# THE HEALTH OF NEWBORNS AND MOTHERS HOSPITALIZED TOGETHER POSTNATAL

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**ABSTRACT**

*The aim of the study is to investigate the health of the newborn and mother hospitalized together postnatal. The objectives areto identify the characteristics of newborns and the mothers and to find some of the correlations between neonatal and physical and psychological maternal variables. In a cross-sectional study were included mother-child couples hospitalized together after birth, divided as: a) a sample of newborns (n = 176); b) a sample of accompanying mothers (n = 165). In this study, a various pathology of infants, physical pathology and postpartum psychological manifestations were associated, and very significant correlations (r < -0.75 or > 0.75; p < 0.001) were between the following variables: the gestational age with the birth weight (r = 0.883); number of days of hospitalization with birth weight (r = 0.793) and the gestational age, respectively (r = 0.788); number of days of hospitalization and anxious attachment (r = -0.793); anxiety as a condition and anxiety as a trait (r = 0.753). A significant number of infants had acute episodes and chronic diseases. Almost half of the mothers had a pathological pregnancy and/or birth and postpartum psychological manifestations. Several correlations were identified within neonatal variables and maternal variable and between these categories of variables.*

**KEY WORDS:** *anxiety as a state, anxiety as a trait, fullterm newborn, postpartum depression, premature newborn.*

### INTRODUCTION

In the neonatal period (0-28 days of life), fullterm and premature newborns often have acute conditions, some of which become chronic diseases. In this context, mothers may have various psychological manifestations.

Up to 20% of parents experience postpartum depression or anxiety (Baran *et al.*, 2021). Postpartum depression is a type of depression that can occur after birth. Symptoms can be found in children but also in people who have not given birth (surrogate and adoptive parents), through hormonal, physical, emotional, behavioral and socio-economic changes that occur after the child appears in the family (Citu *et al.*, 2022). Depending on the intensity of the manifestations, postpartum depression can be of three types: postpartum blues or baby blues, which affects 50-75 % of parents; postpartum depression, which affects 1/7 of parents (up to 15 % of parents with baby blues; postpartum psychosis, which affects 1/1000 people after birth (Baran *et al.*, 2021).

Similar to postpartum depression, postpartum anxiety may worsen from postpartum anxiety due to hormonal changes and in response to real stressors, for example: problems related to the child's health, financial situation, previous miscarriage (miscarriage or fetus death in uterus). The prevalence of peripartum mood and anxiety disorders (PMAD) in the general population worldwide is estimated at 10-20 % (Simhi M. *et al.*, 2021).

The pioneer of attachment theory John Bowlby defined genetically programmed attachment as a special emotional relationship that involves an exchange of comfort, pleasure, and care between mother and child (Thompson *et al.*, 2022). Guided by the attachment styles of the child, the attachment in intimate relationships was classified as secure, avoidant and anxious attachment style (Fernández *et al.*, 2015).

The aim of the study is to investigate the health of the newborn and mother for mother-child couples hospitalized together postnatal. The objectives are:

1) to identify the different characteristics of newborns;

2) to find some of the correlations between neonatal and maternal variables, including postpartum maternal psychological manifestations.

**MATERIALS AND METHODS**

The cross-sectional study included mother-child couples hospitalized together after birth, divided as follows:

a) a sample of 175 newborns;

b) a sample of 165 accompanying mothers. Data were collected from medical documents of newborns and mothers hospitalized together postnatal between 01.03.2020-01.09.2020.

Mothers responded to three psychological tests: *the Spielberger State-Trait Anxiety Inventory (STAI-Y)*, *the Edinburgh Postpartum Depression Scale (EPDS)*, and *the Collins and Read Adult Attachment Scale (Collins and Read AAS)*.

Statistical analysis was performed using SPSS 20, Excel and Microsoft Access programs. Frequency analysis and correlations between different neonatal and maternal variables were performed.

**RESULTS AND DISCUSSIONS**

Numerous data have been identified about newborns and mothers.

