Maternal Stress and Postpartum Depression among Mothers of Hospitalized Neonates in Nigerian Hospitals: A Cross-Sectional Study

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ABSTRACT

The neonatal intensive care unit (NICU) can be a stressful environment for mothers. This study identified the stress factors and assessed the prevalence and symptom severity of postpartum depression among mothers of hospitalized neonates in selected health facilities in a state in Southwestern Nigeria. The Parental Stressor Scale: NICU, and the Edinburgh Postpartum Depression Scale were used among 124 mothers using the cross-sectional study design. Data were analyzed using descriptive and inferential statistics at a significant level of $p < 0.05$. The study revealed the highest stressor of mothers as altered relationship and parenting roles, baby looks and behavior, and sight and sounds in the NICU. The overall stress level among mothers was high and majority of mothers were depressed and had suicidal thoughts. Mothers of hospitalized neonates were depressed and had suicidal thoughts. There is a need for more involvement of mothers in the care of hospitalized neonates and regular screening of postpartum depression among mothers in the perinatal period, so that negative maternal and neonatal health outcomes can be prevented.

RÉSUMÉ

L'unité de soins intensifs néonatals (USIN) peut être un environnement stressant pour les mères. Cette étude a identifié les facteurs de stress et évalué la prévalence et la gravité des symptômes de la dépression post-partum chez les mères de nouveau-nés hospitalisés dans des établissements de santé sélectionnés dans un État du sud-ouest du Nigeria. L'échelle de stress parental, l'unité de soins intensifs néonatals et l'échelle de dépression post-partum d'Édimbourg ont été utilisées auprès de 124 mères dans le cadre d'une étude transversale. Les données ont été analysées à l'aide de statistiques descriptives et inférentielles à un niveau significatif de p < 0,05. L'étude a révélé que les facteurs de stress les plus importants pour les mères étaient l'altération des relations et des rôles parentaux, l'apparence et le comportement du bébé, ainsi que la vue et les sons dans l'unité de soins intensifs néonatals. Le niveau de stress global chez les mères

était élevé et la majorité d'entre elles étaient déprimées et avaient des pensées suicidaires. Les mères de nouveau-nés hospitalisés étaient déprimées et avaient des idées suicidaires. Il est nécessaire d'impliquer davantage les mères dans les soins aux nouveau-nés hospitalisés et de procéder à un dépistage régulier de la dépression post-partum chez les mères pendant la période périnatale, afin de prévenir les effets négatifs sur la santé maternelle et néonatale.

KEYWORDS

neonates, neonatal care, parental stressors, maternal depression, suicidal ideation.

INTRODUCTION

The journey of pregnancy, childbirth, and the postpartum period is a profound experience for mothers, filled with anticipation of positive outcomes. Traditionally, prematurity and low birth weight have been prominent reasons for neonatal admissions,[1] but recent studies across the world suggest that there are other hospital and patient characteristics associated with neonatal intensive care unit (NICU) admissions.[2,3] The NICU presents a challenging and unfamiliar environment for mothers, characterized by unfamiliar sights, sounds, and equipment, inducing significant stress and emotional strain[4] that can be intimidating, fostering increased fear, anxiety, and hampered bonding between mother and baby[5,6] and disruptions in parental roles and relationships.[7] Mothers also grapple with fear, anxiety, and feelings of helplessness, compounded by fatigue and disrupted sleep patterns.[8]

Globally, studies have explored maternal stress in the NICU, highlighting factors such as altered parenting roles, infant appearance and behavior, and communication challenges with healthcare providers.[9,10] Moreover, postpartum depression (PPD) emerges as a prevalent concern, affecting a significant proportion of mothers, with NICU experiences exacerbating its occurrence.[4] Indeed, NICU hospitalization is associated with heightened rates of PPD and stress-related disorders among mothers.[11,12]

In the context of Nigerian hospitals, anecdotal evidence suggests a lack of support for mothers during their infants' NICU hospitalization, potentially predisposing them to postpartum depressive symptoms. While existing research in African NICUs focuses on neonatal outcomes, there is a dearth of knowledge regarding maternal stressors and their impact on PPD. Therefore, this study aims to identify stress factors among mothers of hospitalized neonates and assess the prevalence and severity of PPD in this population.

The Parental NICU Stress model delineates various stressors influencing parents, including personal characteristics, situational factors, personal resources, and environmental support.[13] Notably, NICU environmental stressors directly influence parental stress responses, with key factors including sights and sounds, infant appearance and behavior, altered parent-infant relationships, and staff communication.[4]

Understanding the interplay between maternal stressors and PPD is crucial for informing targeted interventions and support strategies. While tools like the Parental NICU Stress Scale have been instrumental in assessing maternal stress, research indicates a pressing need for comprehensive studies in diverse healthcare settings to elucidate predictors and implications of PPD among mothers of hospitalized neonates.

