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Influence of Perinatal Depression on Labor-Associated Fear and Emotional Attachment to the Child in High-Risk Pregnancies and the First Days After Delivery

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Background: The aim of this study was to analyze the influence of the level of perinatal depression on the labor-associated fear and emotional attachment of children born to women during high-risk pregnancies and in the first days after delivery.





Material/Methods: 133 women aged between 16 and 45 years took part in the study. The first group included 63 pregnant women (mean age=28.59, SD=5.578) with a high-risk pregnancy (of maternal origin, for example, cardiologic disorders and diabetes). The second group included 70 women (mean age=27.94, SD=5.164) who were in the first days post-partum. Research methods included: Analysis of medical documentation; Clinical interview; the Edinburgh Postnatal Depression Scale (EPDS); the Questionnaire of Labor-Associated Anxiety (KLP), the Maternal-Fetal Attachment Scale (MFAS).

Results: Women after delivery displayed a higher level of concern for the child's health and life when compared to the high-risk pregnancy group. The results indicated the appearance of a postnatal fear, the level of which is connected with the perception of the role of the mother. This fear is lower in women prior to childbirth than it is after. There has also been noted a statistically significant relationship between the appearance of depression and attachment to the child. Those women with depression show less attachment to their child than is the case for those who do not suffer from depression.

Conclusions: The appearance of a high level of depression amongst women from the high-risk pregnancy group during the first days post childbirth was accompanied by perinatal depression and a weaker attachment to the child.

MeSH Keywords: **Fear • Maternal-Fetal Relations • Pregnancy Complications**

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Background

The pregnancy and perinatal period are special events in a woman's life, ones that induce many changes involving both the woman's body and the other areas of her functioning, and may lead to an experiencing of both physical and emotional stress [1,2]. Additional problems, associated with the maternal and child health status, are experienced by women with pregnancy complications [3]. The anxiety present in such mothers concerning their own health and the health of their unborn child indicates a highly stressful situation that may potentially lead to such emotional consequences as grief, despondence, and even depression. Previous studies have revealed that high-risk pregnancy is associated with a higher level of depressive symptoms [3,4]. Women hospitalized due to pregnancy complications significantly more frequently show mood disorders, emotional lability, and ambivalent emotions concerning their pregnancy and child [5–8].

Furthermore, a new situation, namely the delivering of a child, is associated with an array of changes which in turn can result in a range of emotions. In the case of many women, the perinatal period and the adaptation to the new social role is associated with many emotional problems. They can manifest themselves as severe mood disorders, for example postpartum depression (PPD), also called postnatal depression, which is a type of clinical depression, and which can affect women after childbirth [9–13]. Postnatal depression is usually manifested by depressed mood, anxiety, feelings of guilt, diminished interests (including libido), negative self-assessment of the maternal role, fear of injuring the child, fatigue, problems with concentration and sleeping, and eating disorders [14]. Depressive mood disorders associated with puerperium have negative consequences for a woman's functioning, the relationship with her partner, family, and particularly for the development of her child both during infancy and in later periods [3]. As a result of experiencing postnatal depression, a mother may be unable to engage in empathetic contact with the child or may even reject it [15] impairing the emotional relationship with the newborn [16]. Therefore, analyzing the depressive disorders associated with pregnancy and the postnatal period is of vital importance.

It is estimated that pregnancy-associated depressive symptoms can be observed in approximately one out of four women, who, sadly, are not the only individuals affected by this condition as impaired functioning and diminished quality of maternal life may also have a detrimental effect on the child [1]. According to epidemiologic estimates, approximately 25–35% of pregnant women show symptoms of depression, including about 20% of patients who met the criteria of a mild or moderate depressive disorder [16–18]. According to other authors, 10–16% of all pregnant women meet the diagnostic criteria

