

ORIGINAL ARTICLE

Association between maternal-infant bonding and depressive symptoms in Neonatal Intensive Care Unit mothers: A case-control study

A. Karamanou^a, P. Varela^{b,*}, C. Nanou^c, A. Deltsidou^d^a Hospital General de Patras Santo Andrew, Patras, Greece^b Hospital General de Atenas Alexandra, Departamento Obstétrico, Universidad de Occidental Attica, Athens, Greece^c Departamento Obstétrico, Universidad de Occidental Attica, Atenas, Greece^d Departamento Obstétrico, Universidad de Occidental Attica, Greece

Received 23 June 2021; accepted 20 July 2021

Available online 5 November 2022

KEYWORDS

Neonatal Intensive
Care Unit;
Hospitalized
newborns;
Mother;
Depression;
Maternal-infant
bonding

Abstract

Objectives: Maternal perinatal depression has been associated with impaired mother-infant bonding. The adverse effect of this impaired bonding has been reported. This study aimed to investigate and compare the posnatal depressive symptoms and the mother-infant bonding in a Neonatal Intensive Care Unit (NICU) and of mothers with healthy newborns respectively. Secondly, was to explore the association between depressive symptomatology and bonding in both groups.

Methods: In this case study, mothers in the early postpartum period who gave birth in the same perinatal center of Greece were recruited to participate. The cases consisted of 88 mothers of neonates who were hospitalized in the NICU and controls were 100 mothers of full-term healthy neonates. For the collection of the data questionnaires including demographics and perinatal variables were used. For the bonding and posnatal assessment, the Mother to Infant Bonding Scale, the Postpartum Bonding Questionnaire, and the Hospital Anxiety and Depression Scale were used.

DOI of original article: <https://doi.org/10.1016/j.enfi.2021.07.003>

* Corresponding author.

E-mail address: pinelopimid@yahoo.gr (P. Varela).

Results: There was a significant difference between the mean of bonding scores of NICU mothers and the control group ($t = -2.696$, $P = 0.008$). NICU mothers presented lower scores in bonding with the newborn compared to the control group and presented higher depression scores compared to those of controls ($\chi^2 = 28.588$, $P = 0.000$). The depression scores were correlated with bonding scores in both groups.

Discussion: A NICU admission has an impact on bonding and in some way interacts with maternal postpartum mental health, therefore more research is needed.

Conclusions: NICU mothers have been presented as more vulnerable than mothers of healthy infants since they expressed a lower mother-infant bonding and higher depression scores. The support of these vulnerable mothers and the facilitation of mother-infant bonding by the NICU staff is of utmost importance.

© 2021 Sociedad Española de Enfermería Intensiva y Unidades Coronarias (SEEIUC). Published by Elsevier España, S.L.U. All rights reserved.

PALABRAS CLAVE

Unidad de Cuidados
Intensivos
Neonatales;
Neonatos
hospitalizados;
Madre;
Depresión;
Vínculo madre-hijo

Asociación entre el vínculo madre-hijo y los síntomas depresivos en madres de la Unidad de Cuidados Intensivos Neonatales: estudio caso-control

Resumen

Objetivos: Se ha asociado la depresión perinatal de la madre a un vínculo madre-hijo deficiente. Se ha reportado el efecto adverso de la deficiencia de dicho vínculo. El objetivo de este estudio fue investigar y comparar los síntomas depresivos posnatales y el vínculo madre-hijo en una Unidad de Cuidados Intensivos Neonatales (UCIN), y las madres con neonatos sanos, respectivamente. Y, en segundo lugar, explorar la asociación entre la sintomatología depresiva y los vínculos en ambos grupos.

Métodos: En este estudio de casos se seleccionó a madres que se encontraban en el periodo posparto temprano, que habían dado a luz en el mismo centro perinatal de Grecia. Los casos consistieron en 88 madres de neonatos que fueron hospitalizados en la UCIN y 100 controles, consistentes en madres de neonatos sanos a término. Para la recopilación de los datos se utilizaron cuestionarios que incluían datos demográficos y variables perinatales. Para la evaluación del vínculo y la situación posnatal, se utilizaron la Mother to Infant Bonding Scale, el Postpartum Bonding Questionnaire y la Hospital Anxiety and Depression Scale.