METHODS

Participants and Procedures

The study enrolled mothers whose neonates were admitted to the NICU in selected healthcare facilities within a southwestern state of Nigeria. These facilities were specifically chosen because they possessed fully operational NICUs. Eligible participants were mothers aged 18 years or older, the legal age of consent in Nigeria, who demonstrated orientation to time, place, and person. In addition, inclusion criteria required that their neonates had been hospitalized for a minimum of 24 hours. To determine the sample size, a prior study with a similar focus was referenced, where the proportion (p) of women experiencing PPD was reported as

30.6%.[14] Utilizing the Adjusted Cochran's Formula for small populations,[15] the sample size was calculated, resulting in the recruitment of 124 mothers through consecutive sampling.

Instruments

The instrument used for data collection was a pretested questionnaire with subsections. The first section includes items on the sociodemographic data of each mother and neonate and was filled by the researcher. The Parental Stressor Scale: Neonatal Intensive Care Unit (PSS:NICU) and Edinburgh Postnatal Depression Scale (EPDS) were adapted for the second and third sections of the questionnaire used for this study.

The Parental Stressor Scale: Neonatal Intensive Unit (PSS:NICU)

The PSS:NICU, developed by Miles and Funk,[16,17] assesses parental perception of stressors within NICU environments. It measures stress related to changes in parental roles, infant appearance and behavior, and unit stimuli. The scale comprises three subscales: (a) unit stimuli (5 items), (b) infant appearance and behavior (14 items), and (c) parental role and relationship with the infant (7 items). A previous study reported a Cronbach's alpha of 0.89 for the PSS:NICU,[9] while in this study, the Cronbach's alpha was found to be 0.769. The PSS:NICU utilizes a five-point Likert scale ranging from 1 (not at all stressful) to 5 (extremely stressful) for rating the stressfulness of each item.[18] Participants rate their experiences, with those not encountering a particular stressor receiving a score of 1 to denote no stress experienced. This scoring method provides an "Overall Stress Level" reflecting the cumulative stress experienced by individuals within the NICU environment. For example, if a parent rates an item as moderately stressful, they receive a score of 3. If they do not encounter the stressor, they receive a score of 1. This approach ensures a comprehensive assessment of stress levels, facilitating comparison and analysis of stress across different contexts.

Edinburgh's Postnatal Depression Scale

The EPDS, developed by Cox, Holden, and Sagovsky in 1987, is a 10-question tool used to identify individuals at risk for postnatal depression.[19] It is recognized for its simplicity and effectiveness in screening for depression. In this study, a score of 10 was indicative of possible depression. The EPDS comprises 10 questions, with responses scored from 0 to 3 based on symptom severity; some items are reverse-scored. The total score, ranging from 0 to 30, is obtained by summing scores across all items. Item 10 serves as an indicator of possible suicidal thoughts. Previous research reported high reliability (Cronbach's alpha of 0.97), specificity (0.97), and sensitivity (0.75) at a cut-off point of 9,[20] while in this study, the Cronbach's alpha for the EPDS was 0.706.

Procedures

Upon obtaining ethical clearance, the researcher sought permission from relevant authorities at the study settings. Eligible mothers were then recruited, and the study's purpose and objectives were explained to them. Signed informed consent was obtained from each participant before data collection. Data were collected through face-to-face administration of standardized questionnaires, which were promptly retrieved upon completion. Subsequently, returned questionnaires were reviewed for completeness and organized accordingly. Throughout the data collection process, strict measures were in place to ensure anonymity and confidentiality of information provided by participants.

DATA ANALYSIS

Data from this study were subjected to computer analysis using SPSS version 23. Descriptive statistics such as frequencies and percentages mean, standard deviations (SDs) were used to describe all the variables. Inferential statistics such as multiple regression and fisher exact chi-square test were employed to test the relationship among the variables of the study.

RESULTS

Stress Factors in Mothers of Hospitalized Neonates

More than one-third of the mothers (43.6 %) were within the age group of 30–39 years while 41.1% of them belonged to the age group of 20–29 years with a mean age of 31.40 ± 6.44 years. Majority of

the respondents (72.6%) were Christians, 46.8% had tertiary education, and majority of them were married (76.6%). Only 33.1% of the respondents were civil servants, and 31.5% of them had at least two children with the mean number of children being 1.85 ± 1.21. Furthermore, above half (58.1%) of the neonates were term, 40.3% were preterm,

and 1.6% were postterm with a mean gestational age of 38.38 ± 4.11 weeks, while more than one-third (46.8%) of the mothers weighed between 2.5 and 3.5kg with a mean weight of 2.80 ± 0.72. More than half of the neonates (52.4%) were male while majority (59.7%) of them were delivered via spontaneous vaginal delivery (SVD) (Table 1).

Table 1. Sociodemographic characteristics of respondents.

