmental aspects of maternal subjective quality of life will decrease probability of impaired mother-infant bonding), while maternal depressive symptoms will predict postnatal bonding in a positive direction (that is, presence of depressive symptoms among mothers will predict lesser quality of postnatal bonding with their child).

Method

Sample and procedure

The sample in this cross-sectional study consisted of 162 women in their postnatal period, i.e., the first 12 months after childbirth, who asked for a medical examination and advice from a gynecologist. Namely, 7 national health institutions in the Republic of North Macedonia were included: University Clinic for Gynecology and Obstetrics (tertiary health care), and Special Hospital for Gynecology and Obstetrics (secondary health care) in the capital city of Skopje, and 5 regional maternity hospitals located in 5 towns. Socio-demographic characteristics of the participants in this research are given in Table 1.

Data was collected during June, 2022 by junior medical doctors and specialists from University Clinic of Psychiatry and University Clinic for Gynecology and Obstetrics. Participation in the study was voluntary, anonymous, and confidential. All study participants signed informed consent prior to answering the questionnaires. The National Ethics Committee at the Faculty of Medicine, Ss. Cyril and Methodius University in Skopje (No. 03-1260/3) approved the study.

Table 1.
Demographic characteristics of study participants (N=162)

	Category	Frequency	Percent
Age	<20	9	5.5
	20-30	89	54.9
	>30	64	39.5
Level of education	Higher/ University diploma	82	50.6
	Secondary/ High school	59	36.4
	Primary	18	11.1
	No education	3	1.9
Marital status	Married	158	97.5
	In romantic relationship	3	1.9
	Divorced	1	.6
Number of pregnancies	1	77	47.5
	2	58	35.8
	≥3	27	16.7
Course of pregnancy	normal	155	95.7
	irregular	7	4.3
Method of delivery/ giving birth	Normal delivery	71	43.8
	Premature delivery	7	4.3
	C-section	84	51.9
Risk factors	No	147	90.7
	Yes	15	9.3

Measures

Edinburgh postnatal depression scale (EPDS, [Cox et al., 1987]) is a self-rating measure used to assess symptoms of depression/to screen for possible depression during prenatal and postnatal period. It consists of 10 items scored on a 4-point Likert scale (from 0 to 3, range 0-30 with higher score indicating higher prevalence of depressive symptoms). Authors reported satisfactory sensitivity and specificity. Recent meta-analysis of 36 validation studies showed that cut-off value of 11 or higher implied to good combined sensitivity and specificity of the EPDS, while cut-off score of 13 or higher could be used to recognize highly expressed depression symptoms among women in antenatal and postnatal period (Levis et al., 2020). Internal consistency reliability of the EPDS in this study's sample was found to be α=0.82.

Subscales of psychological domain (with 6 items) and environmental domain (with 8 items) of the World Health Organization Quality of Life Scale – short form (WHOQOL-BRIEF, [WHOQOL group, 1998]) were used to measure psychological and environmental health. Items were rated on a 5-point Likert scale (from 1-disagree to 5-extremely agree), where higher scores denoted poorer psychological and environmental health, respectively. This measure contained additional two subscales for assessment of physical health and social relationships and showed acceptable discriminant validity and reliability, as reported by the WHOQOL group (1998). In a study of Skevington et al. (2004) conducted among sick and well adults from 23 countries, 4 factor structure of the WHOQOL BRIEF using confirmatory factor analysis was confirmed. Good to excellent reliability was registered, as well, revealing that it could be used as a sound measure in a cross-cultural setting. Reliability of psychological domain/aspect and environment domain/aspect in this study were found to be $\alpha = .70$, and $\alpha = .77$, respectively.

Mother-infant relationship was assessed with Postpartum Bonding Questionnaire (PBQ, [Brockington et al., 2006]) consisted of 25 items rated on a 6-point Likert scale (from 0-always to 5-never). Total score may range from 0 to 125. Higher score indicated higher degree of mother-infant bonding disorder. The authors of this measure identified 4 factors, i.e., general factor, rejection and pathological anger, infant-focused anxiety and incipient abuse. However, in this study overall scale was used. Its internal consistency was $\alpha = 0.92$.