Resultados: Existió una diferencia significativa entre las puntuaciones sobre el vínculo de las madres de la UCIN y el grupo control ($t = -2,696$, $p = 0,008$). Las madres de la UCIN presentaron menores puntuaciones en términos de vínculo con los neonatos, en comparación con el grupo control, y presentaron puntuaciones más altas de depresión en comparación con los controles ($\chi^2 = 28,588$, $p = 0,000$). Las puntuaciones sobre depresión guardaron relación con las puntuaciones sobre vínculos en ambos grupos.

Discusión: El ingreso en la UCIN tiene un impacto sobre el vínculo e interactúa de alguna manera con la salud mental posparto de la madre. Por ello se hace necesaria más investigación.

Conclusiones: Las madres de la UCIN se han mostrado más vulnerables que las madres de bebés sanos, ya que han expresado un menor vínculo madre-hijo y puntuaciones más altas de depresión. El apoyo a estas madres vulnerables y la facilitación de vínculos madre-hijo por parte del personal de la UCIN es de la mayor importancia.

© 2021 Sociedad Española de Enfermería Intensiva y Unidades Coronarias (SEEIUC). Publicado por Elsevier España, S.L.U. Todos los derechos reservados.

What is known?

Mental health problems are common among mothers of infants admitted to the Neonatal Intensive Care Unit. Poor bonding has been observed in children hospitalised in NICUs, which could have an adverse future outcome.

What it contributes?

The findings of the present study reflect that mothers of infants admitted to the NICU are more vulnerable than mothers of healthy infants, as they expressed lower mother-child bonding and higher depression scores. These results not only further confirm the vulnerability of these mothers, but also demonstrate the need for intervention by NICU staff.

Implications of the study

Neonatal Intensive Care Unit health professionals should conduct further studies on this vulnerable group and promote mother-infant bonding by encouraging communication, participation in care, breastfeeding, and other evidence-based practices.

Introduction

Research to date has provided essential evidence on the association between perinatal depression and impaired bonding,^{1,2} which in turn may have adverse future outcomes for children.³ The negative impact of impaired bonding has also been observed in children hospitalised in the Neonatal Intensive Care Unit (NICU). In fact, a longitudinal study revealed that these infants showed a higher prevalence of impaired bonding at the age of 3 years.⁴ Factors closely related to the NICU environment that may endanger maternal and neonatal bonding and attachment include physical distance, invasive medical devices, and limited maternal involvement in the care of their child.⁵

NICUs are facilities with specialist staff designed to provide advanced care for newborns. There are several reasons for a newborn to be admitted to the NICU, such as premature birth, complications of the mother's pregnancy, congenital birth defects, respiratory irregularities, and infections.⁶ Admission rates to the NICU are increasing for all types of newborns (i.e., preterm and term) and the reason for this is not yet known.⁷ While admission of a newborn to the NICU reduces mortality, parental separation alters parental involvement and roles.^{8,9} The NICU can be a difficult area for parents as it is crowded, hot and noisy, with specialised medical equipment and complicated medical terminology, all of which can act as barriers between parents and infants.¹⁰ The noises in the NICU environment are stressful for parents and may make them feel uncomfortable in the unit. However, there is a type of parent who feels that they have to remain continuously at their infant's bedside in order to protect them.¹¹

Irrespective of the reason for the newborn's admission to the NICU, parental experiences share certain similarities and therefore mental health problems are common among these parents from different ethnic and cultural groups and countries.¹² Parents are sometimes overwhelmed, bereaved and isolated,¹³ and report feelings of guilt and shame, and

high levels of stress.¹² In addition, anxiety, depression and post-traumatic stress disorder are common, and are frequent manifestations for parents of medically vulnerable babies in the NICU.^{12–14}

In view of the above, further research is necessary to contribute to this growing area of study. The aims of the present study were: 1) to investigate the prevalence and comparison of postnatal depressive symptoms and bonding in 2 different groups of mothers: the first comprising mothers of children hospitalised in the NICU and the second comprising mothers of children not admitted to the NICU, and 2) to explore the association between depressive symptomatology and mother-child bonding in both groups.

