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Mental stress in mothers of newborns admitted to neonatal intensive care: A cross-sectional, quantitative survey in a tertiary referral hospital in Botswana

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Abstract*: Background:* Hospitalization of a neonate in the Neonatal Intensive Care Unit (NICU) can be an overwhelming experience for a parent.
Aim: To explore stress experienced by mothers with a newborn admitted to the NICU.
Methods: Aquantitative, cross-sectional survey using a validated psychometric tool (PSS-NICU) was performed to measure maternal stress related to NICU admissions. Mothers with a newborn admitted to the study hospital were enrolled from November 2019 to May 2020. The coding of the data was done using SPSS Ver 25. Maternal stress was quantified using the Likert scale; low (1–2.9), moderate (3–3.9), and high (4–5).
Results: Among the 104 enrolled mothers, the mean score was 3.28,consistent with “moderate stress”. The most stressful events identified were “parental role adjustment”, “staff communication and behaviour”, “appearance and behaviour of baby” and lastly “sights and sounds in NICU” with scores of 3.61, 3.52, 3.33 and 2.84, respectively. Amongst all the associations studied, only lower maternal education was found to be protective against maternal stress (p-value 0.02).
Conclusion and Contribution: This study revealed a need in Botswana to address the stress experienced by mothers who have a newborn admitted to a NICU. We suggest that health care workers and policymakers should familiarize themselves with the specific sources of maternal stress when a neonate is placed in the NICU. Interventions such as unit orientation and involvement of the parents in clinical decisions may help to facilitate family-centred care in the NICU, hence reduce maternal stress.

Key word: Mothers, Neonatal intensive care, Demography, Nurses. Doctors, Newborns

Resume: *Contexte :* L'hospitalisation d'un nouveau-né dans une unité de soins intensifs néonatals (USIN) peut être une expérience bouleversante pour les parents.
Objectif: étudier le stress ressenti par les mères d'un nouveau-né admis à l'unité de soins intensifs néonatals.
Méthodologie : Une enquête transversale quantitative utilisant un outil psychométrique validé (PSS-NICU) a été réalisée pour mesurer le stress maternel lié aux admissions en USIN. Les mères ayant un nouveau-né admis à l'hôpital ont été enrôlées de novembre 2019 à mai 2020. L’analyse des données a été réalisée à l'aide du logiciel SPSS Version 25. Le stress maternel a été évalué à l'aide de l'échelle de Likert ; faible (1-2,9), modéré (3-3,9) et élevé (4-5).
Résultats : Parmi les 104 mères inscrites, le score moyen était de 3,28, ce qui correspond à un « stress modéré ». Les événements les plus stressants identifiés sont « l'ajustement du rôle parental », « la communication et le comportement du personnel », « l'apparence et le comportement du bébé » et enfin « les images et les sons de l'unité de soins intensifs néonatals » avec des scores respectifs de 3,61, 3,52, 3,33 et 2,84. Parmi

toutes les associations étudiées, seul le faible niveau d'éducation de la mère s'est avéré protecteur contre le stress maternel (p= 0,02). *Conclusion et contribution :* Cette étude a révélé la nécessité, au Botswana, d'aborder la question du stress subi par les mères dont le nouveau-né est admis dans une unité de soins intensifs néonatals. Des interventions telles que l'orientation de l'unité et l'implication des parents dans les décisions cliniques peuvent contribuer à faciliter les soins centrés sur la famille, et donc à réduire le stress maternel dans l'unité de soins intensifs néonatals.

Mots clés : Mères, Soins intensifs néonatals, Démographie, Stress parental, Infirmières, Médecins, Nouveau-nés

Introduction

A neonate born prematurely or with critical illness may affect the mother's mental health. Prior studies have documented elevated maternal stress associated with their neonates' stay in neonatal intensive care units (NICU)[1-3]. Mothers´ mental health and their ability to participate in the care of their newborn has been linked to several advantages including earlier discharge, fewer complications, better mother–baby bonding, and an easier transition to home after discharge[4]. Previous studies reported that mothers with sick babies in NICUs have more depressive, anxiety, and stress symptoms, although few studies have been performed in Botswana. Maternal -infant attachment was negatively associated with anxiety and stress symptoms[5].

