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Determinants of Late Preterm Hospitalisation During the Neonatal Period at Kakamega County Teaching and Referral Hospital, Kakamega County

Duncan Omuchilo Moyia[1*], Dr. Sarah Bett[2] & Dr. Grace Githemo[3]
[123]Nursing (Pediatrics), Kenyatta University
Corresponding Author Email: duncanmoyia95@gmail.com

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Abstract

Purpose: Late preterm infants frequently face specific difficulties stemming from their physiological underdevelopment, which heightens their risk for health issues and the need for later hospitalization. Nevertheless, the factors influencing late preterm hospitalization following discharge from delivery have not been thoroughly investigated within the healthcare system in Kenya. In particular, the study determined the relationship between neonatal characteristics, maternal characteristics, neonatal care practices, and hospitalization outcome.

Methods: Analytical cross-sectional quantitative research was conducted using a sample of 74 infant-mother dyad pairs selected through purposive sampling. Late preterm infants hospitalized in the KCTRH pediatric emergency unit within 28 days after birth discharge were recruited. A structured questionnaire was used to collect data. A bivariate test using chi-square was conducted to assess the associations between maternal, late preterm, and neonatal care practices and late preterm hospitalization outcomes. Subsequently, multivariate logistic regression was performed on the variables found to be significant in the bivariate analysis to further evaluate their independent effects on hospitalization outcomes. P-values were set at <.05

Results: Late preterm infants who were hospitalized for more than 48 h had worse outcomes (AOR = 0.08, p = 0.006), as did infants who were appropriately breastfed (AOR = 0.13, p = 0.022). Symptomatic danger signs before hospitalization were linked to the worst outcomes (AOR = 44.50, p =. 040). Maternal education post-basic/tertiary (AOR = 66.72, p =. 014), antenatal care utilization (AOR = 0.02, p =. 031), and the lack of previous pregnancy complications (AOR = 21.27, p =.031). 017) were also associated with favorable outcomes. Some of the neonatal practices done during the first few days of life, which included breastfeeding after birth (AOR |= 1.44, p = .001) and receiving teaching from nurses on dangerous signs (AOR = 2.32, p = .007), appeared to be beneficial.

Implication: The findings emphasize the importance of effective maternal and neonatal care in the outcomes for hospitalization late in the preterm period. It is important to develop specific neonatal care strategies that are based on maternal education and early intervention measures in order to improve late preterm infant health and limit hospital stays.

Keywords: *Late Preterm, Hospitalization, Determinants, Neonatal Care, Neonatal Care Practices*

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1. Introduction

Late preterm (LP) designates infants who are born between 34 weeks and 36 weeks and 6 days of gestation. These infants have been referred to as "near term," "mildly preterm," and "marginally and minimally preterm," among other designations. Although referred to as having preterm birth, this group of infants possesses several features which are typical of term neonates, including their birth weight and size. As a result, they tend to be managed as full-term babies (Howson et al., 2019; American Academy of Pediatrics, 2005). Consequently, they are typically regarded as having functional and developmental maturity, with the infant medical protocols created for term babies being routinely applied to them Bulut et al., 2018. Thus, it is crucial to identify the unique needs and risks for late preterm infant care when providing such services.

Preterm infants are usually considered to be physiologically immature and may have limited compensatory mechanisms for the postnatal environment as compared to term infants (Whaley & Wong, 2016). The understanding of the developmental biology and the pathophysiological processes in late premature infants remains incomplete,this is a population of very premature children (Wang et al., 2012; Oddie et al., 2018). This prematurity may manifest as immature lung development, which can result from reduced absorption of intrapulmonary fluid, reduced production of surfactant, and impaired gas exchange (Wong et al., 2017). But the problems encountered by late preterm infants in their transition to extrauterine life need comprehensive research and clinical focus to address the issues uniquely encountered by this population.

Late preterm infants exhibit immature cardiovascular function, which can impair their ability to recover from breathing difficulties linked to delayed arterial duct closure and ongoing lung hypertension (Bhat et al., 2017). Furthermore, these infants typically show increased frequency and extended periods of jaundice and hyperbilirubinemia compared to full-term babies. This stems from their underdeveloped systems and reduced levels of uridine diphosphoglucuronate glucuronosyltransferase (Bhutani et al., 2019). Existing research evidence indicates that late-preterm infants have double the risk of developing significantly elevated bilirubin levels compared to full-term babies, with maximum levels usually seen between days five and seven post-birth (Canadian Paediatric Society, 2005). Consequently, they face increased kernicterus risk even at lower bilirubin concentrations than full-term infants (Bhutani et al., 2019). These susceptibilities emphasize the importance of diligent observation and targeted interventions to minimize potential health risks in late preterm infants.