of depression. Pregnancy-associated depressive episodes can differ in terms of their onset and duration, and many of them begin and are resolved in a period ranging from between one and three trimesters. It is estimated that more than 30% of women will suffer from depression during at least one trimester, while 25% of them will experience depression during only one trimester of their pregnancies [19,20]. Other authors have revealed that the prevalence of pregnancy-associated depression amounts for 7.4% in the first, 12.8% in the second, and 12% in the third trimester [15]. Pregnancy-associated depression manifests itself with specific symptoms. In the first and third trimester women are categorized by a higher sensibility and emotional lability [21]. Depressive symptoms observed in the course of pregnancy include: slightly decreased mood (tearfulness, grief, or irritability), impaired drive (lack of energy, a slowing down or agitation, fatigability), disorders of the circadian rhythms (poor morning mood, sleeping disorders, problems with falling asleep, disturbed sleep, or excessive sleepiness), changes of appetite (diminished or excessive appetite associated with weight loss or gain), impairment of the cognitive functions (problems with concentration and memory), depressive self- and reality-assessment (feeling guilty and valueless, diminished self-esteem), anhedonia, diminished interest, anxiety (anxiety states "without content" or anxiety concerning pregnancy, self-imagined threats), and suicidal ideation [15].

Depressive symptoms are more frequently reported in women with complicated pregnancies, particularly in those hospitalized [22]. In the study by Mercer and Ferketich [23], up to 51% of women with symptomatic pregnancy pathologies showed symptoms of depression. Characteristically, women affected with perinatal depression incorporate the pregnancy- and child-associated issues into the spectrum of their symptoms. Thus, their concerns usually include the course of pregnancy and the health status of the child, and depressive thoughts are associated with expected failures and complications. The woman is affected by feelings of guilt and the depression deprives her of the joy that should be associated with maternal experiences. The effect of the depressive episode experienced during the perinatal period can be so devastating that one-third of affected women change their reproductive plans and decide not to have another child [15]. Increasing evidence suggests that psychosocial factors can increase the probability of such perinatal complications as preterm birth, low birth weight, and intrauterine growth retardation [24]. Obstetrical concerns such as miscarriage, intrauterine mortality, or the death of the child during the perinatal period represent the strongest risk factors of pregnancy-associated depression [21]. A number of new considerations appear in the case of postnatal depression. Similarly to baby blues, this condition affects women with a history of previous emotional disorders, including pregnancy-associated disorders. Other risk factors include disturbed marital or partner relationships, lack of social

support, and negative life events experienced during the period of the pregnancy [18], along with low self-esteem, the poor health status of the child, unplanned and/or unaccepted pregnancy, and single-parent maternity [15]. The results of some studies suggest that aside from marital status, also the importance assigned by the women to the marital status, along with the opinion of the generative family with regards to cohabitation and having children from this type of relationship, and pressure from others, represent determinants of postnatal depression [15,22].

According to many authors, depressive symptoms can be associated with a poor marital relationship during pregnancy and the postnatal period [15]. Braverman and Roux [3] revealed that mothers who more frequently reported marital problems during pregnancy, experienced higher levels of depression after delivery [15,25]. Also, the study by Kumar and Robson [24] confirmed that women experiencing pre-pregnancy marital conflicts belong to the risk group of postnatal depression. O'Hara and Swain [11] observed that women who showed lower scores of marital satisfaction, as determined by the DAS Scale by G. S. Spanier, during pregnancy were at a higher risk of developing depression after delivery. In contrast, Hopkins, Campbell and Marcus [17] did not observe any significant association between marital satisfaction and the prevalence of postnatal depression [15].

Rubin [2] identified four specific tasks which the pregnant women observed navigated before childbirth: seeking safe passage for themselves and the baby, ensuring that the baby is accepted by others of importance, establish prenatal bond with the baby and giving of herself. The bond between a woman and her foetus is often conceptualized by health professionals in terms of maternal-foetal attachment or prenatal attachment [26–29]. Maternal-foetal attachment (MFA) is a term used to describe the relationship between a pregnant woman and her foetus [30,31]. Qualitative descriptions of maternal attitudes and adaptation to pregnancy indicate that MFA is based on cognitive representations of the foetus [30]. MFA is manifested in behaviors that demonstrate care and commitment to the foetus and include nurturance (eating well, abstaining from harmful substances, such as alcohol), comforting (stroking the belly), and physical preparation (buying baby clothes and equipment) [32]. Bonding with the mother is already determined prenatally and is extremely important for the proper development of the child [31]. There are three elements that make up the developing mother-child relationship: the perception of the child as a separate, independent entity, the assigning to it of traits and attempts to contact the child [32].