NICUs are specialized in accurate and precise diagnosis and management of premature and critically ill neonates [1]. Health care workers (HCW) in NICUs provide coordinated care and management of premature and critically ill neonates, including proper nutrition for appropriate growth and advanced respiratory support. Advanced technology and knowledge in neonatology have enabled these neonates to be cared for and kept alive in NICU[2,6,7], but some survive with disabling long-term complications, like cerebral palsy. These conditions then put financial and psychological strains on the family.

Having a premature or critically ill neonate often has devastating effects on the mother, family, and other members of the community, hence, it is important to study maternal stress associated with NICU admissions and to develop interventions to help mothers of hospitalized neonates to cope with the stress[1]. HCWs should be aware of the mother´s and the rest of the family´s concerns and well-being. Caring for the neonate and family should include respect, information sharing, collaboration, choice, and flexibility at all levels of service delivery[8]. Family-centred care has benefits to the well-being of both the neonate and the family[8].

The topic of parental stress in NICU-admitted neonates has been well explored in developed countries like the United States (US), the United Kingdom (UK), Australia, and New Zealand[6,9-13]. A multicentre, multinational study explored the effectiveness of Family Integrated Care (FICare) in NICUs on infant and parent outcomes[14]. This study found that weight gain was greater for infants with mothers who received FICare compared to the standard care group. These investigators also found that the parents who received FICare had lower mean stress and anxiety scores compared to parents who received standard care. These findings suggest that an approach to NICU care is family-centred benefits both neonate and mother.

In contrast to many units in developing countries, neonatal units in high income countries (HIC) have put more effort into family-centred care which has become the standard of care in many hospitals[3]. HIC units have studied outcomes beyond the singular focus of reducing neonatal mortality[15] and explored the stressors that parents face in NICU[16]. In sub-Saharan countries such research has been very limited. A study in Rwanda on parents' perceptions of stress in a NICU[17] used a well-validated and reliable tool (Parental Stressors Scale: Neonatal Intensive Care Unit, PSS-NICU)[6]. This study sought to quantify the level of stress experienced by parents of NICU-admitted neonates. Another study performed in Botswana by Ncube et al[18] used qualitative methods that highlighted stressors of mothers of preterm neonates admitted to the NICU. The investigators reported that mothers found the NICU environment intimidating, and it heightened their fears and anxieties.
Given a paucity of information from low- and middle-income countries (LMIC), the current study aimed to explore NICU-related maternal stress in a tertiary hospital in Botswana. The study's primary objective was to determine the stress levels of mothers of neonates admitted to the NICU using the PSS: NICU tool. The secondary objective was to examine the association between the maternal and neonatal factors, and the NICU-related maternal stress.

Materials and Methods

Study Design and Setting

This cross-sectional, quantitative survey used the PSS: NICU questionnaire to measure the maternal stress related to the neonatal intensive care unit (NICU) admissions. The neonates were admitted in a tertiary hospital in Gaborone, Botswana, the Princess Marina Hospital, (PMH) over a six-month period from the November 2019 to May 2020. PMH is a 567 beds public referral hospital in the capital city of Botswana, Gaborone. The NICU is a 6-bed cubicle nested within a 39-bed Special Care Baby Unit. NICU provides care for critically ill neonates, including ventilatory support, administration of surfactant, inotropic medications, and other intensive care procedures.

Study population and sampling strategy

Our *a priori* sample size target was 113 based on assumptions we extracted from literature with methodology similar to the current study [16,17,19,20] and included a non-response or missing data rate of 10%. All mothers of admitted neonates were eligible for enrolment, except mothers with a pre-existing mental health condition or age below 18 years. Before invitation to participate in the study, the mother should have observed her baby in the NICU, and her baby should have been in the NICU for one to four days. When mothers came to visit their babies in the NICU, the study was explained, and they were invited to participate in the study. Those who agreed to participate were offered a consent form which was either in Setswana or English, depending on the mother's preference.

