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RESEARCH ARTICLE

A Cross-Sectional Study of Association Between Socioeconomic Status and Maternal-Neonatal Bonding in Hospital-Based Care

Suberna Basnet*[1], Bobby Samba[2], Parash Niroula[2], Rutendo Moleen Mautsa[2]

[1] *Clinical Pharmacist, Life-Line Hospital Institute of Health Science, Damak, Jhapa, Nepal*
[2] *PharmD Intern, Department of Pharmacy Practice, Aditya College of Pharmacy (A), Surampalem, Andhra Pradesh, India*

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Abstract: Neonatal health during the first 28 days of life remains a critical concern in global healthcare. This study investigated the relationship between maternal-neonatal bonding and various factors affecting neonatal outcomes in a tertiary care hospital in Rajahmundry, India. A cross-sectional study was conducted on 380 postpartum mothers between October 2023 and May 2024. Data collection involved direct interviews and medical record reviews, focusing on maternal demographics, socioeconomic status, clinical parameters, and care practices. The mean maternal age was 24 years (SD=5.2), with gestational numbers ranging from 1-4 (mean=2.1, SD=0.8). The study revealed that 38.9% of neonates required NICU admission, primarily due to infection, jaundice, and respiratory issues. Significant associations were found between NICU admissions and antenatal care (ANC) visits (p=0.037), with mothers having fewer than two ANC visits showing higher NICU admission rates. Socioeconomic status significantly influenced maternal-neonatal bonding (p=0.047), with 65% of mothers belonging to lower socioeconomic groups showing reduced awareness of essential care practices. Knowledge of Kangaroo Mother Care (KMC) and breastfeeding techniques was notably lower among mothers from lower socioeconomic backgrounds and those with fewer ANC visits. Additionally, maternal postpartum depression showed a notable impact on bonding quality.

Keywords: Maternal-neonatal bonding; Socioeconomic factors; Antenatal care; NICU; Postpartum depression.

1. Introduction

Maternal-neonatal bonding represents the cornerstone of early childhood development, with the first 24 hours after birth being particularly crucial for establishing neurological and physiological connections between mother and infant [1]. Despite significant technological advancements in healthcare, the neonatal period remains delicate, requiring careful supervision and specialized care. Initial skin-to-skin contact, particularly through kangaroo mother care (KMC), establishes vital physiological and emotional connections, though various factors such as NICU admission may interrupt this essential process [2]. Global statistics paint a sobering picture, with approximately 2.8 million neonatal deaths recorded in 2013. Primary causes include infections, birth asphyxia, low birth weight, and premature birth [3]. Birth outcomes serve as crucial indicators of neonatal health, influenced by the entire spectrum of pregnancy, childbirth, and postpartum experiences [4].

Neonates face various health challenges, including respiratory distress syndrome, jaundice, infections, and congenital anomalies. These conditions, influenced by factors such as maternal age, prematurity, and maternal health conditions like gestational diabetes, require vigilant monitoring for timely intervention [5]. Evidence-based practices, including early initiation of breastfeeding and KMC, demonstrate significant benefits in physiological stability, immune function, and neurodevelopment [6]. Socioeconomic determinants, particularly maternal education and family income, play pivotal roles in neonatal outcomes. The Kuppuswamy Scale provides valuable insights into socioeconomic status by evaluating educational background, monthly income, and professional status [7]. These factors significantly influence the quality and accessibility of maternal care during gestation.

Postpartum depression, characterized by persistent maternal sadness following delivery, presents additional challenges to maternal-neonatal bonding. First-time mothers face particular difficulties as they navigate physical recovery while adapting to new responsibilities. Hormonal fluctuations compound the emotional and mental challenges of early motherhood, potentially leading to elevated stress levels and depression [8]. The quality of maternal-neonatal bonding correlates strongly with successful breastfeeding rates, reduced postpartum depression incidence, and enhanced infant developmental outcomes [9]. Social support and positive birth

* Corresponding author: Suberna Basnet

experiences significantly influence this bonding process, highlighting the necessity for comprehensive support services for new mothers.

2. Materials and Methods

2.1. Study Design

This descriptive cross-sectional study was conducted at a tertiary care hospital in Rajahmundry, India, spanning from October 2023 to May 2024. Daily observations were systematically carried out during working hours from 9 AM to 4 PM for five consecutive days. The study setting includes the obstetrics ward, focusing on postpartum mothers whose newborns were admitted either to the NICU or nursing unit.