*The sample of newborns*. In the sample of newborns, 10.86 % twins and 1.71 % triplets were included. The newborns were 52.57% boys and 47.43% girls, with the birth weight (BW) of 650-4430 g (average: 2769.62 ± 963.27 g), length (L) of 29-57 cm (average: 47.93 ± 6.48 cm), skull perimeter (CP) of 22 -38 cm (mean: 32.36 ± 3.49 cm) and gestational age (GA) 26-42 weeks (mean: 36.49 ± 3.95 weeks).

The sample of newborns consisted of 115 (65.72%) fullterm newborns, 1 postmature (0.57%) and 59 (33.71%) premature (Table 1). Newborns included in the study came from either dispensary pregnancy, 166 (94.86%) or non-dispensary pregnancy, 9 (5.14%).

The hospitalization of the children lasted 2-128 days (average 18.26 ± 26.12). Out of the total number of newborns, 64 (36.57%) were hospitalized in neonatal intensive care unit. Their affected clinical condition meant that 50.3% of newborns needed oxygen therapy, administered in various ways, often in succession (Table 1).

During hospitalization, 5.71% of infants had surgery. A significant number of infants had various acute episodes, and the most common were: jaundice (74.86%), eating disorders (33.14%) and hydroelectrolytic disorders (32.57%). During hospitalization, 1.71% of infants died. Infants hospitalized for a long time had various chronic diseases, and the most common were: anemia (36%), cerebral hemorrhage (19.43%) and cutaneous hemangiomas (16.57%).

Neonatal infections were objectified by positive microbiological cultures in 6.29% from newborns, namely with the following germs: *cytomegalovirus*, *Klebsiella pneumoniae/spp.*, *Staphylococcus aureus*, *Axylosoxiclous*, *Enterococcus faecium* and mixed, with *Staphylococcus haemolyticus* and *Enterococcus faecium*. The *COVID-19* PCR test was performed on 66.86 % from infants enrolled in the study and only 1.82% had a positive result.

*The sample of mothers.* The accompanying mothers enrolled in the study were 14-53 years old (mean age 29.99 ± 5.39), and of these, 3 (1.82 %) were minors. More data on mothers are presented in the Table 2.

The current pregnancy, which in 96.37 % mothers was obtained naturally and in 3.63%, by in vitro fertilization, took place physiologically in 61.82% from mothers. However, 38.18% mothers had various pathological events during pregnancy: 11.52%, premature rupture of amniotic membranes; 9.69%, pregnancy-induced hypertension; 6.67%, painful uterine contractions; 5.45%, first trimester pregnancy; 4.24%, infections; 2.29 %, early placental abruption; 1.21 %, gestational type I diabetes; 15.76%, others - pregnancy anemia, fetal apnea, fetal arrhythmia, fetal growth failure, scarred uterine fissure, allergodermia, dyslexia, cervical dystocia, cervical cerclage, double circular umbilical cord, diabetes mellitus 1 with pre-pregnancy onset, massive declining edema, right kidney stones - ureteral stent erection, moderate-severe metrorrhagia, oligohydramnios, placenta praevia, toxic pregnancy, autoimmune thyroiditis, thrombophilia, overdue pregnancy.

The 9.09% from mothers who had an imminent abortion, where it was possible, were given the complete antenatal treatment with Dexamethasone subcutaneous injections, a drug useful for the lung maturation of the fetus. The birth took place with some complications in 9.69% mothers and 12.72% had a pathological lust. Most mothers were primiparous, 47.88%, and secondary, 23.03%. Other births and personal pathological antecedents (including obstetrical) had 47.88% mothers, and 86 (52.12%), no. Breastfeeding was possible for 115 (65.71%).

Postpartum depression was found in 38.18% mothers, as follows: mild in 31.52%, moderate 6.06% and severe in 0.6% mother, in whom a suicidal factor was present with maximum value (suicidal factor = 3).

The overall mean score at postpartum maternal psychological manifestations was for postpartum depression 8.64 ± 5.66, anxiety as a condition 37.22 ± 12.66, anxiety as a trait 35.71 ± 10.60, securing attachment 3.05 ± 0.73, avoidant attachment 2.29 ± 0.67, anxious attachment 1.90 ± 0.66.