Data collection and study tool

After consent was obtained, mothers were given the questionnaire to complete at their convenience, in Setswana or English. Some preferred to fill it with the help of the investigators. We used a validated and reliable tool, the PSS: NICU, developed by Miles and Funk in 1987(Annex 1A, B)[6]. This was a self-administered questionnaire that was developed to measure the parental perception of stress during NICU admissions. The tool has been well validated in developed countries[6,9,12,21] as well as Rwanda[17]. The tool consists of four subscales that measure maternal stress levels. The four subscales were: sights and sounds in NICU, appearance and behaviour of the infant, parental role adjustment, and staff communication and behaviour. We collected maternal demographics and neonatal clinical information (Annex 2A,B) and used a tool called the Modified Sick Neonate Score (MSNS) [22], to classify neonates according to the severity of their illness at the time of NICU admission.

Data analysis

The study used the Likert scale[23,24] to grade responses on maternal stress. Items of the questionnaire were coded and processed using the Statistical Package for Social Sciences (IBM SPSS Statistics, version 25). The maternal stress level was calculated from each of the four subclasses in the PSS: NICU tool, classified according to points on the Likert scale as follows: low (1–2.9), moderate[3–3.9], and high[4,5] stress level. These calculations were done using means and standard deviations. Questionnaires that were less than 2/3 complete were excluded from analysis, replicating the procedure from the original study[25].

Statistical calculations

Maternal demographic data were analysed using descriptive statistics. The total stress levels for each of the four subscales from the PSS:NICU tool were compared with the mothers' demographic and infants' clinical characteristics. To find the correlation between these variables, the following statistical tests were applied: Firstly, the Student's t-test was used to compare maternal stress level with an independent variable with two groups, for example, employment status (yes or no). The Analysis of Variance (ANOVA) was used to compare maternal stress level with an independent variable that had more than two groups, for example, an education level (none, primary, secondary, or tertiary). A p-value of <0.05 was used with the above tests to assess for statistical significance.

Ethical considerations

Ethical clearance was obtained from the University of Botswana IRB (Reference number: UBR/RES/IRB/BIO/GRAD/096) (Annex 3A) and the Ministry of Health (Reference number: HPDME 13/18/1) (Annex 3B). Mothers were informed that a social worker was available, should they need any counselling.
The respondents were also informed that they were free to withdraw from the study at any point without facing any consequences. There were no financial incentives offered to participants. Data were treated with privacy and confidentiality, using a password-protected laptop, and only accessible to the researchers.

Results

A total of 114 participants were enrolled in the study. Ten were excluded from analysis due to incomplete data. Table 1 shows the maternal and infant demographics for the 104 participants that were included in this analysis.

Table 1: Study participant's demographics and infant characteristics

Variables	Categories	N, number of participants	Descriptive statistics
Age in years, mean (SD), range	18-42	104	28.84 (6.13) 18-42 years
Education	None	2	1.9%
	Primary	6	5.8%
	Secondary	75	72.1%
	Tertiary	21	20.2%
The severity of infant sickness (MSNS)*	Very sick:(MSNS≤10)	71	68.3%
	Less sick:(MSNS>10)	33	31.7%
Number of children alive, mode (range)	1-7	104	2 (1-7)
Married	Yes	16	15.4%
	No	88	84.6%
Employed	Yes	36	34.6%
	No	68	65.4%
Mode of delivery	Vaginal	68	65.4%
	Caesarean section	36	34.6%
Planned pregnancy	Yes	65	62.5%
	No	39	37.5%
Attended ANC**	Yes	92	88.5%
	No	12	11.5%
Previous baby admitted to NICU?	Yes	7	6.7%
	No	97	93.3%
Length of NICU stay in days at time of questionnaire, mean (SD), range	1-4	104	2.46 (1.12) 1-4 days

*MSNS = modified sick neonate score
**ANC = antenatal clinic

Table 2 provides the stress levels of mothers according to the four subscales as reported in the PSS-NICU tool.

Mothers of neonates admitted to the NICU had a moderate overall stress level of 3.28, as measured by the PSS: NICU tool and the Likert scale. The 95% confidence interval for this study was 3.28 ± 0.17 ($3.11 < \mu < 3.45$), where μ is the mean of the study population.

Table 2: Maternal stress levels as measured by PSS: NICU tool and Likert scale

Subscale	Stress Score Mean (SD)	Stress Level Rating
Sights and sounds	2.84 (0.97)	Low
Appearance and behaviour of baby	3.33 (1.05)	Moderate
Staff communication and behaviour	3.52 (1.36)	Moderate
Parental role adjustment	3.61 (0.98)	Moderate
Overall score	3.28 (0.87)	Moderate

Fig 1.1: Maternal stress levels related to parental role adjustment.