Data analysis

Hierarchical binary logistic regression was performed to analyze the prediction of the binary variable of postpartum bonding on the base of maternal depressive symptoms, as well as psychological domain and environmental domain of subjective quality of life. In the first block/step psychological domain was entered, followed by environmental health entered in the second block, while depressive symptoms variable was entered in the third/final block. Outcome (criterion) variable was dichotomized using median score of 5. That is, all participants scored 5 or less were grouped as those with higher quality of postnatal bonding ($n = 90$), while those scored above the median score comprised the category with lesser quality of postnatal bonding ($n = 72$).

Results

Mean, standard deviation, minimum and maximum score, skewness, and kurtosis of study variables are presented in Table 2. As seen, women in postnatal period who participated in

this study assessed quality of their life as moderate in the environmental domain and relatively high when it comes to psychological domain. Average prevalence of depressive symptoms was also registered among surveyed mothers. In addition, 13.2% of the surveyed mothers in postnatal period had score equal or higher than 11 as a cut off score for depression (Levis et al., 2020; Smith-Nielsen et al., 2018).

Table 2.
Descriptive statistics of the variables in the study (N=166)

	M	SD	Min/max
WHOQOL-Psychological domain	24.45	2.80	12/31
WHOQOL-Environmental domain	30.94	4.14	20/40
Depressive symptoms	5.96	4.50	0/22

Collinearity among predictor variables was not registered (Tolerance values ranged between .666 and .734, and variance inflation factor (VIF) values varied from 1.366 to 1.502). Cook's distances, DfBeta and leverage values indicated there were no cases influencing the logistic regression model.

Results of hierarchical binary logistic regression analysis are presented in table 3. It was found that the third model containing all three predictor variables significantly predicted the quality of postnatal mother-infant bonding ($\chi2(3) = 43.74$, $p < .001$). In addition, Hosmer and Lemeshow test supported goodness of fit of the model (HL(8) = 4.87, $p > .05$). When interaction effects of the predictor variables were added in the model, the model fit was not improved confirming that it was adequately specified.

Table 3.
Results of the hierarchical binary logistic regression analysis (third/final model)

		B (SE)	Wald	df	Exp(B)	95% CI for Exp(B) Lower	Upper
Model 3	WHOQOL-Psychological domain	-.14 (.09)	2.55	1	.87	.730	1.032
	WHOQOL-Environmental domain	-.14 (.05)	6.65[*]	1	.87	.783	.967
	Depressive symptoms	.17 (.05)	10.53[**]	1	1.18	1.068	1.307
	Constant	6.54 (2.42)	8.41	1	688.75		

Nagelkerke R^2=.32; $\chi^2(3)$=43.74, p<.001; HL(8)=7.87, p>.05
[*]p<0.05; [**]p<0.01

Psychological domain and environmental domain of the perceived quality of life, and depressive symptoms accounted for 32% of the variance in the postnatal mother-infant bonding (Negelkerke R2 = .32). Classification of mothers with higher quality vs. lesser quality of postnatal bonding was moderately high, with overall prediction rate of 68.5% (cut off value was .50). Correct prediction rate of mothers with lesser quality of postnatal bonding was 61%, and for mothers with higher quality of postnatal bonding was 74%.

Regression coefficients (Table 3) showed that psychological domain was not significant predictor of the quality of postnatal bonding when depressive symptoms variable was entered in the model (Wald(1) = 2.55, p > .05), while presence of depressive symptoms (Wald(1) = 10.53, p < .01) and environmental domain of the perceived quality of life (Wald(1) = 6.65, p < .05) significantly predicted the outcome variable. Namely, the surveyed mothers with higher incidence of depressive symptoms were 1.18 time more likely to have lesser quality of bonding to their child, than mothers with lower incidence of depressive symptoms. The likelihood of lesser quality of bonding was 18% (Exp(B) = 1.18; CI = 1.068, 1.307). The results further indicated that with the increase in environmental quality of life assessment, the likelihood of lesser quality of postnatal mother-infant bonding decreased for 13% (Exp(B) = 0.87; CI = 0.783, 0.967). It should be noted that psychological domain of quality of life among surveyed mothers significantly predicted quality of postnatal bonding in the first and second block (when psychological health was higher, the likelihood of lesser quality of postnatal mother-infant bonding decreased for 26% and 19%, respectively). However, its effect was suppressed in the third block when depressive symptoms variable was entered.