Late-preterm infants may often exhibit an underdeveloped gastrointestinal system in their functionality (Santos et al., 2017). Such gastrointestinal disturbances are manifested in feeding difficulties, resulting, potentially, in increased enterohepatic circulation, a decrease in stool frequency, dehydration, and hyperbilirubinemia (Beserth, 2018). While feeding may be successfully established during the hospitalization phase following birth, continuing the success of feeding past discharge can be challenging. This may lead late-preterm infants further into the list of dehydration and hyperbilirubinemia, which is usually ascribed to relatively low

oromotor tone, coordination, and neurological development (Kinney, 2012; Akerstrom et al., 2019). Thus, it would imply that care and observation must strictly be provided to counter these vulnerabilities for the late-preterm infants even after they are discharged from the hospital.

Preterm birth is one of the major contributors to prenatal mortality in Kenya and beyond. The Ministry of Health in Kenya estimates a minimum of 134,600 babies born prematurely. According to WHO (2019) and Golden et al. (2020), these preterm births are distributed as: < 28 weeks gestation (5%), 28-31 weeks gestation (15%), 32-33 weeks gestation (20%), and 34-36 weeks gestation (60-70%). Research by Wagura et al. (2014) indicates that preterm births constitute 18.3% of all deliveries at Kenyatta National Hospital. The research further confirmed that of all the preterm births in KNH, the late preterm births constitute 62% of these cases. Therefore, management of the complications related to the late preterm birth becomes a priority consideration if the health outcome and mortality rate of the newborn are to be addressed. According to WHO (2018), premature birth is confirmed as the topmost etiology of deaths in children aged below five years of age. It is important to note that while extremely premature infants face the highest mortality risk, late preterm infants still experience higher death rates compared to full-term babies. Research by Reddy et al. (2018) documented neonatal mortality rates of 7.1, 4.8, and 2.8 per 1000 live births at 34-, 35-, and 36-weeks gestation, respectively. Furthermore, a research study spanning the USA and Canada demonstrated that late preterm infants had nearly four times greater likelihood of death from birth defects and neonatal infections compared to full-term babies (Tomashek et al., 2019). These findings clearly show that late preterm infants should undergo standard performance for a series of interventions leading to better outcomes.

Late preterm infants need undivided healthcare attention than term infants, including the moments they are discharged from a healthcare facility. Without the attention, there can be an undeniably higher rate of late preterm readmissions (Bhutani et al., 2016). A number of existing research studies have determined factors contributing to late preterm readmissions in hospitals. For instance, a retrospective study conducted by Escobar et al. (2014) in seven hospitals reported that 4.4% of infants discharged during birth hospitalization were late preterm and were readmitted within 2 weeks post-discharge. The study further identified that late preterm infants discharged in less than 48 hours had increased risk of morbidity and had a higher likelihood of rehospitalization. With the rise in hospital readmissions of late preterm infants, it is crucial to recognize that they are physiologically immature and thus require continuous assessment, monitoring, and follow-up. Therefore, the objective of this study is to identify factors contributing to the increased rate of late preterm readmissions in the Pediatric Emergency Unit at Kakamega County Referral Unit.

1.1 Problem Statement

The increasing frequency of hospital readmissions for late preterm infants, especially during their initial 28 days of life, represents a significant concern in neonatal healthcare that has gained growing attention in Kenya. This timeframe is particularly crucial for newborns, as their immature physiological systems make them susceptible to various health issues. Infants born late preterm, between 34 and 36 weeks of gestation, experience elevated risks of medical complications, including breathing problems, nutritional challenges, hyperbilirubinemia, and susceptibility to pathogens, often requiring readmission to hospitals. While this phenomenon

is documented worldwide, it poses a particular challenge in Kenya's healthcare facilities, where research by Kaguongo (2018) identified a 26.5% readmission rate for late preterm babies, in contrast to 8.8% for full-term infants. This significant gap emphasizes the critical requirement for specific medical interventions targeting late preterm infant care in the nation.