Method

Study design: this case control study was conducted in a population of mothers who had given birth consecutively in a public perinatal centre in Greece, between July and September 2020.

Procedures

Mothers were approached at the bedside of the NICU, or in their postpartum room in the 2nd to 4th days postpartum, to assess their eligibility and interest in participating in the present study. Inclusion criteria were maternal age ≥ 18 years of age, with sufficient ability to communicate and read Greek, mothers without severe physical illness or mental disorder, and infants treated in the NICU for more than 24 h. Mothers who had been exposed to human immunodeficiency virus and unable to give their written informed consent were ineligible for the study. We also excluded mothers of infants with withdrawal syndrome, major congenital malformations, chromosomal abnormalities, and foetal alcohol syndrome.

The total sample size was calculated according to 2 previous similar studies.^{15,16} The cases were 88 mothers of hospitalised NICU infants (NICU mothers/case group), and the controls were 100 hospitalised mothers of healthy term infants (non-NICU mothers/control group). A total of 120 of the NICU mothers were approached, 15 declined to participate and 17 were ineligible, and therefore the study sample included 88 subjects. In the control group, 120 women were approached, of whom 20 declined to participate, thus the study sample consisted of 100 subjects.

Data measures and collection

Demographic data and other variables

The participants completed a brief questionnaire, designed specifically for this study, which included questions on demographics (age, marital status, educational level), assisted reproduction in current or previous pregnancies, pregnancy and breastfeeding intention, support during delivery and satisfaction with the sex of the baby. Information regarding the type of delivery (vaginal delivery, caesarean section, forceps-assisted delivery), sex and birth weight of the infants was collected from medical records. In addition, the

mothers answered 3 questions related to their satisfaction with their babies' stay in the NICU, using a 10-point Likert scale (satisfaction with the benefits/service provision in the NICU, satisfaction with the interest shown by NICU staff, and satisfaction with the information received from the NICU staff).

Assessment of bonding

Mother to Infant Bonding Scale (MIBS). The MIBS is a self-rated bonding questionnaire designed to assess a mother's feelings towards her newborn/child/baby. It is an 8-item rating scale on a 4-point Likert scale (range 0–3) where the higher the score the worse/weaker the quality of the mother-infant bond. The original version of the MIBS was considered acceptable for use with mothers, with a Cronbach's alpha coefficient of 0.71.¹⁷ Within-sample internal consistency was considered with a Cronbach's alpha coefficient of 0.818. The questionnaire was translated into Greek and then back-translated by 2 independent bilingual translators.

The Postpartum Bonding Questionnaire (PBQ). The PBQ is designed to detect early indications of mother-infant relationship disorders. It is a self-reported questionnaire with 25 items, representative of the 4 main factors (i.e., scale 1: general factor/poor bonding; scale 2: pathological rejection and anger; scale 3: infant-focussed anxiety; and scale 4: incipient abuse) related to mother-infant relationship disorders. Each statement was followed by 6 alternative responses ranging from *always* to *never*. Positive responses were scored from zero (*always*) to 5 (*never*) and negative responses from 5 (*always*) to zero (*never*). Scores were added for each factor, with a high score indicating pathology.^{18,19} The internal consistency of this sample was considered with a Cronbach's alpha coefficient of 0.861. The questionnaire was translated into Greek and then back-translated by two independent bilingual translators.

Assessment of depressive symptoms

Hospital Anxiety and Depression Scale (HADS). The HADS²⁰ has been a widely used scale since it was originally designed. It is a self-reported rating scale of 14 items on a 4-point Likert scale (range 0–3). It is designed to measure anxiety and depression (7 items for each subscale). The total score is the sum of the 14 items and for each subscale the score is the sum of the respective 7 items (ranging from 0 to 21). In the present study we only used the depression subscale. The Greek version of HADS is acceptable, reliable, and valid, with a Cronbach's alpha coefficient for total HADS of 0.884 and for depression of 0.840.²¹ The internal consistency of the sample was considered with a Cronbach's alpha coefficient for depression of 0.802.