**TABLE I. Neonatal variables measured in the study (**Abbreviations: %, percentage; NCPAP, Nasal Continuous Positive Airway Pressure; OTI/MV, orotracheal intubation/mechanical ventilation)

| Neonatal variables | Category | % |
|---|---|---|
| Prematures | Extra low birth weight | 25.43 |
| | Very low birth weight | 13.56 |
| | Low birth weight | 38.98 |
| | Normal birth weight | 15.25 |
| Type of birth | Caesarean | 62.86 |
| | Natural | 37.14 |
| Presentation at birth | Skull | 81.71 |
| | Pelvic | 15.43 |
| | Transverse | 2.86 |
| Neonatal adaptation | Without disorders | 54.29 |
| | With disorders | 45.14 |
| Oxygen therapy | Neopuff at the delivery room | 12 |
| | NCPAP | 12 |
| | Optiflow | 9.71 |
| | OTI/MV | 10.29 |
| | Oxygen under the isolate | 26.29 |
| | Free oxygen in the incubator | 43.43 |
| Special therapies | Erythropoietin | 17.7 |
| | Surfactant | 12.6 |
| | Blood transfusions | 21.1 |
| Food | Natural | 12.57 |
| | Mixed | 72.57 |
| | Artificial | 14.86 |

**TABLE 2. Maternal variables measured in the study (**Abbreviation: %, percentage)

| Maternal variables | | **%** |
|---|---|---|
| Level of education | Primary school | 3.64 |
| | Gymnasium | 4.24 |
| | High school | 32.73 |
| | Higher education | 47.88 |
| | Postgraduate studies | 11.51 |
| Family of origin | Nuclear | 76.36 |
| | Multigenerational | 12.72 |
| | Concubinage | 10.91 |
| Economic situation (self-assessment) | average | 98.79 |
| | rich | 1.21 |
| Type of birth | Caesarean | 63.03 |
| | Natural | 36.97 |
| | Natural with the vidextractor | 1.21 |
| The condition of amniotic membranes at birth | Intact | 32 |
| | Spontaneous rupture | 44.57 |
| | Medical rupture | 8.57 |
| | Spontaneous premature rupture | 9.14 |

The registered dominant maternal attachment, more correctly called the attachment behavior, was: secure in 118 (71.51%) mothers, avoidant in 33 (20%) and anxious in 10 (6.06%) mothers (161 mothers responded).

*Correlations between variables*

By applying the Pearson correlation coefficient, several correlations between various neonatal and/or maternal variables were highlighted. The interpretation of the correlation coefficients is: a) absent/very weak correlation – if $r$ = -0.25-0.25; b) a reasonable degree of correlation - $r$ from -0.5 to -0.25 and 0.25-0.5; c) moderate-strong correlation – if $r$ from -0.75 to -0.50 and 0.5-0.75; d) very strong correlation – if $r <$ -0.75 and $> 0.75$.

Thus, we identified the following correlations between neonatal variables ($p$ <0.001) (Table 3):

- very strong: gestational age with birth weight ($r$ = 0.883); number (no.) days of hospitalization with BW ($r$ = 0.793) and GA, respectively ($r$ = 0.788);
- moderately-strong: APGAR with BW ($r$ = 0.576) and GA, respectively ($r$ = 0.662); no. acute episodes with BW ($r$ = −0.601), GA ($r$ = −0.637) and APGAR ($r$ = −0.550), respectively; no. chronic diseases with BW ($r$ = -0.645), GA ($r$ = -0.690), APGAR ($r$ = -0.628) and, respectively, no. of acute episodes ($r$ = 0.585); no. days of hospitalization with APGAR ($r$ = -0.618), no. acute episodes ($r$ = 0.601) and, respectively, no. chronic diseases ($r$ = 0.709).