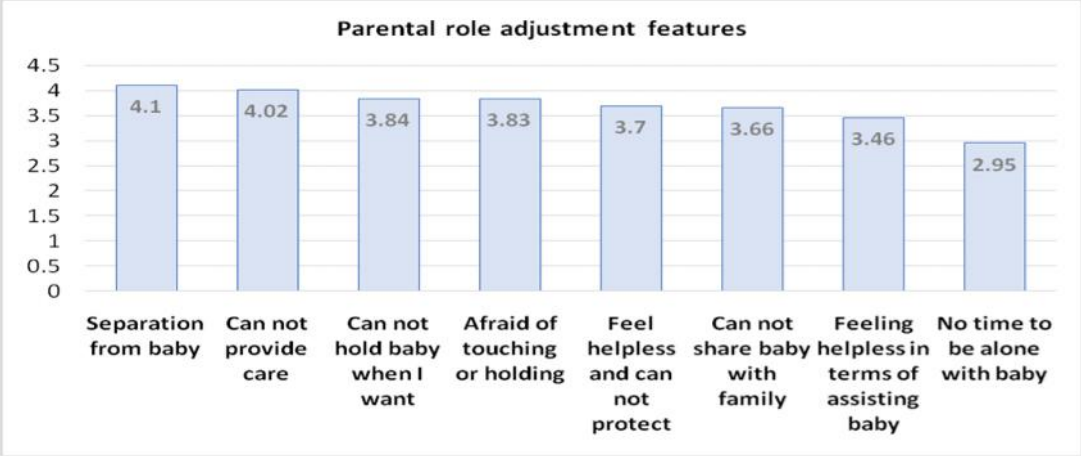

Figure 1.1 shows how items under the subscale of "parental role adjustment" stressed the mothers of neonates admitted to the NICU. "Separation from baby" gave them the most stress while the item of "no time to be alone with baby" was the source of the least amount of maternal stress.

Fig 1.2: Maternal stress levels related to sights and sounds in NICU

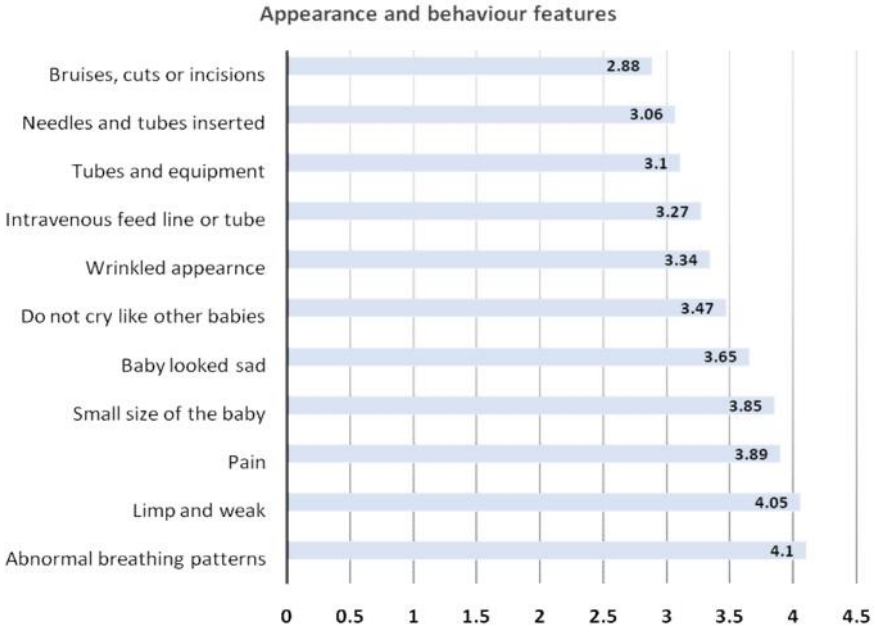

Figure 1.2 depicts how items from a subscale of "sights and sounds in NICU" stressed the mothers. The major source of stress was "having ventilator for baby" while the "large number of staff in the NICU" was deemed least stressful for them.