The development of bonding between a mother and child may occur by the cognitive perception of the foetus example: ideas about the child and interacting with it, assigning

characteristics to the child (physical and mental, a conversation with the unborn child, good nutrition on the part of the mother, the preparation of the home environment or a story about a child with others [31].

There are certain factors of maternal antenatal attachment. As a result, a range of demographic (age, education, socioeconomic status), pregnancy-related clinical (the risk status of the current pregnancy, the outcome of the previous pregnancy), psychosocial (self-esteem, social support, coping style) and psychopathological (depressive and anxiety symptoms) variables have been identified as significant correlates of maternal antenatal attachment [33]. The study shows that women who experienced difficulties in becoming pregnant when compared with women who had not experienced such difficulties, were more intensively focused on the unborn child and constructed for it a stronger image [34].

This important and mysterious relationship between the child and the mother does not begin at birth, and maternal fetal attachment commences early on in pregnancy, increases over pregnancy and is the most intensive during the last trimester [23,28,35]. Studies by Eswi and Khalil [36] have report that pregnant Egyptian women experienced more positive feeling of attachment toward their foetuses. Prenatal attachment was differentiated by high/low risk pregnancy, women with low risk pregnancy experienced a higher level of maternal foetal attachment than other women with high risk pregnancy [36]. Other research findings indicated that the levels of prenatal attachment were associated with a level of social support, anxiety and depression, mothers with higher social support had high MFA scores [37]. Thee results of Chrzan-Detkos and Lockiewicz [38] also demonstrate that a mother's romantic attachment style influences her attachment to the baby, though this relationship is more direct during pregnancy than it is postpartum. In expectant mothers, the anxious-ambivalent romantic attachment style predicted more interaction with, and attributing more characteristics to the foetus; the secure romantic attachment style was positively correlated with role taking, while the avoidant – with attributing more characteristics to the foetus [38].

Maternal fetal interaction is closely correlated with maternal psychological and physical wellbeing. The psychological health of the mother to be might influence not only her relations with the foetus but also her health behavior [39].

Maternal depression is believed to have an adverse impact on the mother – child attachment relationship [40]. Associations between maternal depression and insecure or disorganized mother – infant attachment are more likely in very low socioeconomic groups, where depression is a common concomitant of motherhood [41], and in samples where the depression is

clinically diagnosed, chronic and/or severe [41,42]. Mothers diagnosed as depressed were more likely to have an insecure state of mind regarding attachment [40]. The infants of chronically depressed mothers were more likely to be insecurely attached; however, the relationship between maternal depression and child attachment was moderated by the maternal attachment state of mind [40].

The aim of this study was to analyze the influence of the level of depression on the intensity of experienced labor-associated anxiety, the level of social support, the strength of the emotional relationship with the child, and the qualitative assessment of the marriage/partner relationship in Polish women during high-risk pregnancy and the first days after delivery.

Material and Methods

The study included 133 women divided into two groups. The first group comprised 63 women with a high-risk pregnancy of maternal origin (most commonly due to cardiologic disorders and diabetes). The second group included 70 women, who were 2 or 3 days post-delivery. The age of the participants ranged between 16 and 45 years with a mean of 27.94 (SD=5.164) years in the puerperium group, and 28.59 (SD=5.578) years in the high-risk pregnancy group. The Student's t-test did not confirm a statistical significance for intergroup age differences ($t < 1$). Additionally, the studied groups did not differ significantly in terms of education level, marital status, mean duration of marriage/relationship, material status, the number of planned or unplanned pregnancies, the number of children, and the history of morbidity during pregnancy.

The study was conducted at the Pathology of Pregnancy and Obstetrical Wards of the Gynecological Clinics of the Gdansk Medical University, Nicolaus Copernicus Pomeranian Trauma Centre in Gdansk, and the Specialist Hospital in Koscierzyna, and covered a two-month period in 2010. Both groups were subjected to the same analytical procedures. Participation in the study was voluntary and all patients were informed about the study's objectives and provided with full anonymity. The survey was conducted on an individual basis following the verbal consent of participants in the rooms in which they were hospitalized at the Pathology of Pregnancy and Obstetrical Wards. In order to improve contact with the patient, the survey was preceded by a chat dealing with the course of pregnancy, emotions associated with labor, mental and physical mood, the health status of the child, and hospitalization. Subsequently, following the explanation of the study's objectives and instructions concerning the completion of the personal questionnaire and other questionnaires included in the survey, each patient received a complete set of survey instruments. Each patient had the possibility to express her concerns and to ask questions

related to the questionnaires and the study's objectives. The participants were allowed to complete all the questionnaires at a freely selected location and at a time convenient for them.