Variables	Frequency n = 124	Percentage
Age		
≥18–<20	3	2.4
20–29	51	41.1
30–39	54	43.6
≥40	16	12.9
Religion		
Christian	90	72.6
Islam	28	22.6
Traditional	3	2.4
Others	3	2.4
Level of Education		
No formal education	6	4.8
Primary	9	7.3
Secondary	51	41.1
Tertiary	58	46.8
Marital status		
Single	24	19.4
Married	95	76.6
Divorced	5	4.0
Occupation		
Civil servant	41	33.1
Trader	25	20.2
Entrepreneur	22	17.7

(*continues*)

Table 1. Continued

Variables	Frequency n = 124	Percentage
Unemployed	18	14.5
Artisan	16	12.9
Housewife	2	1.6
Number of children		
1	44	35.4
2	39	31.5
3	29	23.4
4	9	7.3
5	3	2.4
Gestational age at birth		
Pre term (24–37 weeks)	50	40.3
Term (38–42 weeks)	72	58.1
Postterm (Above 42 weeks)	2	1.6
Weight of neonate at birth		
1.0–2.5 kg (Small)	42	33.9
>2.5–3.5 kg (Normal)	58	46.8
>3.5 kg (Large)	24	19.3
Gender of neonate		
Male	65	52.4
Female	59	47.6
Type of delivery		
Spontaneous vaginal delivery	74	59.7
Caesarean section	50	40.3

Table 2 shows the maternal stress factors. The subscale with the lowest level of stress for the mothers is the sights and sounds subscale (1.31 ± 0.74), and the baby looks and behaves subscale (2.22 ± 0.38) while the subscale that contributed the highest level of stress to the mothers is that of altered relationship and parenting roles (2.68 ± 0.31) with their babies. The major stressor under the sights and sounds subscale was "the sudden noises of monitor alarms" (1.63 ± 1.15) while that under the baby looks and behaves subscale was "when my baby seemed to be in pain" (2.76 ± 1.57). The major

Table 2. Maternal stress factors, postpartum depression, and suicidal thought.

Stress Factors			Depression		Suicidal thought	
	Mean	SD	F	Sig	F	Sig
Sights and Sounds						
The sudden noises of monitor alarms	1.63	1.15	7.59	0.10	3.16	0.53
The presence of monitors and equipment	1.37	1.04	13.36	**0.01***	5.20	0.26
The constant noises of monitors and equipment	1.35	0.87	12.15	**0.03***	10.40	0.06
The other sick babies in the room	1.30	0.99	11.53	**0.02***	13.81	**0.01***
The large number of people working in the unit	1.19	0.89	15.56	**0.01***	4.29	0.36
Total Mean Score	**1.31**	**0.74**				
Baby Looks and Behaves						
When my baby seemed to be in pain	2.76	1.57	2.78	0.73	6.00	0.30
When my baby looked sad	2.73	1.56	18.95	**0.02***	3.56	0.61
Seeing needles and tubes put in my baby	2.56	1.52	23.12	**0.01***	4.49	0.48
Bruises, cuts, or incisions on my baby	2.52	1.60	5.79	0.32	5.88	0.31
Tubes and equipment on or near my baby	2.35	1.48	8.34	0.13	5.33	0.37
My baby being fed by an intravenous line or tube	2.32	1.56	2.34	0.80	1.77	0.87
The limp and weak appearance of my baby	2.30	1.70	4.08	0.53	2.80	0.73
My baby's unusual or abnormal breathing patterns	2.25	1.78	13.81	**0.01***	8.82	0.11
The unusual color of my baby (for example, looking pale or yellow jaundiced)	2.24	1.65	6.59	0.25	4.29	0.50
My baby not being able to cry like other babies	2.09	1.79	20.01	**0.01***	4.22	0.51
Having a machine (respirator) breathe for my baby	2.02	1.75	17.34	**0.01***	1.11	0.95
Jerky or restless movements of my baby	1.90	1.67	9.11	0.10	7.48	0.18
The small size of my baby	1.58	1.71	9.65	0.08	5.54	0.35
The wrinkled appearance of my baby	1.47	1.48	2.70	0.74	7.53	0.18
Total Mean Score	**2.22**	**0.38**				

[*continues*]

Table 2. Continued.

Stress Factors			Depression		Suicidal thought	
	Mean	SD	F	Sig	F	Sig
Relationship and Parental Role						
Not having time alone with my baby	3.08	1.50	5.17	0.39	5.02	0.41
Feeling helpless about how to help my baby during this time	3.05	1.48	5.87	0.31	2.99	0.70
Feeling helpless and unable to protect my baby from pain and painful procedures	2.83	1.52	10.61	0.60	1.04	0.95
Being separated from my baby	2.65	1.64	10.61	0.60	6.60	0.25
Not being able to hold my baby when I want	2.51	1.52	21.86	**0.01***	9.81	0.08
Not feeding my baby myself	2.45	1.45	0.832	0.163	2.89	0.71
Not being able to care for my baby myself (for example, diapering, bathing)	2.23	1.43	0.80	0.068	3.62	0.60
Total Mean Score	**2.68**	**0.31**				
Grand Mean	**2.22**	**0.52**				

*Significant at $P < 0.05$.

stressor under relationship and parental role which doubles as the major stressor under this study was not having time alone with my baby" (3.08±1.50).