Fig 1.3: Maternal stress levels related to staff communication and behaviour in NICU

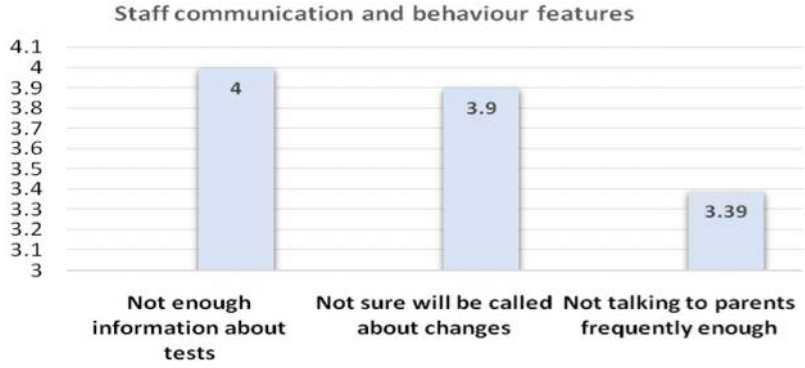

Figure 1.3 shows how items from a subscale of "staff communication in NICU" stressed the mothers. Mothers were most stressed by "not enough information about tests" while "not talking to parents frequently enough" produced the lowest amount of stress.

Fig 1.4: Maternal stress levels related to appearance and behaviour of the baby.

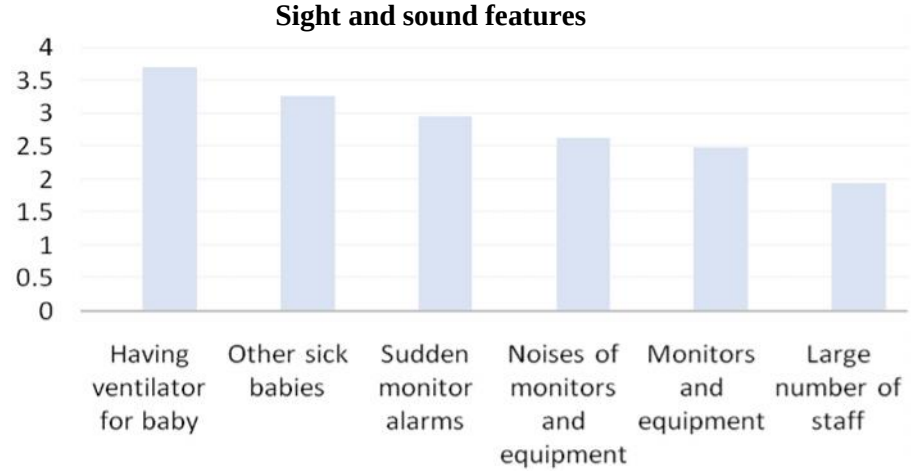

Figure 1.4 depicts how items under the subscale of "appearance and behaviour of baby" stressed the mothers in NICU. "Abnormal breathing patterns" was the greatest stressor, while the presence of "bruises, cuts, and incisions" caused the least amount of stress.

Table 3 reflects the association between the maternal and neonatal demographic factors versus NICU-related maternal stress". Only the maternal level of education was associated with NICU-related stress. The higher the mothers' level of education, the more stressed they reported (p-value of 0.02).

Table 3: Correlation between overall maternal stress levels and demographic parameters

Variables	Categories	N, number participants	Maternal stress score Mean (SD)	p-value
Age in years	18-30	64	3.32 (0.87)	0.52
	31-42	40	3.20 (0.88)	
Education	None	2	2.09 (0.91)	0.02*
	Primary	6	3.23 (0.73)	
	Secondary	75	3.19 (0.88)	
	Tertiary	21	3.72 (0.69)	
The severity of infant sickness	Very sick MSNS≤10)	71	3.35 (0.94)	0.25
	Less sick MSNS>10)	33	3.13 (0.70)	
Number of children alive	Few (1-3)	89	3.31 (0.88)	0.41
	Many (4-7)	15	3.11 (0.85)	
Married	Yes	16	3.34 (0.85)	0.76
	No	88	3.27 (0.88)	
Employed	Yes	36	3.45 (0.83)	0.14
	No	68	3.19 (0.89)	
Mode of delivery	Vaginal	68	3.28 (0.79)	0.95
	caesarean section	36	3.27 (1.02)	
Planned pregnancy	Yes	65	3.22 (0.92)	0.38
	No	39	3.38 (0.78)	
Attended ANC*	Yes	92	3.25 (0.90)	0.29
	No	12	3.53 (0.56)	
Previous baby admitted to NICU	Yes	7	2.97 (1.12)	0.34
	No	97	3.30 (0.85)	
NICU duration in days (at time of questionnaire)	Short (≤2 days)	52	3.29 (0.82)	0.86
	Long (3-4 days)	52	3.26 (0.86)	