Research methods used in this study included: (1) Analysis of medical documentation; (2) Clinical interview; (3) The Edinburgh Postnatal Depression Scale (EPDS) [44]. This scale was originally applied to the determination of depression levels in women after delivery. However, it has also proved useful in pregnant women [15] as well as in the examination of mothers up to three years after delivery [15]. Overall the EPDS score is obtained by summing up the individual scores of all ten statements, which can range from 0 to 30 points. The higher the score, the higher the probability that the examined individual suffers from perinatal depression of various intensity. The authors of the questionnaire proposed 13 points as a cut-off value distinguishing the risk group of postnatal depression [28]. However, Steiner and Yonkers postulated a 12–13 point cut-off value [15], and Krzyzanowska-Zbucka [45] suggested that the score of 10 points is sufficient to identify mothers who are probably experiencing a depression episode. This latter value was adopted for the purpose of this study. (4) The Questionnaire of Labor-Associated Anxiety (KLP) developed by L. Putynski [46]; this instrument is used mostly for scientific purposes and determines the contextual aspects of labor-associated anxiety. Six dimensions of labor-associated anxiety are analyzed: anxiety associated with the course of delivery, concern for the child's health and life, anxiety associated with the maternal role performance, anxiety associated with the postnatal period, concern for one's own health and life, and the fear of losing control during delivery. (5) The Maternal-Foetal Attachment Scale (MFAS) [31,32] including five dimensions of the relationship: parental role taking (e.g. "I picture myself feeding the baby"), differentiation of self from child (e.g. "I'm really looking forward to seeing what the baby looks like"), interaction with the child (e.g. "I talk to my unborn child"), attributing characteristics to the child (e.g. "I can almost guess what my baby's personality will be from the way he/she moves"), and the giving of self to the child (e.g. "I eat meat and vegetables to be sure my baby gets a good diet").

The results were analyzed with the SPSS v.17.0 statistical package. The following statistical methods were used: the Student's t-test for independent variables, the ANOVA analysis of variance, and descriptive statistics.

The consent of the patient as well as the approval of the local Bioethics Commission was obtained to carry out of this study.

Results

Comparative analysis of the labor-associated anxiety level in the studied groups of women, stratified with regards to the

Table 1. Descriptive statistics of the labor-associated anxiety level, stratified with regards to the depression level and analysis of variance estimating the influence of depression on the level of labor-associated anxiety in the studied groups of women.

Dimensions of labor-associated anxiety	Mild depression				Severe depression				Group			Depression			Group* depression		
	After delivery		High-risk pregnancy		After delivery		High-risk pregnancy		F (1;132)	P	Eta2	F (1;132)	P	Eta2	F (1;132)	P	Eta2
	M	SD	M	SD	M	SD	M	SD									
Anxiety associated with the course of labor	13.38	4.976	14.21	5.319	14.61	4.699	15.72	4.803	1.276	.261	.010	2.536	.114	.019	.028	.868	.001
Concern for the child's health and life	5.47	3.253	4.09	2.701	6.79	3.024	5.59	3.521	5.654*	.019	.042	6.729*	.011	.050	.027	.871	.001
Anxiety associated with the maternal role performance	3.34	2.99	2.65	2.521	7.11	4.826	5.03	4.633	4.172*	.043	.031	20.598*	<.001	.138	1.029	.312	.008
Anxiety associated with the postnatal period	5.16	2.76	5.09	3.297	6.79	3.55	6.79	3.499	.003	.955	.000	8.429*	.004	.061	.004	.950	.001
Concern for one's own health and life	6.56	2.526	5.97	2.758	7.42	3.477	7.86	4.024	.018	.894	.000	5.952*	.016	.044	.840	.361	.006
Fear of losing control during labor	9.44	3.654	9.18	5.012	11.13	4.088	10.41	5.2	.389	.534	.003	3.486 ^a	.064	.026	.085	.772	.001

^a <0.10; * p<0.05.

depression level and analysis of variance estimating the influence of depression on the level of labor-associated anxiety from both studied groups is presented in Table 1.