In addition, the table indicates that the "presence of monitors and equipment"(0.01), "constant noises of monitors and equipment"(0.03), "other sick babies in the room"(0.02), "large number of people working in the unit"(0.01), "when my baby looked sad"(0.02), "seeing needles and tubes put in my baby"(0.01), "baby's unusual or abnormal breathing patterns"(0.01), "baby not being able to cry like other babies"(0.01), "machine (respirator) breathe for my baby"(0.01), and "not being able to hold my baby when I want"(0.01) were determinants of PPD while only "other sick babies in the room"(0.01) was the variable that predicted suicidal thoughts among the respondents.

Level of Maternal Stress

Figure 1 reveals the respondents' overall level of stress. Results revealed that 46.0% of the respondents experienced high level of stress, and 45.1% of them experienced low level of stress while only 8.9% experienced moderate stress.

Level of Postnatal Depression and Symptom Severity

Figure 2 illustrates the level of postnatal depression and symptom severity among mothers. It shows that majority of the respondents (66.1%) were depressed while only 20.2% had suicidal thoughts.

As shown in Table 3, a multiple regression was run to predict maternal stress (sights and sounds, baby looks and behaves, and relationship and parental role) with PPD and suicidal thought. The three domains of parental stress predicted suicidal thought (F (5,119) = 7.16, p= 0.01, R^2 =0.15) while none of the three domains of the parental stressor scale contributed to the depression of the mothers (F (5,119) = 2.58, p= 0.06 R^2 =0.60).

The study revealed that most of the sociodemographic characteristics did not influence PPD. However, being divorced has a three-time likelihood to predict suicidal thought (P< 0.05, Odds
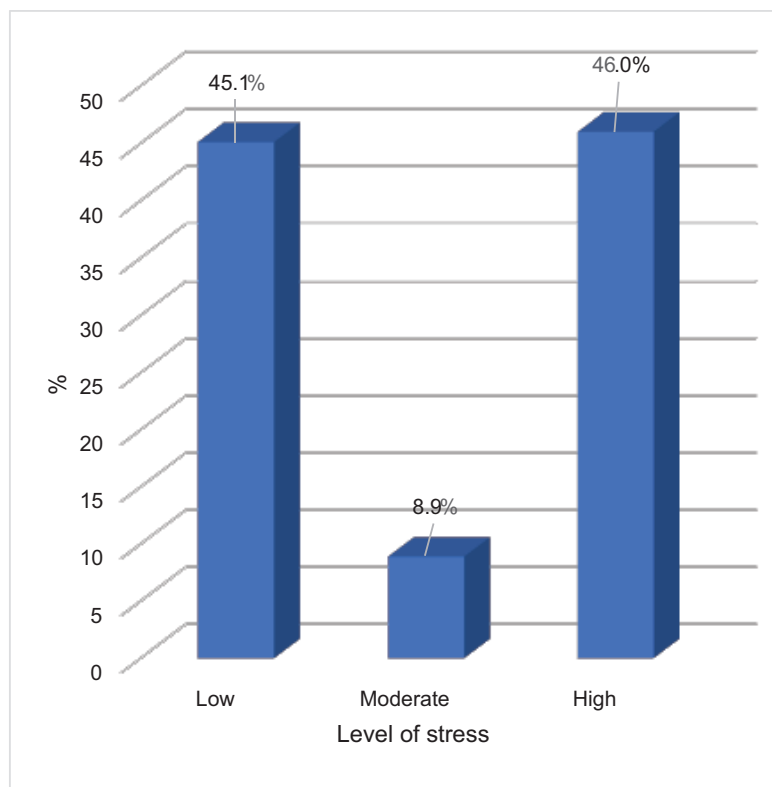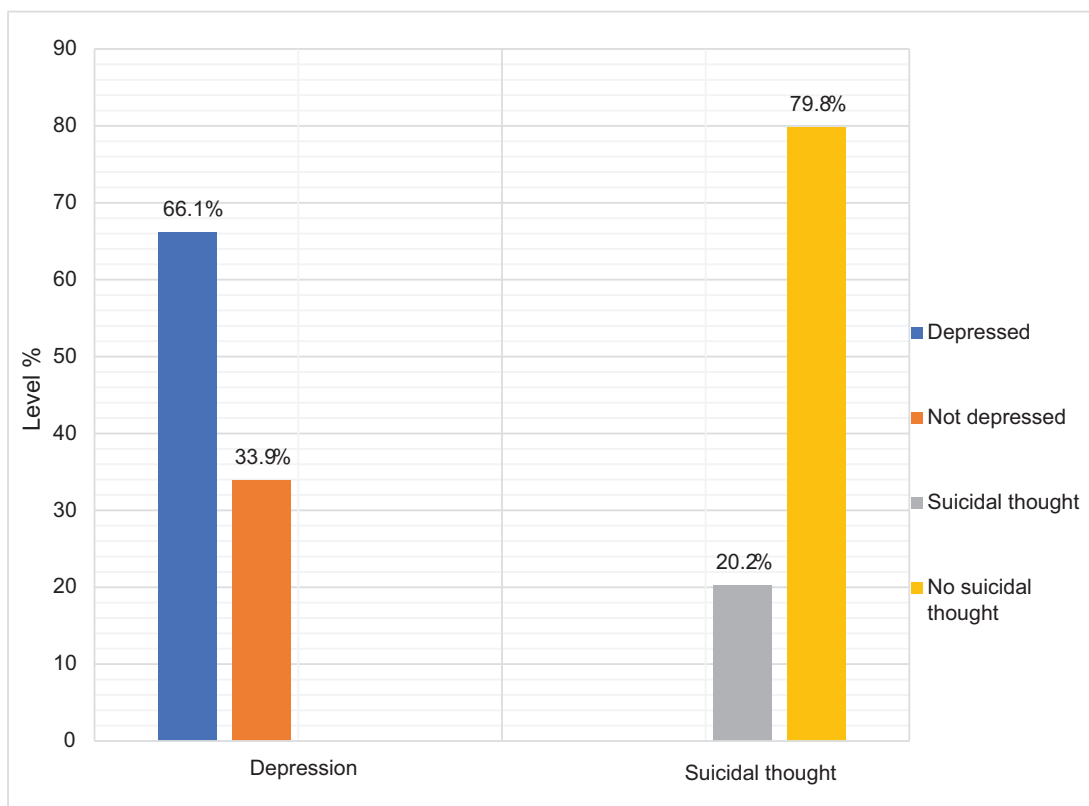
Figure 1. Level of maternal stress.