The elevated readmission rates among late preterm infants reflect underlying issues within neonatal healthcare infrastructure, especially in resource-constrained environments like Kenya. Hospital readmissions frequently indicate deficiencies in initial newborn care, encompassing limited evaluation and supervision, suboptimal discharge strategies, and insufficient aftercare monitoring (Alamneh et al., 2021). In resource-limited settings, common across Kenyan medical facilities, neonatal care units often struggle to deliver the comprehensive follow-up and preventative services required to minimize these risks. Moreover, limited parental guidance about late preterm infants' specific requirements compounds these challenges, resulting in delayed recognition of post-discharge complications. This pattern not only jeopardizes newborn health but also strains already resource-limited healthcare systems.

In Kenya, the high rates of neonatal mortality and the issue of late preterm readmissions present significant challenges to the healthcare infrastructure. The heightened susceptibility to hospital-acquired infections, extended periods of hospitalization, and escalating healthcare expenses linked to multiple admissions create substantial pressure on families while intensifying the operational and economic strain on the already burdened medical system (Purisch & Gyamfi-Bannerman, 2017). Tackling the root causes of this problem is essential for enhancing newborn health outcomes. There is an urgent requirement for detailed studies to identify the key factors driving late preterm readmissions in Kenya's healthcare context to guide evidence-based policies and practices. Strategic approaches, including better newborn evaluation methods, improved discharge procedures, and enhanced parent guidance, could substantially decrease readmission frequencies and strengthen overall neonatal healthcare.

1.2 Research Objective

To determine the relationship between neonatal characteristics, maternal characteristics, neonatal care practices, and hospitalization outcomes.

2. Literature Review

2.1 Late Preterm Neonatal Factors

Late preterm birth is associated with numerous neonatal morbidities, with respiratory complications being a primary concern. According to Goyal et al. (2013), preterm infants face elevated risks of breathing difficulties due to their underdeveloped respiratory systems. These infants often have insufficient surfactant production, a crucial substance that maintains alveolar patency, making them susceptible to respiratory distress syndrome. Luke (2015) further identified bronchopulmonary dysplasia (BPD) as a significant risk for late preterm infants, arising from inadequately developed lungs that become irritated. These infants are also particularly vulnerable to recurring apneic episodes.

Cardiovascular complications represent another significant concern in late preterm neonates. Research by Karmati et al. (2020) highlighted patent ductus arteriosus (PDA) and hypotension as major cardiac issues affecting these infants. The immature cardiovascular system in preterm

infants often results in a persistent opening between the aorta and pulmonary artery, leading to PDA (Hannan et al., 2020; Williams, 2019). Additionally, late preterm birth significantly increases the risk of neurological complications, particularly intraventricular hemorrhages (IVH) in the brain (Gete et al., 2020). Song et al. (2022) elaborate that while late preterm infants commonly experience mild brain hemorrhages, some cases can develop into more severe bleeding, potentially resulting in permanent brain damage.

Late preterm neonates frequently encounter challenges with temperature regulation. Research by Karnati et al. (2020) demonstrates that these infants possess inadequately developed thermoregulatory mechanisms. When exposed, they experience rapid heat loss, potentially leading to hypothermia (Saini et al., 2020). Their limited body fat reserves provide insufficient insulation against temperature fluctuations (Juma et al., 2019). Furthermore, their underdeveloped metabolic systems result in reduced heat generation capabilities (Bawazeer et al., 2021; Desta et al., 2021), making it difficult to maintain stable core body temperatures. These infants also commonly face metabolic complications, particularly hypoglycemia (Mitchell et al., 2020). According to Mackay et al. (2022), preterm infants possess lower glucose reserves compared to full-term babies. Their inadequate metabolic processes may impair proper glucose utilization (Williams, 2019). Additionally, insufficient bilirubin metabolism in late preterm neonates can result in jaundice, characterized by elevated serum unconjugated bilirubin levels. These infants also possess compromised immune systems, increasing their susceptibility to infections. Research by Chanie et al. (2021) indicates that preterm infants may develop severe sepsis more rapidly than their full-term counterparts. Moreover, late preterm birth correlates with various hematological disorders, including reduced blood count, anemia, and thrombocytopenia.