Due to the lack of significant intergroup differences in the depression levels, the standardized scores of the EPDS questionnaire were analyzed together in order to estimate the global level of postnatal depression, and were divided into low and high, based on their median value. Subsequently, the descriptive statistics were calculated in order to analyze the mean values and the standard deviations of all the analyzed dimensions: namely labor-associated anxiety, the emotional bond with the child, in the examined groups of women, stratified with regards to a low and high depression level.

The Student's t-test revealed significant intergroup differences pertaining to the two dimensions of labor-associated fear, namely concern for the child's health and life [t(131)=2.55; p=0.012], and fear associated with the maternal role performance [t(131)=2.26; p=0.025]. Women after delivery displayed a higher level of concern for the child's health and life (M=6.19; SD=3.17) when compared to the high-risk pregnancy group (M=4.78; SD=3.17). Similarly, they scored higher in terms of the anxiety associated with the maternal role performance (M=5.39; SD=4.48) than women with a high-risk pregnancy (M=3.75; SD=3.81).

Levene's test revealed significant intergroup differences [F(1; 131)=4.149; p=0.044] with regards to fear associated with

Table 2. Summary of the analysis of variance estimating the influence of depression on the level of labor-associated anxiety in the studied groups.

Dimensions of labor-associated anxiety	Group			Depression			Group* depression		
	F(1;132)	p	Eta2	F(1;132)	P	Eta2	F(1;132)	P	Eta2
Anxiety associated with the course of delivery	1.276	.261	.010	2.536	.114	.019	.028	.868	.001
Concern for the child's health and life	5.654*	.019	.042	6.729*	.011	.050	.027	.871	.001
Anxiety associated with the maternal role performance	4.172*	.043	.031	20.598*	<.001	.138	1.029	.312	.008
Anxiety associated with the postnatal period	.003	.955	.000	8.429*	.004	.061	.004	.950	.001
Concern for one's own health and life	.018	.894	.000	5.952*	.016	.044	.840	.361	.006
Fear of losing control during labor	.389	.534	.003	3.486 ^a	.064	.026	.085	.772	.001

^a <0.10; * p<0.05.

losing control during labor. The standard deviation of the score in women after delivery (SD=3.96) was lower than in women from the high-risk pregnancy group (SD=5.096), corresponding to a higher variation in the latter. Extremely high and extremely low scores were markedly more frequent prior to delivery than after labor. The results obtained with regards to the dimension of anxiety associated with losing control during labor can be interpreted as natural feelings characteristics of women expecting a child. Some of these women declare a high level of labor-associated anxiety while others probably utilize the technique of anxiety denial.

The ANOVA analysis of the variance of labor-associated anxiety scores was conducted in order to verify if perinatal depression influences the level of this parameter in high-risk pregnancy and post-delivery groups.

The ANOVA analysis of variance revealed significant intergroup differences in terms of concern for the child's health and life between women with a high-risk pregnancy and women after delivery [F(1;132)=5.654; p=0.019] as well as between women representing high and low levels of depression [F(1;132)=6.729; p=0.011]. However, the influence of depression on the level of concern for a child's health and life was irrespective of intergroup differences (F(1;132)=0.027; p=0.871). Analysis of the data showed that the level of concern for a child's health and life is higher in women after delivery when compared to those

with a high-risk pregnancy and in those with a higher vs. lower level of depression. The differences displayed the same direction in both groups but were more pronounced when only patients showing high levels of depression were compared between the 'post-delivery' and 'high-risk pregnancy' groups.

Analysis of variance revealed significant intergroup differences in the anxiety associated with the maternal role performance between women with a high-risk pregnancy and those after delivery (F(1;132)= 4.172; p=0.043), as well as between mothers with high and low levels of depression (F(1;132)= 20.598; p<0.001); the influence of perinatal depression proved to be independent of the intergroup differences (F(1;132)=1.029; p=0.312). Those findings suggest that the level of fear associated with maternal role performance is markedly higher in the group of women after delivery than in women with a high-risk pregnancy, and is the highest in women of the former group representing high levels of depression.