Figure 2. Level of postnatal depression and symptom severity.

Table 3. Relationship between maternal stress, postpartum depression, and suicidal thought.

	Postpartum depression				Suicidal thought			
Model	Beta	t	Sig	Lower- upper	Beta	t	Sig	Lower- upper
Sights and sounds	0.02	0.20	0.83	−0.37–0.30	0.07	−0.82	0.41	−0.01–0.03
Baby looks and behaves	0.07	0.65	0.51	−0.07–0.13	0.17	1.48	0.14	−0.01–0.02
Relationship and parental role	0.19	1.83	0.07	0.01–0.28	0.28	1.48	0.01	0.00–0.02
Constant		2.99	0.03	2.38–11.69		2.61	0.01	0.22–1.62
F = 2.58 Sig = 0.06 Adjusted R = 0.61 R Square = 0.60					F = 7.16 Sig = 0.01 Adjusted R = 0.31 R Square = 0.15			

a. Predictors: Sights and sounds, baby looks and behaves, relationship and parental role.
b. Dependent variables: Depression, suicidal thought.

ratio −3.26, CI: 23.62–2.34] and a fair level of healthcare provider's support also predicted depression [0.01].

DISCUSSION
Sociodemographic Characteristics of the Respondents
This section presents a discussion of the peculiar characteristics of the participants of this study. The mean age of the respondents in this study was 31.40 ± 6.44 years. This is similar to a study conducted among mothers of neonates in the NICU where the mean age was reported to be 32.17 ± 7.49.[8] Another study with a slightly different mean was conducted by Agrawal and Gaur[18] which reported the mean age of mothers to be 27.3 years; however, a study with a lower mean age [23.9 ± 3.2 years] was reported by Ashwani et al.[17] It can therefore be inferred from the study that the women were in their reproductive years. Only women within their reproductive years can be mothers of hospitalized neonates. Most of the respondents had secondary school education and a tertiary education with only few women having no formal education or have only primary school education. This is in contrast with a study where 13% of the parents were not formally educated, 14% went to primary school, 49% had high school education, and 24% were graduates.[17] Another different study reported that 33% of its respondents had primary education, 32.1% went to secondary school, 21.7% had high school education, and 13.2% had university education.[9] There was variation in the educational level of the mothers. Majority of the respondents were married; others were either single or divorced. This is different from a study conducted in an NICU in the United States where more than half of the respondents were married.[4] A study similar to this study was also carried out in the United States where majority of the respondents were married.[11] The study found out that being divorced has a three-time likelihood to predict suicidal thought, and maternal suicide accounts for up to 20% of postpartum deaths. [21]

The hospitalized neonate was the first child for only few of the mothers, whereas in other studies, more than half of the hospitalized neonates were reported to be first children, respectively.[11,17] More than half of the neonates were term, some of them were preterm, and only a few were postterm. This is in contrast to a study by Agrawal and Gaur[18] where more than half of the neonates were preterm and a study conducted in Rwanda where most of the infants were premature [<36 weeks] with three extremely premature [< 28 weeks]; and eight were full-term babies [> 36 weeks]. On the other hand, Ashwani et al.[17] reported in a study in Telangana, India that most of the neonates were preterm while a few of them were term, as well as another study in Madhya Pradesh, India where most of the neonates were preterm.[18] This study revealed that neonates hospitalized in the NICU were majorly preterm and term babies. This is similar to a study by Ashwani et al.[17] where the weight of neonates ranged from

0.75 to 3.5 kg but slightly different from a study by Musabirema et al.[22] where the birth weight ranged from 0.60 to 3.6 kg. Furthermore, more than half of the neonates hospitalized in the NICU were male while others were females. Furthermore, more than half of the neonates hospitalized in the NICU were male while others were females. Similarly, Agrawal and Gaur[18] reported in their study that 56.5% of the neonates were males and Shakya[22] likewise reported a predominance of male neonates. This depicts that most neonates hospitalized in the NICU are of the male gender. The hospitalized neonates were delivered via SVD and caesarean section, with SVD having the largest numbers; this is similar to a study by Ashwani et al.[17] where most of the births were SVD while others were caesarean deliveries but in contrast to a study by Alkozei[11] where majority of the neonates were delivered through caesarean section.