A retrospective analysis conducted by Amsalu et al. (2022) identified primary causes for post-discharge hospitalization among late preterm infants, with jaundice accounting for 58.9%, infections for 10.8%, and respiratory complications for 3.5% of cases. These readmissions typically stem from conditions associated with preterm birth, particularly respiratory infections and jaundice (Kaguongo, 2018). Kardum et al. (2022) found respiratory tract infections to be the predominant cause of hospitalization in late preterm neonates, representing 29.58% of cases. Their research revealed that neonatal jaundice and urinary tract infections contributed to 13.70% and 9.59% of post-discharge hospitalizations, respectively. However, Do et al. (2020) reported significantly higher rates of respiratory-related readmissions, comprising 70% of all cases within six months of discharge.

2.2 Maternal Factors

Through focusing on crucial care protocols in the first 28 days post-birth, ENC addresses key aspects including body heat regulation, prompt and sole breastfeeding initiation, infection prevention, and core newborn support. This comprehensive strategy not only addresses current health requirements but also builds groundwork for sustained wellness outcomes, safeguarding the complete development of infants during this vital shift from intrauterine to external environment. These elements often result in restricted healthcare access and delayed identification of pregnancy complications. Furthermore, maternal substance abuse, including drug and alcohol use, has been associated with late preterm births due to their adverse effects on maternal health and intrauterine development (Alamneh et al., 2021).

Maternal health considerations influencing late preterm births include obstetric and gynecological history, particularly high parity exceeding four births (Chania et al., 2021). Wagura et al. (2018) noted that previous adverse obstetric events, such as preterm deliveries, stillbirths, and abortions, significantly influence subsequent preterm and late preterm births. Various maternal health conditions have been recognized as crucial determinants of late preterm birth outcomes. Purisch and Gyamfi-Bannerman (2017) identified several antenatal conditions increasing late preterm birth risk, including anemia, urinary tract infections (UTIs), malaria, and vaginal infections. AMANHI (2022) further documented that maternal health issues, including chronic conditions, severe infections, UTIs, and cardiovascular disorders, substantially elevate late preterm birth risk. Chanie et al. (2021) added that antenatal conditions include pregnancy-induced hypertension and maternal anemia as additional health complications contributing to preterm births.

Late preterm births are also caused by the pregnancy and fetal-related factors. Studies by Olack et al. (2021) indicate that twin pregnancies significantly raise the risk of preterm births. Multiple pregnancies increase the probability of premature delivery, often leading to issues like reduced fetal growth, as documented in research by Gele et al. (2020) and Leung et al. (2018). Major factors contributing to late preterm deliveries include placental issues and prenatal bleeding. Laelago et al. (2020) highlighted antepartum hemorrhage as a crucial element in late preterm births. Additionally, Mitchell et al. (2021) detailed how late preterm births correlate with various pregnancy and delivery complications, including prolonged labor, premature membrane rupture (PROM), and antepartum bleeding. Studies by Anto et al. (2020) revealed additional risk elements, including limited fetal development, HELLP syndrome (involving hemolysis, high liver enzymes, and low platelets), early pregnancy issues, preeclampsia, and excess maternal weight. Together, these diverse factors enhance late preterm birth risks, demonstrating the complex interplay between maternal and fetal elements affecting preterm delivery outcomes. These health-related factors causing late preterm births create significant challenges for maternal healthcare systems. According to Muchie et al. (2020), inadequate monitoring during antenatal care (ANC) visits significantly impacts outcomes. Research by Pusdekar et al. (2020) revealed that women in low- and middle-income nations, including Kenya, often struggle to complete recommended ANC visits, with approximately 12% delivering without any ANC attendance, increasing late preterm birth risk (Adrian et al., 2020). Moreover, Adrian et al. (2020) emphasized that insufficient ANC visits and restricted access to maternal healthcare services result in delayed identification and management of pregnancy-related complications, potentially leading to late preterm deliveries.

2.3 Neonatal Care Practices

Transitional care practices encompass essential healthcare interventions provided to newborns by caregivers, with notable variations across different regions globally. While some practices prove beneficial, others may increase newborn comorbidity risks (Pascale & Bernadette, 2016). A hospital-based study in Lebanon by Pascale et al. (2016) revealed inadequacies in thermal regulation practices, particularly during breastfeeding initiation, newborn bathing, and infant transportation. Healthcare-related factors contributing to late preterm hospitalizations include hospital stay duration and post-discharge monitoring and management protocols (Kaguongo, 2020; Kurdum et al., 2022).