*ANC = antenatal clinic

Discussion

This study examined the mental stress in mothers of neonates admitted to a tertiary-care referral NICU in a middle-income country. Circumstances that may potentially induce or relieve maternal stress were explored. Furthermore, the study explored if maternal demographic factors or the severity of the neonate´s clinical condition was associated with maternal mental stress. We found that mothers of neonates admitted to the NICU were moderately stressed, in accordance with similar studies done in developing countries[16]. In contrast, studies done in developed countries like the UK and the USA found low levels of maternal stress when their babies were in NICUs[6,7,11,25,26]. This difference between developed and developing countries may be related to struggles that are common in healthcare in developing countries such as understaffing and shortage of equipment and medications, and primarily put emphasis on medical treatment interventions. In contrast, the psychological state of the mothers often take a back seat[19]. A study done in a NICU in Thailand showed that HCWs often viewed parents' involvement as an obstacle to providing neonatal care[27]. On the other hand, mother-child friendly NICUs in developed countries have invested in strategies that promote family-centered care, a plausible explanation why low levels of stress are experienced by these parents.

Among the four subscales of the PSS: NICU tool, "parental role adjustment" scored the highest (3.61), indicating that mothers with neonates placed in the NICU did not cope well if their situation changed and their baby moved to the NICU. Infant-parent separation during this period obstructed the physical, emotional bonds between parents and their infants, and this was likely detrimental to parents' mental health[14]. Most studies both from developed and developing countries[2,6,7,11,16,19,20,26,28] have shown this pattern. However, mothers in developing countries scored higher compared to peers from developed countries. For example, in a study done in India[16] as well as in the current study, "parental role adjustment" rated 4.12 and 3.61, respectively. The same subscale in the UK and USA scored 2.98 and 2.75, respectively[11]. Amongst the four subscales of the PSS: NICU tool, "sights and sounds in NICU" scored lowest in most studies[2,16,25], both in developed and developing countries, in accordance with

the current study findings. We suggest that this should be studied qualitatively with open-ended questions, to explore how to minimise maternal stress when their neonate is placed in a NICU.

The associations of maternal and infant factors versus NICU mothers´ stress levels were explored, including ten maternal demographic factors and the neonates' admission clinical status. The level of maternal education was significantly associated with maternal stress. The highest educated mothers experienced more stress when their neonates were placed in the NICU, similar to findings from a study in Rwanda[17] and in the USA[26]. A possible explanation could be that the highly educated mothers had a higher awareness and knowledge about their neonates´ risk of complications and may have accessed additional information, potentially using internet search engines, which could lead to feeling frightened and overwhelmed, as opposed to relying on HCWs who provide information in a spoken and sensitive manner. Surprisingly, this study did not find that the severity of the neonate's sickness was correlated with the maternal stress level. This may suggest that all mothers with babies in NICU are stressed, regardless of the condition of their neonates, hence all these mothers must receive special attention and support to alleviate the stress they experience.

Aspects of NICU practice that contribute to maternal stress were identified. Sharing this study´s findings with HCWs in similar settings, may help to reduce the stress levels experienced by mothers. Also, the findings of this study may influence policymakers to consider establishing or building spacious NICUs in the future and allow parents to spend more time with their infants. This study highlights the need to capacitate all HCWs on how to assist parents that experience stressors in NICU. Our recommendations would be to use the PSS: NICU tool regularly to screen mothers whose neonates are admitted to a NICU, and to develop appropriate individual interventions, including engaging a psychologist to help alleviate any experienced maternal stress. For example, a recent study in USA concluded that universal screening is needed to identify at-risk mothers as well as a need for individualized interventions that address both maternal and child well-being[29]. Mothers of NICU admitted neonates experienced mental stress so peer counselling by mothers with a previous NICU experience could be helpful, as well as organizing regular group counselling sessions for mothers of NICU babies.