Stress Factors in Mothers of Neonates Hospitalized in the NICU

This section discusses the findings related to stressors that mothers of hospitalized neonates faced while their babies were in the NICU. This study revealed that the stress related to altered parenting roles of the mothers was responsible for the highest level of stress. This is in agreement with a study conducted in Turkey which reported that stress related to the altered parenting role was higher than other subscales.[9] A similar example is a study conducted in India where stress related to altered parenting roles emerged as the highest. This is also consistent with another study by Agrawal & Gaur[18] and Shakya[23] where the altered parenting role was responsible for the highest level of stress in both studies. This finding is however in contrast with a study which took place in Rwanda, which reported that altered relationship and parenting roles subscale is the least source of stress to mothers of babies in the NICU.[22] Various studies have reported alteration in parenting roles as a leading source of stress to mothers whose neonates are in the NICU. Factors responsible for altered parenting roles of the mothers includes reduced access to babies, separation of mother and child, failure to breastfeed, reduced or no participation in the grooming of the babies, and not spending time alone with the babies.

Mothers have reported that separation of the babies from them and timed feeding of the babies were stressful for them. Increased mother's access to babies and their involvement in the babies' care as much as possible will help mothers to cope better and might reduce the stress associated with altered parenting roles and the negative experiences they might encounter in the NICU.[5,6]

Secondly, the subscale which contributed next to the stress of mothers was that the baby looks and behaves subscale. This is very similar to a study conducted in Portugal by Baía et al.,[24,9] which reported that the infant appearance was the second major contributor to maternal stress in the NICU. It is also consistent with several other studies which reported infant looks and behaves subscale as the second source of stress to mothers in the NICU.[9,17,23]. This study is however inconsistent with a study carried out in Rwanda that identified the looks and behavior of an infant admitted to an NICU as the most significant source of stress for parents.[22] The appearance of babies includes uncontrolled/jerky movements of babies, limp or weak appearance, and or attachment of machines and tubes to the babies. It was reported by mothers that seeing tubes and machines attached to the baby was stressful to them.[25] Nonfamiliarity of mothers with the expected appearances of babies in the NICU could be a source of stress to the mothers. Information given to mothers before, during, and after childbirth should include informing mothers about the possibility of NICU admission of their babies and the expected sight and behaviors of their babies. This study can therefore infer that the unpleasant sight and behaviors of babies in the NICU is a major contributor to the stress experienced by their mothers.

Furthermore, this study revealed that the third contributor of stress to mothers in the NICU is the sights and sounds of equipment or machines in the NICU. This finding resonates with previous studies which reported that sights and sounds of machines was least associated with maternal stress in the NICU.[9,17,23,24] However, it is different from a study in Rwanda which reported that sights and sounds of the NICU was the second major contributor to maternal stress.[22] The study is also in contrast to a study conducted in Pradesh, India which reported

sights and sounds as the main source of stress for mothers in the NICU.[26] It can therefore be inferred from the study that very minimal maternal stress was caused by the presence and sounds of machines in the NICU, as mothers reported that they perceive the machines were present in the NICU for the care of their babies.

Prevalence and Symptom Severity of PPD among Mothers

Discussion on the prevalence and symptom severity of PPD was presented in this section. This study revealed that the prevalence of PPD among the respondents was high with a few of the respondents having had thoughts of harming themselves. Hypothetically, it can be explained that having PPD depends on several factors such as previous experience in the NICU, parity, support system, culture, and life experiences, although these claims will have to be furtherly ascertained through research. This is similar to a study conducted in Philadelphia where the EPDS score among NICU mothers was reported to be high[27]; however, it is different from a study conducted in Nepal among postpartum women where the prevalence of PPD was low[28] and another study conducted among postnatal women, attending children welfare clinics in Jos, Nigeria where the prevalence of PPD was reported to be low.[29] The finding from this study does not resonate with the global pooled prevalence of PPD among postnatal women. One factor that might be responsible for these differences is the presence of the respondents of this study in the NICU. Comparatively, a study conducted among mothers of hospitalized neonates in Pradesh, India revealed that the prevalence of PPD among the mothers was low[25] while another study reported PPD prevalence of moderate severity among mothers.[11] In addition, this study revealed that there is no relationship between concurrent stressors of mothers and PPD symptom severity in the NICU. This is different from a study conducted in Pradesh which reported that PPD is significantly associated with maternal stress in the NICU[25]; it is also similar to a study conducted in Jordan which reported significant association between stress and PPD in the NICU.[30] Gerstein et al.[31] also reported a significant association between NICU stress and maternal

depression. Osborne et al.[21] also emphasized that mothers of babies in the NICU may continue to experience symptoms past the perinatal period, and this stress can cause less secure parent–infant attachment. The infant is also at increased risk for their own health, as there could be developmental, psychological, and behavioral concerns.