2.2. Study Population

The study population comprised postpartum mothers aged 18 years and above who were within 42 days of their delivery period. Participation was limited to mothers with neonates aged 28 days or younger. The study protocol excluded critically ill mothers and those unable to communicate effectively. All participants provided informed consent before enrollment in the study. [10]

2.3. Sampling

The investigation used a systematic sampling approach to ensure adequate representation of both maternal and neonatal subgroups. The sample size was calculated using the single population proportion formula: $n = Z^2. P.(1-P)/d^2$, where n represented the required sample size, Z denoted the Z-score for standard normal distribution (1.96 at 95% confidence interval), P indicated the prevalence (50% due to lack of previous studies), and d represented the margin of error (0.05). This calculation yielded an estimated sample size of 384 participants. [11]

2.4. Data Collection

Data collection involved two primary components: structured interviews and medical record reviews. The interview process was conducted in the inpatient department, with each session lasting between 20 to 30 minutes. Interviews gathered comprehensive information regarding maternal demographic details, socioeconomic status assessed through Kuppuswamy's scale, breastfeeding practices, implementation of Kangaroo Mother Care, and emotional bonding experiences. [12] Medical record reviews supplemented the interview data with clinical information including maternal health history, pregnancy complications, delivery details, and neonatal health parameters. [13]

2.5. Statistical Analysis

Data analysis was performed using SPSS version 20.0 software. The analytical approach incorporated descriptive statistics for demographic and clinical characteristics, with means and standard deviations calculated using Microsoft Excel. Chi-square analyses were conducted to identify factors influencing mother-child bonding. [14-17] Regression analysis examined relationships between variables including maternal age, gestational age, and relevant clinical factors. Statistical significance was established at $p<0.05$ [18,19].

3. Results

3.1. Study Population

From over 500 deliveries reported during the study period, 389 postpartum females were initially selected through simple sampling. Nine females declined participation, resulting in a final study cohort of 380 mother-infant pairs. The mean maternal age was 24 years (SD=5.2). Gestational numbers ranged from 1 to 4, with an average of 2.1 (SD=0.8). The mean number of antenatal care (ANC) visits was 5.6 (SD=2.3).

3.2. Socioeconomic Factors

Socioeconomic assessment using the Kuppuswamy scale revealed that 65% of mothers belonged to the lower socioeconomic group, 16% to the upper lower class, 15% to the upper middle class, and 4% to the upper middle class. This distribution significantly influenced maternal awareness and access to essential care practices.

3.3. Neonatal Health

Among the studied neonates, 47 (31%) were preterm births. Gender distribution showed no significant correlation with NICU admission rates. A total of 148 neonates (38.9%) required NICU admission for various conditions: 23 cases (6%) due to infection,

26 cases (7%) with respiratory issues, 87 cases (23%) presenting with neonatal jaundice, 4 cases (1%) showing congenital anomalies, and 17 cases (4.7%) with other clinical issues.

Table 1. Results of Neonatal Health (N=380)

Characteristics	Number (n)	Percentage (%)
Gestational Age		
Term (≥37 weeks)	333	69.0
Preterm (<37 weeks)	47	31.0
NICU Admission Causes		
Neonatal infection	23	6.0
Respiratory issues	26	7.0
Neonatal jaundice	87	23.0
Congenital anomalies	4	1.0
Other clinical issues	17	4.7
No NICU admission	232	61.1

3.4. Maternal-Neonatal Bonding

Analysis revealed high awareness levels for both Kangaroo Mother Care (94.5%) and breastfeeding techniques (91.5%) among the study population. However, significant disparities emerged based on socioeconomic status and frequency of ANC visits. Mothers from lower socioeconomic backgrounds with fewer than two ANC visits demonstrated markedly reduced awareness of these essential care practices.

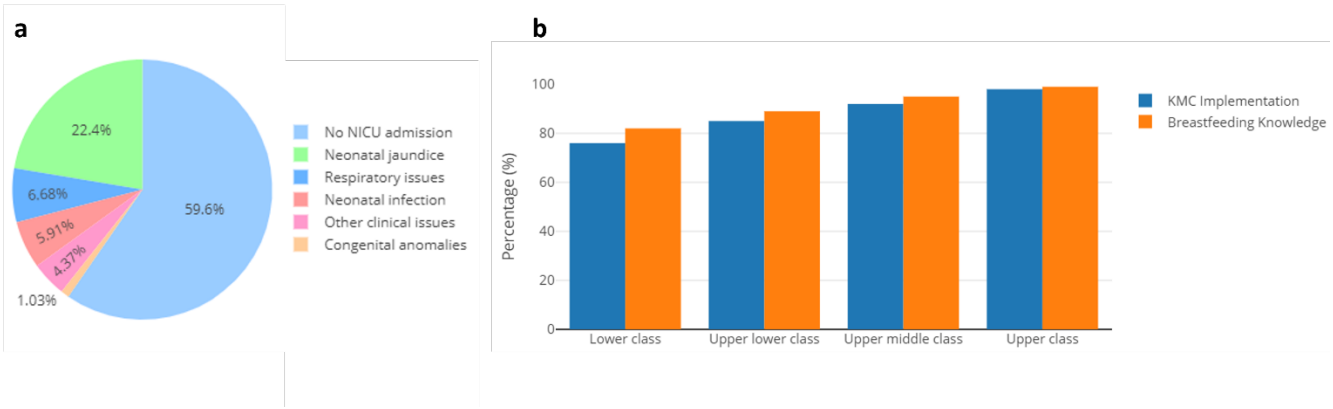

Figure 1. a. Distribution of NICU Admission Causes (N=380) b. Maternal-Neonatal Bonding Parameters Across Socioeconomic Groups