**TABLE 3. Pearson correlations between neonatal variables**

|  |  | Birth weight | Gestational age | APGAR score | No. acute apisodes | No. chronic diseases |
|---|---|---|---|---|---|---|
| Gestational age | $r$ | 0.883** |  |  |  |  |
|  | $p$ | < 0.001 |  |  |  |  |
| APGAR Score | $r$ | 0.576** | 0.662** |  |  |  |
|  | $p$ | < 0.001 | < 0.001 |  |  |  |
| No. acute episodes | $r$ | -0.601** | -0.637** | -0.550** |  |  |
|  | $p$ | < 0.001 | < 0.001 | < 0.001 |  |  |
| No. chronic diseases | $r$ | -0.645** | -0.690** | -0.628** | 0.585** |  |
|  | $p$ | < 0.001 | < 0.001 | < 0.001 | < 0.001 |  |
| No. hospitalization days | $r$ | -0.793** | -0.788** | -0.618** | 0.601** | 0.709** |
|  | $p$ | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |

**. Correlation is significant at the 0.01 level; No. – number.

Thus, we identified the following correlations between neonatal and maternal variables (Table 4):

- very strong: no. days of hospitalization and anxious attachment ($r$ = -0.793, $p <$ 0.001);
- moderately-strong: no. chronic diseases and anxiety attachment ($r$ = -0.645, $p <$ 0.001);
- reasonable: postpartum depression with GA ($r$ = -0.311), APGAR ($r$ = -0.333), no. of chronic diseases ($r$ = 0.308) and, respectively, no. days of hospitalization ($r$ = 0.304) - $p < 0.001$; anxiety as a condition with BW ($r$ = -0.262, $p$ = 0.001), GA ($r$ = -0.331), APGAR ($r$ = -0.343), no. of acute episodes ($r$ = -0.279) and, respectively, no. of chronic diseases ($r$ = 0.257, $p$ = 0.001); anxiety as a trait and GA ($r$ = -0.301, $p < 0.001$);
- weak: postpartum depression with BW ($r$ = -0.230, $p$ = 0.003), anxiety as a condition and, respectively, no. days of hospitalization ($r$ = 0.233, $p$ = 0.003); anxiety as a trait with BW ($r$ = -0.243, $p$ = 0.002), APGAR ($r$ = -0.239, $p$ = 0.002) and, respectively, no. of acute episodes ($r$ = 0.205, $p$ = 0.008); avoidant attachment and APGAR score ($r$ = -0.214, $p$ = 0.007).

We identified the following correlations between postpartum maternal psychological variables (Table 5).

Thus, the correlatios are as follows:

- very strong between anxiety as a condition and anxiety as a trait ($r$ = 0.753, $p <$ 0.001);
- moderately strong between the symptoms of depression and anxiety as a condition ($r$ = 0.707) and, respectively, that as a feature ($r$ = 0.613) – $p < 0.001$;
- reasonable between: avoidant attachment and symptoms of depression ($r$ = 0.307) and anxiety as a state, respectively ($r$ = 0.285); anxiety attachment and depression ($r$ = 0.308) and, respectively, avoiding ($r$ = 0.388) – $p < 0.001$;
- weak between: anxiety as a trait and avoidant attachment ($r$ = 0.201, $p$ = 0.011) and the anxious one, respectively ($r$ = 0.198; $p$ = 0.012); anxiety as a condition and anxious attachment ($r$ = 0.222, $p$ = 0.005).

Postpartum depression has been found in similar proportions to those in the literature. A cross-section study of 972 pregnant women or women up to 6 months postpartum (EPDS) in Israel, of which only 730 women (604 Jews and 126 Arabs) were included in the study (Alfayumi-Zeadna *et al.*, 2022).

The prevalence of depression in the total population included in the study was 40%, with a difference between Jews 36.3% and Arabs 57.9%. Factors associated with depression identified were: ethnicity (Arab rather than Jewish), anxiety, marital status

(unmarried more often than married), income (non-income > income), education (no higher education > higher education), pandemic stress high > low), social support (low > high), COVID-19 (positive > negative) (Alfayumi-Zeadna *et al.*, 2022).

The COVID-19 pandemic is the significant public health crisis of the 21st century, which has disrupted local and international personal and territorial relations (Ade-Ojo *et al.*, 2022). A study conducted in Poland during the COVID-19 pandemic investigated the symptoms of depression (EDPS and GAD-7) and antepartum and postpartum anxiety in 130 women.