Statistical analysis

Data were entered, coded, and analysed using the statistical package SPSS version 23.0. Quantitative data were described as mean (standard deviation [SD]) and qualitative data as frequency (percentage). The independent t-test

and χ^2 test were used to identify differences between the 2 groups. Pearson's rho correlations were calculated to assess associations of total PBQ scores and HADS scores (depression subscale). A p-value <0.05 was considered statistically significant.

Ethical considerations

Permission was obtained from the hospital's Scientific and Ethics Committee to conduct this study. All participants gave their informed consent and were informed about the study aims, and the confidentiality and anonymity of the data.

Results

Demographic data and other variables

Table 1 describes the sample in detail. Most of the participants were married, highly educated women, without assisted reproduction in their current or previous pregnancies, with positive pregnancy and breastfeeding intentions, who were not alone during delivery, were satisfied with the sex of the baby and delivered by caesarean section. The mean (SD) scores of mothers' responses regarding satisfaction with their baby's stay in the NICU showed a high level of satisfaction (Table 2).

Assessment of bonding

The percentage of missing data from the PBQ was 27.2% (n = 51). The mean substitution method was used to handle this missing data. The score of the first dimension (i.e., poor bonding) of the PBQ in the total sample was 5.93 (7.29), meaning that most mothers scored between 0 and 5, indicating a very good relationship between mother and newborn, while 10 mothers scored above 12, indicating a threat of rejection of the newborn by the mother. On the second dimension of the PBQ (i.e., rejection and pathological anger), the mean score was 2.62 (4.67) for the total sample. In the majority of the mothers no mother-child relationship disorders were observed, while 8 mothers had a score indicative of severe mother-child relationship disorders. The mean score of the third dimension of the PBQ (i.e., infant-focussed anxiety) was 3.58 (3.10) for both groups. The majority of the mothers had scores indicative of not experiencing anxiety in relation to their newborn, while only 6 mothers had scores indicative of increased stress in relation to their baby. On a relative note, in the fourth dimension of the tool (i.e., incipient abuse) the mean score was 0.39 (1.30) for the total sample. The scores of the majority of the participants indicated that they did not intend to harm their infants, while 10 mothers had scores above 3, indicating that these mothers had an increased risk of injuring their newborn.

The percentage of missing data in the MIBS was 12.7% (n = 24). The mean substitution method was chosen to handle the missing data. The mean MIBS score of the total sample

Table 1 Demographic characteristics and other variables for the NICU mothers and the controls.

	N	%
<i>Maternal age, years, mean (SD)</i>	31.74 (5.40)	
<i>Marital status</i>	(n = 186)	
Married	165	88.7
Single	8	4.3
Cohabiting with the child's father	10	5.4
Divorced	3	1.6
<i>Educational level</i>	(n = 182)	
<12 years	20	10.9
12 years	64	35.2
Higher education	84	46.1
Postgraduate or doctoral degree	14	7.6
<i>Assisted reproduction in current or previous pregnancy</i>	(n = 184)	
Yes	13	7.1
No	171	92.9
<i>Pregnancy intention</i>	(n = 185)	
Yes	173	93.5
No	12	6.5
<i>Breastfeeding intention</i>	(n = 182)	
Yes	156	85.7
No	26	14.3
<i>Support during delivery</i>	(n = 184)	
Yes	103	56
No	81	44
<i>Sex of newborn</i>	(n = 187)	
Female	99	52.9
Male	88	47.1
<i>Satisfaction with the sex of the child</i>	(n = 185)	
Yes	184	99.5
No	1	.5
<i>Birthweight, g, mean (SD)</i>	(n = 175) (newborn in NICU n: 86, no newborns in NICU n: 89) 3.042.85 (641.79)	
<i>Type of delivery</i>	(n = 185)	
Vaginal birth	58	31.4
Caesarean	123	66.5
Forceps/vacuum-assisted delivery	4	2.2

Table 2 Maternal satisfaction with NICU hospitalisation of the newborn.