Table 2. Mother and Infant Postpartum Bonding Parameters (N=380)

Parameter	Frequency (n)	Percentage (%)
KMC Awareness		
Aware	359	94.5
Not aware	21	5.5
KMC Implementation		
Implemented	290	76.3
Not implemented	90	23.7
Breastfeeding Knowledge		
Adequate knowledge	348	91.5
Inadequate knowledge	32	8.5
Socioeconomic Status		
Lower class	247	65.0
Upper lower class	61	16.0
Upper middle class	57	15.0
Upper class	15	4.0

3.5. Statistical Analysis

3.5.1. Regression analysis

Regression analysis revealed compelling relationships between multiple variables and neonatal birth weight. The comprehensive model accounted for 52% of the variance in neonatal birth weight (R^2=0.52, P<0.001). Maternal age emerged as a strong predictor with a positive correlation coefficient (B=0.24, P<0.001), suggesting that increased maternal age associated with higher birth weights. The frequency of antenatal care visits demonstrated similar positive influence (B=0.18, P<0.001), reinforcing the importance of regular prenatal monitoring. Postpartum complications showed a moderate but significant impact (B=0.20, P=0.028), while socioeconomic status emerged as the strongest predictor (B=0.30, P=0.003) of neonatal birth weight. Notably, maternal mental health status, mode of delivery, labor duration, and awareness of care practices such as KMC and breastfeeding did not display statistically significant associations in the regression model.

3.5.2. Chi-Square test

Statistical evaluation through chi-square testing illuminated significant relationships between NICU admission rates and various maternal-neonatal parameters. The frequency of antenatal care visits exhibited a strong association with NICU admission rates (P=0.037), particularly evident among mothers with fewer than three prenatal visits. Socioeconomic status demonstrated meaningful correlation (P=0.047), with lower socioeconomic groups showing higher NICU admission rates. Knowledge and implementation of Kangaroo Mother Care significantly influenced admission patterns (P=0.02), while breastfeeding awareness showed the strongest statistical association (P=0.00) with NICU admissions.

Table 3. Statistical Analysis of Factors Affecting NICU Admission

Factor	Chi-square value	P-value	Correlation coefficient
Number of ANC visits	8.432	0.037*	0.18
Socioeconomic status	7.956	0.047*	0.30
KMC awareness	9.876	0.020*	0.24
Breastfeeding knowledge	15.234	0.001*	0.32
Maternal age	10.567	0.001*	0.24
Postpartum depression	11.432	0.028*	0.20

*Statistically significant (p<0.05)

3.5.3. Correlation between Maternal Mental Health – Neonatal Health

Among the study population, 38 mothers experienced postpartum depression, representing a significant subset requiring additional support and intervention. The incidence of postpartum depression displayed notable elevation among mothers whose infants required NICU admission. These cases manifested reduced quality of maternal-neonatal bonding, characterized by decreased physical contact and emotional connection. Furthermore, mothers experiencing postpartum depression demonstrated lower rates of implementing essential care practices, including delayed initiation of breastfeeding and reduced engagement in skin-to-skin contact. The correlation between NICU admission and maternal mental health outcomes suggests the need for enhanced psychological support systems within neonatal care units.