Fear associated with the postnatal period was the other dimension of labor-associated fear that showed significant differences (p<0.05). However, those differences pertained solely to those groups of women representing high and low levels of depression (F(1;132)=8.429; p=0.004), while no significant intergroup differences were observed between women with high-risk pregnancy and women who had already delivered (F(1;132)=0.003; p=0.955). Additionally, the influence of

Table 3. Descriptive statistics of emotional attachment to the child presented by women with a high-risk pregnancy and those after delivery and the analysis of variance estimating the influence of depression on the level of emotional attachment to the child in the studied groups.

Components of emotional attachment to the child	Mild depression				Severe depression				Group			Depression			Group* depression		
	After delivery		High-risk pregnancy		After delivery		High-risk pregnancy		F	P	Eta2	F	P	Eta2	F	P	Eta2
	M	SD	M	SD	M	SD	M	SD	(1;132)			(1;132)			(1;132)		
Parental role taking	17.06	3.232	17.53	2.842	15.82	3.127	15.9	3.735	.237	.627	.002	6.559*	.012	.048	.118	.732	.001
Differentiation of self from child	17.13	2.282	16.62	2.764	16.5	2.14	15.79	3.2	1.800	.182	.014	2.566	.112	.020	.049	.826	.000
Interaction with the child	19.16	3.293	18.24	2.764	19.08	2.981	17.31	3.846	5.771*	.018	.043	.801	.372	.006	.573	.450	.004
Attributing characteristics to the child	23.16	3.936	21.24	4.71	21.76	4.258	20.48	5.173	4.135*	.044	.031	1.857	.175	.014	.166	.685	.001
Giving of self to the child	20.66	2.404	21.97	2.022	19.24	3.208	20.38	2.678	7.156*	.008	.053	10.746*	.001	.077	.035	.852	.000
Global attachment score	97.16	11.45	95.59	10.689	92.39	10.777	89.86	14.913	.973	.326	.007	6.363*	.013	.047	.054	.817	.000

* p<0.05.

depression on the level of fear associated with the postnatal period proved to be independent of intergroup differences ($F(1;132)=0.004$; $p=0.950$). The data presented in Table 2 shows that the level of this fear dimension is quite similar in women with a high-risk pregnancy and those after delivery. The direction of this relationship was similar in both groups, also when stratified according to low and high levels of depression.

Concern for one's own health and life was another dimension of fear in which statistically significant differences were observed ($p<0.05$). Those differences pertained to women representing high and low levels of perinatal depression ($F(1;132)=5.952$; $p=0.016$). Similarly to the previously discussed dimension of labor-associated fear, no significant intergroup differences were documented between women with a high-risk pregnancy and women who had already delivered ($F(1;132)=0.018$; $p=0.894$). Additionally, the influence of depression on the level of concern for one's own health and life proved independent of intergroup differences ($F(1;132)=0.840$; $p=0.361$).

Subsequently, the mean values and standard deviations of particular scales included in Cranley's "Maternal-Foetal Attachment" questionnaire were described along with the characteristics of the overall score of the emotional attachment presented by women with a high-risk pregnancy and

those after delivery, stratified according to low and high levels of perinatal depression. The results are presented in Table 3.

Women after delivery or with a high-risk pregnancy who experienced a high level of depression presented the lowest intensity of attachment to their child. Higher scores of the particular subscales of emotional attachment always corresponded to a lower level of depression, both in the high-risk pregnancy group and in women who had already delivered. Women with a high level of perinatal depression showed a lower level of emotional attachment to their baby, but this difference did not prove significant when compared to women with mild depression.

Analysis of variance was applied in order to analyze the influence of perinatal depression on the emotional attachment to the child in mothers with a high-risk pregnancy and in those who had already delivered.

The ANOVA analysis of variance did not reveal statistically significant differences with regards to undertaking the parental role between women after delivery and in those with a high-risk pregnancy [$F(1;132)= 0.237$; $p=0.627$]. In contrast, this parameter was significantly influenced ($p<0.05$) by the level of depression [$F(1;132)= 6.559$; $p=0.012$]; the effects of this latter

factor were similar in both studied groups [$F(1;132)=0.118$; $p=0.732$]. Significant ($p<0.05$) intergroup differences were observed in another dimension of the emotional attachment – interaction with the child [$F(1;132)=5.771$; $p=0.018$], while the influence of depression was not documented in that parameter. Analysis of variance revealed that women after delivery and those with a high-risk pregnancy differed in terms of the subscale determining attributing characteristics to the child [$F(1;132)= 4.135$; $p=0.044$]. However, equally this dimension was not modulated by depression. In the case of subordination to the interests of the child, our analysis revealed statistically significant intergroup differences between women with a high-risk pregnancy and those who had already delivered [$F(1;132)=7.156$; $p=0.008$], as well as between women representing high and low levels of depression [$F(1;132)= 10.746$; $p=0.001$]. The influence of depression on subordination to the interests of the child was observed independently of the intergroup differences [$F(1;132)=0.035$; $p=0.852$].