	Mean	SD
Satisfaction with the benefits/provision of services offered in the NICU	9.02	1.78
Satisfaction with the interest shown by NICU staff	9.01	1.63
Satisfaction with information received from the NICU staff	8.90	1.92

reflected that the vast majority of mothers showed a very high degree of bonding with their newborn (scores from 0 to 5), the mean score being 1.86 (3.10). There was a significant difference between the mean MIBS scores of the NICU mothers and the control group. More specifically, it was observed that the control group showed greater bonding with the newborn compared to the NICU mothers ($p = 0.008$) (Table 3).

Assessment of depressive symptoms

The percentage of missing data in the HADS was 9.05% ($n = 17$). The mean substitution method was chosen to handle the missing data. The mean HADS score of the total sample was 5.27 (3.84). The majority of mothers (72%) showed no severe postpartum symptomatology, 17.5% had a score close to abnormal (8–10) and 11% had an abnormal score (11–21).

Table 3 Mothers' Postpartum Bonding Questionnaire (PBQ) and Mother to Infant Bonding Scale (MIBS).

PBQ dimensions	n = 137 Mean (SD)
Impaired bonding	5.93 (7.29)
Rejection and pathological anger	2.62 (4.67)
Infant-focused anxiety	3.58 (3.10)
Incipient abuse	.39 (1.30)
	(n = 164)
MIBS	1.86 (3.10)
NICU mothers	2.5 (3.82)
Control mothers	1.22 (1.98)
t-test (t(162)	-2.696
p-value*	.008

* p < 0.05.

The χ^2 test showed that there was a significant difference between HADS scores close to abnormal in the NICU mothers and the control group. The case group had higher scores compared to the controls (28% vs. 8.4%, $2(2) = 28.588$, $p = 0.000$). For normal and abnormal level scores, there were no significant differences.

Correlation of depressive symptoms with bonding between NICU mothers and control group mothers

The HADS scores correlated with the PBQ scores in both groups. Specifically, in the control group it was observed that 3 of the 4 dimensions of the PBQ appeared to have a weak to moderate correlation with HADS. On the other hand, scores in all the PBQ dimensions in the case group appeared to have a weak to moderate correlation with depressive symptoms. Notably, most of the PBQ dimensions correlated at a moderate level with the HADS scores (Table 4).

Discussion

The findings of the present study suggest that NICU mothers displayed less bonding with their infants and had higher scores on depression with a level close to abnormal compared to the control group. However, the majority of the mothers in both groups expressed a very satisfactory degree of bonding with the newborn and did not show severe symptoms of postpartum depression. Another important finding was that the NICU mothers' depressive symptoms were associated with poor bonding at a higher level compared to the control group.

The findings suggest that in mothers of children hospitalised in an NICU there may not only be an adverse impact on bonding with their infants, but also a reason for the onset of maternal depressive symptoms. Furthermore, there was a remarkable correlation between depressive symptoms of the NICU mothers and bonding status. It might be expected that the mothers' satisfaction would affect the mothers in a positive way. However, all of the above findings were observed despite the NICU mothers' satisfaction with their infants' stay in the NICU.

Lower bonding scores by NICU mothers have also been shown in other studies. A recent qualitative study showed that the bonding process was disrupted in the case of extremely preterm births. Hospitalisation in the NICU may limit the development of bonding.²² A possible explanation is that bonding is disturbed by the complex treatment of the newborn in the NICU. Close physical contact with the newborn is necessary for bonding with mature infants in a stable attachment model.⁸

The findings of the present study, with respect to depressive symptoms, are consistent with those of de Magistris et al.¹⁵ and Yurdakul et al.,²³ who found that NICU mothers had a higher percentage of depressive symptoms compared to mothers in the control group. However, there are research findings that do not support this observation.²⁴

Consistent with the results of the present study, previous studies have shown that depression and bonding scores positively correlated. However, their sample did not include NICU mothers.^{25,26} It is well documented that maternal mental health can affect the early mother-infant relationship^{27,28} and that maternal mood can limit the development of bonding.²²