Factors such as age, marital status, educational level, available social support, and income of mothers can affect how mothers perceive stress and depression. The level of healthcare provider's support had a significant association with depression in this study. This is akin to a Canadian study where less social support was a significant predictor of postpartum depressive symptoms.[32] Another study among mothers of premature babies in an NICU revealed that age, educational level, place of residence, and income did not predict depression; however, occupation predicted depression.[33] It can therefore be inferred that the higher the level of healthcare provider's support of neonates' mothers in the NICU, the lesser their chances of experiencing depressive symptoms, although this might also be affected by the age, income, parity, and educational level of the mothers.

LIMITATIONS OF THE STUDY

The small sample size of this study may not be worthy of generalization to a larger population, hence extra precaution has to be taken while interpreting results from this study. This study was limited to 124 mothers from a single state, which may have restricted its broader applicability. Expanding the sample size and including multiple hospitals or diverse socioeconomic backgrounds may strengthen further studies.

This study was not an experimental study. Hence, there was no control group which may have helped to determine whether NICU hospitalization itself is a primary factor in maternal stress and depression or if similar rates of PPD exist among postpartum mothers in general.

SUGGESTION FOR FURTHER STUDIES

The following are suggestions for further studies. Comparative studies on stress factors and PPD should be conducted between mothers whose neonates are in the NICU and mothers of well

babies in postnatal ward. Stress factors and fathers' involvement in the NICU should also be studied. Intervention studies can be conducted on evaluating stress and PPD among mothers having family centered care (FCC) in the NICU and mothers having nonfamily centered care (NFCC) care in the NICU.

CONCLUSION

This study concluded that mothers of hospitalized neonates were depressed and had a suicidal thought and the major stressor was altered parenting role. Hence there is a need for more involvement of mothers in the care of hospitalized neonates in the NICU and regular screening of post-partum depression should be done for mothers before, during and after childbirth so that negative maternal and neonatal health outcomes can be prevented.

CONFLICT OF INTEREST

The authors declared no conflict of interest.

REFERENCES

1. Demisse AG, Alemu F, Gizaw MA., et al. Patterns of admission and factors associated with neonatal mortality among neonates admitted to the neonatal intensive care unit of university of Gondar hospital, Northwest Ethiopia. Pediatric. Health Med. Ther. 2017(8): 57–64. https://doi.org/10.2147/PHMT.S130309

2. Haidari ES, Lee HC, Illuzzi JL, et al. Hospital variation in admissions to neonatal intensive care units by diagnosis severity and category. J. Perinatol. 2021;41(3):468–477. https://doi.org/10.1038/s41372-020-00775-z

3. Ojima WZ, Olawade DB, Awe OO, et al. Factors associated with neonatal mortality among newborns admitted in the special care baby unit of a Nigerian hospital. J. Trop. Pediatr. 2021;67(3): fmab060. https://doi.org/10.1093/tropej/fmab060

4. Williams KG, Patel KT, Stausmire JM, et al. The neonatal intensive care unit: Environmental stressors and supports. Int. J. Environ. Res. Public Health. 2021;15(1):60. https://doi.org/10.3390/ijerph15010060

5. Shokane MA, Mogale RS., Maree C. Preparing for implementation of family integrated neonatal care by healthcare providers in a district hospital of Limpopo Province. Int. J. Afr. Nurs. Sci. 2021;100575. https://doi.org/10.1016/j.ijans.2023.100575

6. Wang LL, Ma JJ, Meng HH, et al. Mothers' experiences of neonatal intensive care: A systematic review and implications for clinical practice. World J. Clin. Cases. 2021;9(24):7062. https://doi.org/10.12998/wjcc.v9.i24.7062

7. Toral-lópez I, Fernández-alcántara M, González-carrión P, et al. Needs perceived by parents of preterm infants: Integrating care into the early discharge process. J. Pediatr. Nurs. 2016;31(2):e99–e108. https://doi.org/10.1016/j.pedn.2015.09.007

8. Busse M, Stromgren K, Thorngate L, et al. Parents' responses to stress in the neonatal intensive care unit. CCRN. 2013;33(4):52–59. https://doi.org/10.4037/ccn201371552

9. Akkoyun S and Arslan FT. Investigation of stress and nursing support in mothers of preterm infants in neonatal intensive care units. Scand. J. Caring Sci. 2018;20–25. https://doi.org/10.1111/scs.12630

10. Currie ER, Christian BJ, Hinds PS, et al. Parent perspectives of neonatal intensive care at end-of-life. J. Pediatr. Nurs. 2016;31(5):478–489. https://doi.org/10.1016/j.pedn.2016.03.023

11. Alkozei A, Mcmahon E, Lahav A. Stress levels and depressive symptoms in NICU mothers in the early postpartum period. J. Matern Fetal. Neonatal Med. 2014;27(17):1738–1743. https://doi.org/10.3109/14767058.2014.942626

12. Slomian J, Honvo G, Emonts P, et al. Consequences of maternal postpartum depression: A systematic review of maternal and infant outcomes. WHS. 2019;15: 1745506519844044. https://doi.org/10.1177/1745506519844044

13. Wereszczak J, Miles MS, Holditch-Davis D. Maternal recall of the neonatal intensive care unit. NRN. 1997;16(4):33–40. PMID: 9216318.