Neonatal bathing serves as a critical intervention in preventing infections among newborns (Wong et al., 2017). However, research like "the Nepal study" demonstrated concerning statistics, with merely 31% of mothers implementing appropriate bathing practices for their infants. The majority failed to adequately wash or dry their newborns' heads and bodies (Diagouich et al., 2016). Similarly, investigations in South Turkey revealed suboptimal transitional care practices, with mothers placing neonates on unprotected surfaces and cold floors, while also delaying the wrapping process, thereby increasing hypothermia risks (Geckil et al., 2017). A study by Lennol et al. (2018) evaluating Kangaroo care's impact on breastfeeding discovered that only 38% of mothers implemented Kangaroo Mother Care during breastfeeding sessions. Furthermore, research by Enock et al. (2017) identified widespread unhygienic cord care practices across various countries, where mothers applied substances like oil, ash, or cow dung to umbilical wounds, significantly increasing infection risks. These practices stem from cultural beliefs suggesting these substances provide moisturization, promote healing, or prevent cord tearing. Such findings emphasize the urgent need for enhanced education and guidance regarding proper neonatal care practices.

Studies by Do et al. (2018) and Kurdum et al. (2022) have provided valuable insights into factors influencing late preterm infant hospitalizations. Do et al. (2018) identified that late preterm infants discharged within 48 hours post-delivery faced higher hospitalization risks, potentially due to insufficient health status monitoring and management. Kurdum et al. (2022) highlighted several contributing factors, including inadequate post-discharge care planning, insufficient health education, and limited follow-up care and home visits. These findings emphasize the critical role of proper care practices in preventing late preterm infant hospitalizations. Additionally, research conducted by Kaguongo (2018) in Kenya revealed specific factors associated with late preterm neonate hospitalizations, including abbreviated initial hospital stays post-birth and single parenthood. This study offers crucial insights into the unique challenges confronting late preterm infants within the Kenyan healthcare context. While research like that of Schell et al. (2016) has examined hospitalization predictive factors among preterm infants, including discharge complexity and comorbidity, these studies often lack a specific focus on late preterm infants. This research gap underscores the necessity for more targeted investigations focusing on late preterm infants to better understand the distinct factors influencing their hospitalization rates.

3. Methodology

Analytical cross-sectional quantitative research was conducted using a sample of 74 infant-mother dyad pairs selected through purposive sampling. Late preterm infants hospitalized in the KCTRH pediatric emergency unit within 28 days after birth discharge were recruited. A structured questionnaire was used to collect data. A bivariate test using chi-square was conducted to assess the associations between maternal, late preterm, and neonatal care practices and late preterm hospitalization outcomes. Subsequently, multivariate logistic regression was performed on the variables found to be significant in the bivariate analysis to further evaluate their independent effects on hospitalization outcomes. P-values were set at <.05.

4. Results

4.1 Late Preterm Characteristics and Late Preterm Hospitalization Outcome

A chi-square analysis was performed to investigate the connection between late preterm attributes and hospital outcomes (positive versus negative) for the preterm infants in the research. Multiple attributes demonstrated a statistically significant correlation with hospital outcomes. These comprised the infant's age, X^2 (1, N = 140) = 4.53, p = .033; the infant's sex, X^2 (1, N = 140) = 4.78, p = .029; the delivery method, X^2 (1, N = 140) = 9.86, p = .002; the duration of initial hospitalization, X^2 (1, N = 140) = 8.43, p = .004; the feeding approach, X^2 (1, N = 140) = 7.52, p = .006; and the occurrence of warning signs prior to hospitalization, X^2 (1, N = 140) = 5.00, p = .025 (table 5). Nevertheless, several variables lacked statistically meaningful correlations. These encompassed gestational age, X^2 (1, N = 140) = 3.45, p = .063; delivery method, X^2 (1, N = 140) = 1.58, p = .208; infant weight, X^2 (1, N = 140) = 1.10, p = .294; delivery location, X^2 (1, N = 140) = 1.31, p = .253; time until rehospitalization, X^2 (1, N = 140) = 1.26, p = .261; breastfeeding initiation timing, X^2 (1, N = 140) = 0.02, p = .881; and post-delivery monitoring, X^2 (1, N = 140) = 0.35, p = .552. This analysis reveals that while specific late preterm attributes significantly affected hospitalization outcomes, various other elements showed no substantial effect.