One of the strengths of our study was that depressive symptoms and bonding were assessed in 2 diverse groups (NICU and non-NICU mothers), which enabled differences between these groups to be highlighted and thus provide a broader explanation of this research topic. However, a number of limitations must be considered. Firstly, our sample size was small and drawn from a single maternity hospital. One source of weakness of this study, which could have affected the measurement of depressive symptoms and bonding, was that we used only self-report scales. A semi-structured interview would have been preferable. The present study did not investigate whether depressive symptoms and bonding in NICU mothers correlated with severity of infant health or prematurity. Possibly the above association is a dose-response situation. Therefore, it is not possible to generalise our findings, and these results should be viewed with caution.

However, we believe that the findings of this study certainly contribute to the current literature and are important to expand on future research. It is recommended that the association between bonding and mental health symptoms in NICU mothers be investigated in future studies. Further research is needed to better understand the extent to which bonding is affected by NICU admission and how it interacts with maternal postpartum mental health. The findings of the present study suggest practical implications for action by NICU staff. NICU health professionals can facilitate greater mother-infant bonding by encouraging communication, participation in care, breastfeeding, or massage.²²

In conclusion, in this study the NICU mothers showed less bonding with their infants and had higher depression scores at a level close to abnormal compared to the control group. Finally, the NICU mothers' depressive symptoms were associated with poor bonding at a higher level compared to the control group. The professionalism of the NICU is compromised if it lacks awareness and sensitivity towards vulnerable mothers and infants in the unit.

Table 4 Correlation of the HADS and PBQ between the NICU mothers and the control mothers.

Dimensions	PBQ		HADS	
	NICU mothers		Control mothers	
	r	p-value*	r	p-value*
Impaired bonding	.565	< .001	.453	< .001
Rejection and pathological anger	.494	< .001	.305	.004
Infant-focussed anxiety	.605	< .001	.514	< .001
Incipient abuse	.397	< .001	.050	.636

* p < 0.05.

Funding

This study received no financial support.

Conflict of interests

The authors have no conflict of interest to declare.