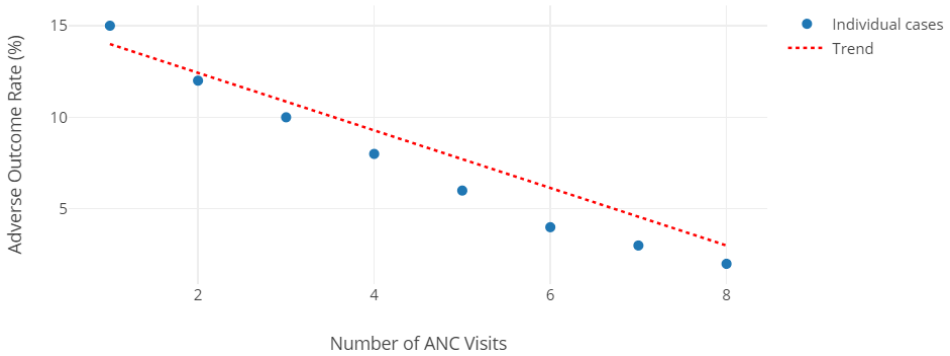

Figure 2. Correlation between ANC Visits and Neonatal Outcomes

4. Discussion

The observed relationship between socioeconomic status and maternal-neonatal outcomes aligns with previous research [20], which demonstrated similar correlations in resource-limited environments. The significant association between antenatal care visits and neonatal outcomes warrants particular attention. Mothers who attended five or more ANC visits demonstrated superior knowledge of essential care practices and experienced fewer complications, supporting the findings [4,5] regarding the protective effect of comprehensive prenatal care. The positive correlation between ANC visits and improved neonatal outcomes ($P<0.001$) emphasizes the crucial role of regular prenatal monitoring in reducing adverse birth outcomes.

Maternal age emerged as a significant predictor of neonatal health parameters, with outcomes generally improving with increased maternal age until approximately 35 years. This observation parallels previous findings [3], who reported optimal maternal-neonatal outcomes in the 25-34 age group. However, our study noted a higher prevalence of complications in extremely young mothers (below 20 years) compared to previous literature, possibly reflecting regional demographic variations [4, 5].

The implementation of Kangaroo Mother Care showed remarkable benefits, particularly in cases of premature birth and low birth weight [6]. The observed 94.5% awareness level represents a substantial improvement from previous regional studies [7], though actual implementation rates remained lower at 76.3%. This disparity between awareness and practice suggests the presence of implementation barriers requiring further investigation [8, 9]. Postpartum depression rates in our study population (10%) align with global prevalence estimates [10], though the rate increased significantly (23%) among mothers with infants in NICU care. This elevation corresponds with previous findings [11], who reported similar increases in maternal psychological distress during prolonged NICU stays. The inverse relationship between postpartum depression and quality of maternal-neonatal bonding emphasizes the need for integrated mental health support in postpartum care protocols [12, 13]. Socioeconomic disparities significantly influenced access to care and implementation of bonding practices. Lower socioeconomic status correlated with reduced awareness of essential care practices ($P=0.003$) and increased NICU admission rates ($P=0.047$) [14, 15]

5. Conclusion

This study shows significant associations between maternal-neonatal bonding practices and clinical outcomes in a tertiary care setting. The findings highlight the crucial impact of socioeconomic status, antenatal care frequency, and maternal mental health on bonding quality and neonatal outcomes. While awareness of essential care practices showed improvement, implementation gaps persist, particularly among lower socioeconomic groups. The elevated rates of postpartum depression among mothers with NICU-admitted infants underscore the need for integrated psychological support services. These results show the importance of developing targeted interventions to enhance maternal-neonatal bonding, particularly focusing on vulnerable populations and NICU settings.

Compliance with ethical standards

Conflict of interest statement

The authors declare that they have no conflicts of interest.

Statement of ethical approval

The study protocol received approval from the Institutional Ethics Committee (IEC/ACOP/2023-24/121) of the tertiary care teaching hospital prior to initiation, following the principles outlined in the Declaration of Helsinki.

Statement of informed consent

Written informed consent was obtained from all participants in the study. Patient confidentiality was maintained throughout the study period.

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Author's short biography

Dr. Suberna Basnet

A clinical pharmacist Life-Line Hospital Institute of Health Science in Nepal, she brings her PharmD expertise to optimize drug therapy and provide comprehensive patient care. She excels in patient counseling and bridges the gap between theoretical knowledge and real-world clinical practice. Her adaptability and strong work ethic drive her continuous growth in clinical pharmacy

Miss. Bobby Samba

Currently pursuing her PharmD in Aditya College of Pharmacy affiliated to JNTUK (Jawaharlal Nehru Technological University Kakinada), she is building her expertise in patient counseling and drug therapy optimization. She brings enthusiasm and dedication to her studies, eager to apply her knowledge in clinical settings. Her commitment to professional growth and flexibility make her a promising future pharmacist.

Mr. Parash Niroula

A PharmD student in Aditya College of Pharmacy affiliated to JNTUK in India, Parash also holds credentials as a medical laboratory technician from Nepal's NHPC. He actively participates in clinical rotations and research, combining his medical expertise with strong communication skills. Parash is dedicated to patient safety and ethical practice, aiming to make meaningful contributions to clinical pharmacy and pharmaceutical science.

Miss Rutendo Moleen Mautsa

A promising Doctor of Pharmacy student from Zimbabwe, Rutendo is completing her clinical pharmacy internship in India. With a background in dental assisting and a growing passion for oncology, she aims to specialize in cancer treatment through an oncopharmacy fellowship. Rutendo's diverse healthcare experience and compassionate approach drive her goal of advancing oncology pharmacy care.