14. Ukaegbe CI, Iteke O, Bakare MO, et al. Postpartum depression among Igbo women in an urban mission hospital, South East Nigeria. Ebomed. 2012;11(1&2): 29–36. www.ajol.info/index.php/ebomed/article/view/86281

15. Israel GD. Determining sample size. IFAS. 1992. https://cutt.ly/IziBzCy

16. Miles MS, Funk SG, Carlson J. Parental stressor scale: Neonatal intensive care unit. Nurs. Res. 1993;42(3): 148–52. https://www.unboundmedicine.com/medline/citation/8506163/Parental_Stressor_scal:neonatal_intensive_care_unit_

17. Ashwani N, Rekha NA, Kumar CS. Parental stress experiences with NICU admission in a tertiary care centre. Int. J. Psychol. & Behav. Sci. 2017;7(1):27–31. https://doi.org/10.5923/j.ijpbs.20170701.05

18. Agrawal R and Gaur A. Parent stress in neonatal intensive care unit: An unattended aspect in medical care. Int. J. Contemp. Pediatr. 2017;4(1): 148–153. http://doi.org/10.18203/2349-3291.ijcp20164596

19. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression: Development of the 10-item Edinburgh Postnatal Depression Scale. Br. J. Psychiatry. 1987 Jun;150(6):782–6.

20. Adewuya AO, Eegunranti AB, Lawal AM. Prevalence of postnatal depression in Western Nigerian women: A controlled study. Int. J. Psychiatry Clin. Pract. 2005 Mar 1;9(1):60–4.

21. Osborne AD, Barbeau DY, Gladdis T, et al. Understanding and addressing mental health challenges of families admitted to the neonatal intensive care unit. J. Perinatol. 2024;1–8. https://doi.org/10.1038/s41372-024-02187-9

22. Musabirema P, Brysiewicz P, Chipps J. Parents perceptions of stress in a neonatal intensive care unit in Rwanda. Curationis. 2015;38(2):1–8. https://doi.org/10.4102/curationis.v38i2.1499

23. Shakya N. Stress experienced by parents of hospitalised neonate. Int. J. Nurs. Res. Pract. 2017;4(2):4–9.

24. Baía I, Alves E, Amorim M, et al. Parental needs and stress in neonatal intensive care units: Effect of data collection period. Publicação Breve. 2015;29(6):160–162. http://www.scielo.mec.pt/pdf/am/v29n6/v29n6a04.pdf

25. Yapici G, Ozel S, Oner S, et al. Evaluation of mothers' stress in the neonatal intensive care unit. J. Nurs. Health

Sci. 2018;7(2):40–49. https://doi.org/10.9790/1959-0702104049

26. Gautam GC. and Vishwakarma R. Patterns of distress in mothers of NICU admissions. IJSR. 2020;9(1):21–23. https://doi.org/10.36106/ijsr

27. Bonacquisti A, Geller PA, Patterson CA. Maternal depression, anxiety, stress, and maternal-infant attachment in the neonatal intensive care unit. J. Reprod. Infant Psychol. 2020;38(3):297–310.

28. Giri RK, Khatri RB, Mishra SR, et al. Prevalence and factors associated with depressive symptoms among post-partum mothers in Nepal. BMC Res. Notes. 2015; 8(111):1–7. https://doi.org/10.1186/s13104-015-1074-3

29. Tungchama FP, Obindo JT, Armiya'u AY, et al. Prevalence and sociodemographic correlates of postpartum depression among women attending postnatal and/or children's welfare clinics in a tertiary hospital, Jos, Nigeria. Sahel Med. J. 2018;21(1):23–30. https://doi.org/10.4103/smj.smj

30. Maghaireh DF Al, Abdullah KL, Chong MC, et al. Stress, anxiety, depression and sleep disturbance among Jordanian mothers and fathers of infants admitted to neonatal intensive care unit: A preliminary study. J. Pediatr. Nurs. 2017; 36:132–140. https://doi.org/10.1016/j.pedn.2017.06.007

31. Gerstein ED, Njoroge WFM, Paul RA., et al. Maternal depression and stress in the neonatal intensive care unit: Associations with mother-child interactions at age 5 years. JAACAP. 2019; 58(3):350–358.e2. https://doi.org/10.1016/j.jaac.2018.08.016

32. Ballantyne M, Benzies KM, Trute B. Depressive symptoms among immigrant and Canadian born mothers of preterm infants at neonatal intensive care discharge: A cross sectional study. BMC Pregnancy Childb. 2013;13(Suppl 1):1–10. https://doi.org/10.1186/1471-2393-13-S1-S11

33. Abdelsalam ZAM. Relationship among depression, anxiety and mother-infant bonding in mothers of premature babies. SOJ Nurs. Health Care. 2017;3(2):1–7. https://doi.org/10.15226/2471-6529/3/2/00132Health