Discussion

The focus of this study was on the predictive role of maternal depressive symptoms and perceived quality of life on postnatal mother-infant bonding. Research results partially confirmed what was hypothesized, indicating that environmental domain (but not psychological domain) of the perceived quality of life as well as maternal depressive symptoms significantly predicted the quality of postnatal mother-infant bonding. Such results are consistent with findings from relevant research considered above. Namely, several recently published studies (e.g. Doyle et al., 2022; Hildingsson & Rubertsson, 2022; Liu et al., 2022) on bonding between mother and the child during the pregnancy and in the early postpartum period (in particular), reported the negative impact of maternal depression on this important process. The similar was confirmed in the present study too, where mothers with higher incidence of depressive symptoms were more likely to have lesser quality of bonding

with their child. In addition, it was continuously indicated that poor mental health of mothers may lead to various negative outcomes for the child. In this sense, adequate mother-infant bonding is showing to have a great positive effect on children's cognitive, behavioral and emotional development on long-term bases However, if the bonding is somehow impaired (as cited in Roxanne et al., 2022), it will negatively affect children's development as a whole. Considering all this, further research concerning the quality of bonding between the mother and her child b is essential, with bigger set of variables included, in order to gain more detailed insight in how this bond is influenced while being formed (pre- and postnatal) during post-Covid-19 period.

The predictive role of perceived quality of life's environmental domain analyzed in this study indicated that when mothers evaluate their financial resources, access to information and health care services, physical safety, and home and physical environment as higher (or better), it contributed to higher quality of bonding with their child. In other words, results revealed that more positive assessment of the environmental support decreased the possibility of weak mother-infant bonding. This finding is partially supported by some of the results reported in the meta-analysis conducted by McNamara et al. (2019). As already mentioned, these authors included several research on the role of social support and a good intimate partner relationship, indicating their positive effects on maternal-fetal attachment that lasts through the postpartum period in relation to mother-infant bonding. Also, the recent study of Rusanen et al. (2022) among other, found that the quality of relationships mother has in her family and in the broader context, were related to social and emotional problems that children experience when they reached the age of two, which in general terms confirms again the importance of social support and good interpersonal relationships (especially with significant ones) for positive developmental outcomes later on.

It should be noted that psychological domain of quality of life as assessed by mothers in postnatal period was significant predictor of the quality of bonding between the mother and her child in the first and second block, leading to reducing the risk for impaired postpartum bonding. However, when depressive symptoms variable was entered in the third block, the effect of psychological domain of the perceived quality of life, to postpartum bonding was nonsignificant. This implies that presence of depressive symptoms probably mediates the role of psychological health in postnatal bonding, which is a finding that deserves to be investigated more in depth in future.

Limitations of the study

This study is one of the first to explore mother-infant bonding in the Republic of North Macedonia. According to the best of our knowledge similar studies are not conducted in the near region, as well. The findings confirmed the importance of maternal psychological well-being to the bond with her child, as well as suggested on the relevance of the larger environmental support for mother-infant relationship during the postnatal period. However, it should be noted that the sample consisted of mothers from all regions in the country, but only those who were advising with gynecologist answered the questionnaires. This prevents broader generalizations of the study results. Longitudinal research should be further applied to examine study variables in different time points using larger sample size. In addition, fathers' role should be studied, as well. Mother-fetus bond (e.g. Pavše et al., 2017), millennial women expectations and perceptions of motherhood (e.g. van Beeck et al., 2019), as well as, experiences of emotional neglect of mothers (e.g. Lehnig et al., 2019) might be taken into consideration in the future research. Finally, the EPDS aimed to screen potential depression, however other measures need to be applied along to this scale to further assess presence and severity of depression and, consequently its role on mother-infant relationship.

Conclusion

This study revealed on significant predictive role of maternal depressive symptoms, as well as, perceived environmental domain of quality of life on postnatal bonding quality. This gives good reason for focusing increased attention on formation of mother–infant dyads both during pregnancy and postpartum. Early postnatal period (according to some literature especially first 12 weeks), is usually considered a highly sensitive period for development of the relationship between the mother and her child, thus causing long-term effects on child's development in all domains. The empirical data from this research warrant further studies focusing on mental health of mothers and children, by emphasizing protection and support during and after pregnancy. It also highlights the importance of good maternal mental health and the need to invest in it as early as possible, with regular medical checkups and consultations due to maintain positive and prevent negative developmental outcomes both pre- and postnatal.

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