**TABLE 4. Pearson correlations between neonatal variables and postpartum maternal variables** ([**]. Correlation is significant at the 0.01 level; [*]. Correlation is significant at the 0.05 level; A, attachment)

|  |  | Depression | Anxiety as a state | Anxiety as a trait | Secure A | Avoidant A | Anxious A |
|---|---|---|---|---|---|---|---|
| Birth weight | r | -0.230[**] | -0.262[**] | -0.243[**] | 0.024 | -0.063 | -0.001 |
|  | p | 0.003 | 0.001 | 0.002 | 0.764 | 0.428 | 0.989 |
| Gestational age | r | -0.311[**] | -0.331[**] | -0.301[**] | 0.076 | -0.132 | -0.108 |
|  | p | < 0.001 | < 0.001 | < 0.001 | 0.338 | 0.096 | 0.173 |
| APGAR score | r | -0.333[**] | -0.343[**] | -0.239[**] | 0.059 | -0.214[**] | -0.191[*] |
|  | p | < 0.001 | < 0.001 | 0.002 | 0.461 | 0.007 | 0.016 |
| No. acute episodes | r | 0.187[*] | -.279[**] | 0.205[**] | -0.029 | 0.021 | 0.061 |
|  | p | 0.016 | < 0.001 | 0.008 | 0.714 | 0.788 | 0.444 |
| No. chronic diseases | r | 0.308[**] | 0.257[**] | -0.047 | 0.114 | 0.133 | -0.645[**] |
|  | p | < 0.001 | 0.001 | 0.556 | 0.148 | 0.092 | < 0.001 |
| No. hospita-lization days | r | 0.304[**] | 0.233[**] | -0.080 | 0.103 | 0.042 | -0.793[**] |
|  | p | < 0.001 | 0.003 | 0.313 | 0.194 | 0.599 | < 0.001 |

**TABLE 5. Pearson correlations between maternal variables**

|  |  | Depression | Anxiety as a state | Anxiety as a trait | Secure attachment | Avoidant attachment |
|---|---|---|---|---|---|---|
| Anxiety as a state | r | 0.707[**] |  |  |  |  |
|  | p | < 0.001 |  |  |  |  |
| Anxiety as a trait | r | 0.613[**] | 0.753[**] |  |  |  |
|  | p | < 0.001 | < 0.001 |  |  |  |
| Secure attachment | r | -0.126 | -0.077 | -0.007 |  |  |
|  | p | 0.111 | 0.338 | 0.927 |  |  |
| Avoidant attachment | r | 0.370[**] | 0.285[**] | 0.201[*] | -0.057 |  |
|  | p | < 0.001 | < 0.001 | 0.011 | 0.469 |  |
| Anxious attachment | r | 0.318[**] | 0.222[**] | 0.198[*] | 0.070 | 0.388[**] |
|  | p | < 0.001 | 0.005 | 0.012 | 0.378 | < 0.001 |

[**]. Correlation is significant at the 0.01 level; [*]. Correlation is significant at the 0.05 level.

Postpartum depression has been closely linked to: average socioeconomic status, history of anxiety disorder, neurosis or depression, poor medical care, breastfeeding

problems and postpartum pain (Baran *et al.*, 2021). The level of postpartum depression increased significantly in 52 women, compared to 22 with antepartum symptoms, but the level of anxiety did not change (Baran *et al.*, 2021).

In Romania, Timișoara, the global prevalence of postpartum depression in 154 women enrolled in a cross-sectional study during the pandemic period (wave 1:16 March - March 31, 2020 and wave 4: October 1-14, 2021), was 18.8% (EPDS > 13) and 43.5% (EPDS > 10), with a rate of 11.4% in wave 1 and much higher during wave 4 of COVID-19, of 28.8% (Motegi *et al.*, 2020).

We identified the following correlations between postpartum maternal psychological variables:

- very strong between anxiety as a condition and anxiety as a trait;
- moderately-strong between the symptoms of depression with anxiety as a condition and anxiety as a trait;
- reasonable between avoidant attachment with symptoms of depression and anxiety as a condition; anxious attachment to depression and avoidance;
- weak between anxiety as a trait with avoidant and anxious attachment; anxiety as a condition and anxious attachment.

A cross-sectional study of 172 mother-child dyads in Africa (86 mothers with full-term newborns and 86 premature mothers) investigated comorbidity, depression and postpartum anxiety and their precursors: the stress associated with caring for newborns in hospital, newborn survival, social support and mother family dynamics (Mutua *et al.*, 2020). Thus, 35.1% of mothers had postpartum anxiety (75% of them - premature mothers) and 25%, postpartum anxiety-depression comorbidity (83.7%, premature mothers) (Mutua *et al.*, 2020, Winter *et al.*, 2022).