The overall attachment score differed significantly between women with high and low depression levels [$F(1;132)= 6.363$; $p=0.013$], while no significant intergroup differences were observed between women with pathological pregnancy and those after delivery [$F(1;132)=0.973$; $p=0.326$]. Also, in the case of this parameter the influence of depression proved independent of the intergroup differences [$F(1;132)=0.054$; $p=0.817$].

Discussion

Our hypothesis that perinatal depression can modulate the fear experienced during labor was confirmed with regards to the following dimensions of fear: the health and life of the child, the maternal role performance, the postnatal period, and the woman's health and life. The influence of depression on the level of labor-associated fear was observed in both groups, and a high level of depression was always associated with a higher level of experienced fear. Moreover, women in puerperium usually presented lower levels of fear when compared to women with pregnancy complications. The observed effect of depression confirmed that fear is not resolved after delivery but its intensity is even higher with regards to certain dimensions. To the best of our knowledge, there has been no published research verifying whether women with a high-risk pregnancy or during puerperium, who experienced perinatal depressive disorders, display higher levels of labor-associated fear.

Our study partially confirmed the effect of perinatal depression on the intensity of emotional attachment to the child. This finding can be reflected by the overall score of emotional attachment intensity and its two dimensions, i.e., parental role taking and compliance with the child's interests. Intergroup differences in the overall score of the emotional

relationship observed in women with a high level of depression were evident.

Women with a high-risk pregnancy obtained higher scores when compared to puerperium women representing the same level of depression. Delivery associated with a low level of depression is reflected by a higher intensity of emotional attachment to the child. The only exception pertained to the compliance with the child's interests; the score for this dimension was the highest in the group of women in whom high-risk pregnancy was associated with a low level of perinatal depression.

Prenatal studies revealed that the neurohormonal system, if properly matured during prenatal period, releases certain hormones which modulate the maternal mood. Emotions memorized by the body are relatively stable and can define an inherited predisposition for anxious, aggressive or joyful arrival into the extra-uterine environment [49].

Previous studies revealed that experienced emotions (mostly grief and worry) are associated with emotional attachment to the child. High depression scores in the third trimester co-exist with low levels of attachment [15,47,48,50]. The postnatal consequences of impaired attachment to the child resulting from perinatal depression are widely described in the available subject literature. They include problems with breastfeeding and changing the baby; furthermore, the mother is often reluctant to cuddle her child, is afraid of him/her, and avoids contact with the baby, sometimes even avoiding visual contact. The lack of emotional and physical contact between the depression-affected mother and her newborn may cause many physiological disorders in the latter, including decreased appetite, anxiety, excessive crying, and being underweight. Furthermore, maternal depression can lead to a complete rejection of the child, which may manifest itself as persistent intellectual and personality alterations and speech and behavior disorders. Some studies of pregnant women confirmed that high depression scores during the third trimester co-exist with a low intensity of relationship with the child [50]. However, high scores of the relationship associated with depressive symptoms in pregnant women have also been noted [51]. A strong emotional relationship with the child during the prenatal period acts as a barrier that protects the woman against pregnancy-associated depression and distress [52], as well as against other symptoms, including emotional lability and the loss of control over one's behavior [52–55].

Conclusions

We found that perinatal depression influences the following aspects of labor-associated fear: the child's health and life, the maternal role performance, the postnatal period, and one's

own health and life. The fear in those dimensions is higher in women who after delivery manifest low or high depression levels. Perinatal depression modulates emotional attachment to the child in the context of the undertaking of the parental role, subordination to the interests of the child, and the overall level of emotional attachment. The level of emotional attachment is the lowest in women with a high-risk pregnancy who show high levels of depression.

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