Maternal role adjustment was identified as the highest stressor; hence interventions should encourageless separation of mothers from their baby. NICUs in developing countries should be designed with enough space enabling mothers to spend more time with their sick neonates, including sufficient time for skin-skin care (kangaroo-parent/mother care). This could reduce maternal stress. Future studies should explore how mental stress experienced by parents evolves throughout their neonates' NICU stay, for example by applying repetitive surveys through the NICU stay. Of utmost importance is that HCWs working in NICUs must be aware of routinely providing updates of laboratory tests as mothers were stressed by "not enough information about tests". Counselling the mothers about the condition of their infants and the NICU expectations should probably be done early after admission. Education and training of HCWs can be done by lectures arranged by the hospital. This will help to give mothers accurate and reliable information before accessing such information from alternative sources like the internet, which can be overwhelming. Such interventions could help alleviate maternal stress associated with a higher maternal level of education in this study.

This study has limitations. It was not designed to explore if prematurity or low birth weight impacted on maternal stress, but instead summarized the neonate's clinical features and associations with mothers´ wellbeing. In contrast, a study done in India[16] showed that the more premature the neonate was, the higher the maternal stress. Similarly, a study in Rwanda showed that mothers whose neonates had low birth weight tended to experience more stress[17]. Generalization of this study findings is limited as sampling was done by a non-random convenience method in a single referral governmental hospital. Furthermore, the use of questionnaires to explore maternal stress could have been influenced by subjective bias, e.g., social desirability, a tendency of individuals to present themselves in a positive light according to social norms and values[30]. The lack of fathers in the study is another limitation, but this study was not designed to explore fathers' stress levels while some studies in the developed world did[11,25,26].

Conclusions

The findings of this study highlight challenges experienced and interventions which are needed to relieve maternal stressors when a neonate is admitted to NICU. HCWs and policymakers should familiarise themselves with stressors associated with NICU stays. As a result they should implement interventions to reduce the maternal stress and thereby promote good health to both child and parent, in accordance with the WHO definition of health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity[31]."