In this study, several correlations were identified between neonatal variables:
a) very strong: GA with BW; no. days of hospitalization with BW and GA;
b) moderately strong: APGAR with BW and GA; no. acute episodes with BW, GA and APGAR; no. chronic diseases with BW, GA, APGAR and no. of acute episodes; no. days of hospitalization with APGAR, no. of acute episodes and no. of chronic diseases.
Thus, we identified the following correlations between neonatal and maternal variables:
a) very strong: no. of days of hospitalization and anxious attachment;
b) moderately-strong: no. of chronic diseases and anxiety attachment;
c) reasonable: postpartum depression with GA, APGAR, no. chronic diseases and no. days of hospitalization; anxiety as a condition with BW, GA, APGAR, no. of acute episodes and, respectively, no. chronic diseases; anxiety as a trait and GA;

d) weak: postpartum depression with BW, anxiety as a condition and no. days of hospitalization; anxiety as a feature with BW, APGAR and, respectively, no. of acute episodes; avoidant attachment and APGAR score.

A cross-sectional study explored the association between depression, anxiety, parity and mother-infant bonding in 2379 mothers in Japan (1116 primiparous and 1263 multiparous) (Citu *et al.*, 2022). Depression, anxiety and primiparity (MIBS, EPDS and HADS) were negatively associated with the mother-child relationship at one month postpartum (Citu *et al.*, 2022).

*Psychological counseling and mother therapy*

All the mothers in the study group who needed an intervention for physical and mental health, benefited from the help of an interdisciplinary team consisting of neonatologist, gynecologist, psychologist and psychiatrist, according to the protocols of the department. Any accompanying mother of the child admitted to the neonatal intensive care unit (NICU) or in the chronic premature ward received psychological intervention (assessment, individual and group counseling and occupational therapy), in conditions of confidentiality. For the accompanying mothers, the psychologist of the clinic performed the psychological evaluation of the mother, which represents the analysis of the psychological and emotional state with the help of the individual psychological file and the psychological tests. The anamnesis of the mother, pregnancy and birth was performed and data were collected, physical appearance, attention, affectivity, attitudes, skills, cognitions, worries, behavior and presence of the mother during the interview.

Psychological counseling of the mother is a form of psychological support that the psychologist provides at a given time. Individual and group counseling sessions were organized, where mothers' issues were discussed and counseled based on personal experience and the strength of the support group. Occupational therapy has been performed to prevent emotional disorders of the mothers without sufficient access to care for sick and premature babies. The mothers, under the guidance of the clinical psychologist, a visual artist and several craftsmen were engaged to help (painting, handmade objects, clay and marzipan objects) in order to reduce stress and help in adaptation to the current situation. Upon discharge, the mother received mental health maintaince instructions and recommended specialist help, if necessary, through a psychologist or psychiatrist.

**CONCLUSIONS**

A significant number of infants had acute episodes (for example, jaundice, eating disorders, hydroelectrolytic disorders, allergic erythema and eyelid edema) and chronic diseases (for exemple, anemia, cerebral hemorrhage, cutaneous hemangiomas, retinopathy of the premature newborn and congenital crooked leg). Almost half of the mothers had a pathological pregnancy and/or birth and postpartum psychological manifestations (depression, anxiety as a state and as a state). Several correlations were identified between neonatal variables: GA with BW; no. days of hospitalization with BW and GA; APGAR with BW and GA; no. acute episodes with BW, GA and APGAR; no. chronic diseases with BW, GA, APGAR and no. of acute episodes; no. days of hospitalization with APGAR, no. of acute episodes and no. of chronic diseases. The correlations (very strong and strong) between neonatal and maternal variables were identified: no. of days of hospitalization and anxious attachment; no. of chronic diseases and anxiety attachment. The correlations (very strong and strong) between postpartum maternal psychological variables were identified: between anxiety as a condition and anxiety as a trait; between the symptoms of depression with anxiety as a state and as a trait.

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