References

- Moehler E, Brunner R, Wiebel A, Reck C, Resch F. Maternal depressive symptoms in the postnatal period are associated with long-term impairment of mother-child bonding. *Arch Womens Ment Health*. 2006;9:273–8.
- Kerstis B, Aarts C, Tillman C, Persson H, Engström G, Edlund B, et al. Association between parental depressive symptoms and impaired bonding with the infant. *Arch Womens Ment Health*. 2016;19:87–94.
- de Cock ESA, Henrichs J, Klimstra TA, Janneke A, Vreeswijk CMJM, Meeus WHJ, et al. Longitudinal associations between parental bonding, parenting stress, and executive functioning in toddlerhood. *J Child Fam Stud*. 2017;26:1723–33.
- Pennestri MH, Gaudreau H, Bouvette-Turcot AA, Moss E, Lecompte V, Atkinson L, et al. Attachment disorganization among children in Neonatal Intensive Care Unit: Preliminary results. *Early Hum Dev*. 2015;91:601–6.
- Forcada-Guex M, Borghini A, Pierrehumbert B, Ansermet F, Muller-Nix C. Prematurity, maternal posttraumatic stress and consequences on the mother-infant relationship. *Early Hum Dev*. 2011;87:21–6.
- Kochanek KD, Murphy SL, Xu J, Tejada-Vera B. Deaths: final data for 2014. Washington, D.C., U.S.: National Vital Statistics Reports; 2016. Report No.: 65(4).
- Harrison W, Goodman D. Epidemiologic trends in neonatal intensive care, 2007-2012. *JAMA Pediatr*. 2015;169:855–62.
- Flacking R, Lehtonen L, Thomson G, Axelin A, Ahlqvist S, Moran VH, et al. Closeness and separation in neonatal intensive care. *Acta Paediatr Int J Paediatr*. 2012;101:1032–7.
- Spinelli M, Frigerio A, Montali L, Fasolo M, Spada MS, Mangili G. 'I still have difficulties feeling like a mother': the transition to motherhood of preterm infants mothers. *Psychol Heal*. 2016;31:184–204.
- Fowlie PW, McHaffie H. Supporting parents in the neonatal unit. *BMJ*. 2004;329:1336–8.
- Heinemann AB, Hellström-Westas L, Hedberg Nyqvist K. Factors affecting parents' presence with their extremely preterm infants in a neonatal intensive care room. *Acta Paediatr Int J Paediatr*. 2013;102:695–702.
- Roque ATF, Lasiuk GC, Radünz V, Hegadoren K. Scoping review of the mental health of parents of infants in the NICU. *JOGNN*. 2017;46:576–87.
- Whittingham K, Boyd RN, Sanders MR, Colditz P. Parenting and prematurity: understanding parent experience and preferences for support. *J Child Fam Stud*. 2014;23:1050–61.
- Del Fabbro A, Cain K. Infant mental health and family mental health issues. *Newborn Infant Nurs Rev*. 2016;281–4.
- De Magistris A, Coni E, Puddu M, Zonza M, Fanos V. Screening of postpartum depression: comparison between mothers in the neonatal intensive care unit and in the neonatal section. *J Matern Neonatal Med*. 2010;23:101–3.
- Vanderbilt D, Bushley T, Young R, Frank DA. Acute posttraumatic stress symptoms among urban mothers with newborns in the neonatal intensive care unit: a preliminary study. *J Dev Behav Pediatr*. 2009;30:50–6.
- Taylor A, Atkins R, Kumar R, Adams D, Glover V. A new Mother-to-Infant Bonding Scale: links with early maternal mood. *Arch Womens Ment Health*. 2005;8:45–51.
- Brockington IF, Oates J, George S, Turner D, Vostanis P, Sullivan M, et al. A screening questionnaire for mother-infant bonding disorders. *Arch Womens Ment Health*. 2001;3:133–40.
- Brockington IF, Fraser C, Wilson D. The Postpartum Bonding Questionnaire: a validation. *Arch Womens Ment Health*. 2006;9:233–42.
- Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand*. 1983;67:361–70.
- Michopoulos I, Douzenis A, Kalkavoura C, Christodoulou C, Michalopoulou P, Kalemi G, et al. Hospital Anxiety and Depression Scale (HADS): validation in a Greek general hospital sample. *Ann Gen Psychiatry*. 2008;7:4.
- Fernández Medina IM, Granero-Molina J, Fernández-Sola C, Hernández-Padilla JM, Camacho Ávila M, López Rodríguez M del M. Bonding in neonatal intensive care units: experiences of extremely preterm infants' mothers. *Women Birth*. 2018;31:325–30.
- Yurdakul Z, Akman I, Kuşçu MK, Karabekiroğlu A, Yaylalı G, Demir F, et al. Maternal psychological problems associated with neonatal intensive care admission. *Int J Pediatr*. 2009;2009:5913.
- Carter JD, Mulder RT, Bartram AF, Darlow BA. Infants in a neonatal intensive care unit: parental response. *Arch Dis Child Fetal Neonatal Ed*. 2005;90:109–13.
- Ohoka H, Koide T, Goto S, Murase S, Kanai A, Masuda T, et al. Effects of maternal depressive symptomatology during pregnancy and the postpartum period on infant-mother attachment. *Psychiatry Clin Neurosci*. 2014;68:631–9.
- Busonera A, Cataudella S, Lampis J, Tommasi M, Zavattini GC. Psychometric properties of the Postpartum Bond-

- ing Questionnaire and correlates of mother–infant bonding impairment in Italian new mothers. *Midwifery*. 2017;55: 15–22.
27. Brockington I. Postpartum psychiatric disorders. *Lancet*. 2004;363:303–10.
28. Bramante A, Brockington IF. Manuale di psicopatologia perinatale. Profili psicopatologici e modalità d'intervento. In: Grussu P, Bramante A, editors. *Manuale di psicopatologia perinatale. Profili psicopatologici e modalità d'intervento*. Trento: Erickson; 2016. p. 263–80.