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References

1. Steedman WK. Stress experienced by parents from the neonatal intensive care unit. 2007 Thesis in Master of Arts Psychology, University of Canterbury, New Zeeland, ir.canterbury.ac.nz.
2. Sikorova L, Kucova J. The needs of mothers to newborns hospitalised in intensive care units. *Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub. 2012;156(4):330-6.*
3. Cooper LG, Gooding JS, Gallagher J, Sternesky L, Ledsky R, Berns SD. Impact of a family-centered care initiative on NICU care, staff and families. *J Perinatol. 2007;27 Suppl 2:S32-7.*
4. Wanduru P, Hanson C, Waiswa P, Kakooza-Mwesige A, Alvesson HM. Mothers' perceptions and experiences of caring for sick newborns in Newborn Care Units in public hospitals in Eastern Uganda: a qualitative study. *Reproductive Health. 2023;20(1):106.*
5. Bonacquisti A, Geller PA, Patterson CA. Maternal depression, anxiety, stress, and maternal-infant attachment in the neonatal intensive care unit. *J Reproductive and Infant Psychology. 2020;38(3):297-310.*
6. Miles MS, Funk SG, Carlson J. Parental Stressor Scale: neonatal intensive care unit. *Nurs Res. 1993;42(3):148-52.*
7. Carter JD, Mulder RT, Darlow BA. Parental stress in the NICU: the influence of personality, psychological, pregnancy and family factors. *Personality and Mental Health. 2007;1 (1):40-50.*
8. Neff JM, Eichner JM, Hardy DR, Klein M. Family-centered care and the pediatrician's role. *Pediatrics. 2003;112(3):691-.*
9. Miles MS, Funk SG, Kasper MA. The stress response of mothers and fathers of preterm infants. *Research in nursing & health. 1992;15(4):261-9.*
10. Barr P. Factor analysis of the Parental Stressor Scale in parents of term and near-term surgical newborns. *J Reprod Infant Psychol. 2017;35 (3):286-97.*
11. Franck LS, Cox S, Allen A, Winter I. Measuring neonatal intensive care unit-related parental stress. *J advanced nursing. 2005;49(6):608-15.*
12. Franck LS, Scurr K, Couture S. Parent views of infant pain and pain management in the neonatal intensive care unit. Newborn and Infant Nursing *Reviews. 2001;1(2):106-13.*
13. Reid T, Bramwell R. Using the Parental Stressor Scale: NICU with a British sample of mothers of moderate risk preterm infants. *J reproductive and infant psychology. 2003;21 (4):279-91.*
14. O'Brien K, Robson K, Bracht M, Cruz M, Lui K, Alvaro R, et al. Effectiveness of family integrated care in neonatal intensive care units on infant and parent outcomes: a multicentre, multinational, cluster-randomised controlled trial. *The Lancet Child & Adolescent Health. 2018;2(4):245-54.*
15. Garg P, Bolisetty S. Neonatology in developed and developing nations. *The Indian J. Pediatrics. 2007;74(2):169-71.*
16. Chourasia N, Surianarayanan P, Adhisivam B, Vishnu Bhat B. NICU admissions and maternal stress levels. *Indian J Pediatr. 2013;80(5):380-4.*
17. Musabirema P, Brysiewicz P, Chipps J. Parents perceptions of stress in a neonatal intensive care unit in Rwanda. *Curationis. 2015;38(2):1499.*
18. Ncube RK, Barlow H, Mayers PM. A life uncertain - My baby's vulnerability: Mothers' lived experience of connection with their preterm infants in a Botswana neonatal intensive care unit. *Curationis. 2016;39 (1):e1-e9.*
19. Agrawal R, Gaur A. Parent stress in neonatal intensive care unit: an unattended aspect in medical care. *International J Contemporary Pediatrics. 2016;4(1):148-53.*
20. Ashwani N, Rekha N, Kumar C. Parental stress experiences with NICU admission in a tertiary care centre. *International J Psychology and Behavioral Sciences. 2017;7 (1):27-31.*
21. Shields-Poë D, Pinelli J. Variables associated with parental stress in neonatal intensive care units. *Neonatal Netw. 1997;16(1):29-37.*
22. Mansoor KP, Ravikiran SR, Kulkarni V, Baliga K, Rao S, Bhat KG, et al. Modified Sick Neonatal Score (MSNS): A Novel Neonatal Disease Severity Scoring System for Resource-Limited Settings. *Crit Care Res Pract. 2019;2019:9059073.*
23. Norman G. Likert scales, levels of measurement and the "laws" of statistics. *Adv Health Sci Educ Theory Pract. 2010;15(5):625-32.*
24. Sullivan GM, Artino AR, Jr. Analyzing and interpreting data from likert-type scales. *J Grad Med Educ. 2013;5 (4):541-2.*
25. Miles MS, Funk SG, Kasper MA. The neonatal intensive care unit environment: sources of stress for parents. *AACN Advanced Critical Care. 1991;2(2):346-54.*
26. Dudek-Shriber L. Parent stress in the neonatal intensive care unit and the influence of parent and infant characteristics. *American J occupational therapy. 2004;58(5):509-20.*
27. Helen Petsky R. Parent and interdisciplinary professional perceptions of family-centered care in Thai NICU: A qualitative study.

28. Stübe M, Rosa MBCd, Pretto CR, Cruz CTd, Morin PV, Stumm EMF. Níveis de estresse de pais de recém-nascidos em Unidade de Terapia Intensiva Neonatal. Revista da Rede de Enfermagem do Nordeste. 2018;19:3254.
29. Njoroge WFM, Gerstein ED, Lean RE, Paul R, Smyser CD, Rogers CE. Neonatal Intensive Care Unit Latent Profiles of Maternal Distress: Associations With 5-Year Maternal and Child Mental Health Outcomes. *J Am Acad Child Adolesc Psychiatry. 2023;62(10):1123-33.*
30. Colman AM. A dictionary of psychology: Oxford University Press, USA; 2015.
31. Nobile M. The WHO definition of health: a critical reading. *Med Law. 2014;33(2):33-40.*