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Table 1: Late Preterm Characteristics and Hospitalization Outcome

Variable	Positive Outcome (n = 57) n (%)	Negative Outcome (n = 17) n (%)	X^2	p-value
Age of the Baby				
Less than 2 weeks	39 (68.4)	16 (94.1)		
More than 2 weeks	18 (31.6)	1 (5.9)	4.53	.033
Gender of the Baby				
Male	34 (59.6)	15 (88.2)		
Female	23 (40.4)	2 (11.8)	4.78	.029
Gestation at Birth				
Early Preterm	47 (82.5)	17 (100.0)		
Late Preterm	10 (17.5)	0 (0.0)	3.45	.063
Mode of Delivery				
Spontaneous Vaginal Delivery (SVD)	48 (84.2)	12 (70.6)		
Cesarean Section (CS)	9 (15.8)	5 (29.4)	1.58	.208
Type of Birth				
Single Birth	56 (98.2)	13 (76.5)		
Multiple Birth	1 (1.8)	4 (23.5)	9.86	.002
Birth Weight				
Less than 2.50 kg	9 (15.8)	1 (5.9)		
Greater than 2.50 kg	48 (84.2)	16 (94.1)	1.10	.294
Place of Birth				
Health Facility	50 (87.7)	13 (76.5)		
Home / Before Arrival	7 (12.3)	4 (23.5)	1.31	.253
Length of Initial Stay in Hospital				
Less than 48 hours	49 (86.0)	9 (52.9)		
More than 48 hours	8 (14.0)	8 (47.1)	8.43	.004
Duration Before Readmission				
Less than 14 days	53 (93.0)	17 (100.0)		
More than 14 days	4 (7.0)	0 (0.0)	1.26	.261
Mode of Feeding				
Breastfeeding	46 (80.7)	8 (47.1)		
Mixed / Other Feeding	11 (19.3)	9 (52.9)	7.52	.006
Time of Initiating Breastfeeding				
Less than 24 hours	38 (66.7)	11 (64.7)		
More than 24 hours	19 (33.3)	6 (35.3)	0.02	.881
Follow Up After Delivery				
Less than 2 weeks	38 (66.7)	10 (58.8)		
2-4 weeks	19 (33.3)	7 (41.2)	0.35	.552
Had Danger Signs Before Hospitalization				
Yes	38 (66.7)	16 (94.1)		
No	19 (33.3)	1 (5.9)	5.00	.025

4.2 Maternal Characteristics and Late Preterm Hospitalization Outcome

A chi-square test was conducted to examine the relationship between maternal characteristics and hospitalization outcomes. The findings indicated statistically significant factors included maternal age, X^2 (1, N = 140) = 6.38, p = .012; level of education, X^2 (1, N = 140) = 5.29, p = .021; area of residence, X^2 (1, N = 140) = 3.96, p = .046; parity of the mother, X^2 (1, N = 140) = 4.78, p = .029; attendance at antenatal care (ANC), X^2 (1, N = 140) = 9.86, p = .002; having

conditions during pregnancy, X^2 (1, N = 140) = 12.07, p = .001; experiencing obstetric complications, X^2 (1, N = 140) = 5.00, p = .025; and complications in previous pregnancies, X^2 (1, N = 140) = 6.03, p = .014 (table 6). Conversely, other maternal characteristics did not show statistically significant associations with hospitalization outcomes. These included marital status, X^2 (1, N = 140) = 2.78, p = .096; religion, X^2 (1, N = 140) = 0.33, p = .566; employment status, X^2 (1, N = 140) = 0.44, p = .510; number of previous pregnancies, X^2 (1, N = 140) = 1.30, p = .253; number of ANC attended, X^2 (1, N = 140) = 0.21, p = .650) .

Table 2: Maternal Characteristics and Late Preterm Hospitalization Outcome

Variable	Positive Outcome n (n = 57) (%)	Negative Outcome n = 17) n (%)	X^2	p-value
Maternal Age				
Below 30	31 (54.4)	15 (88.2)		
30 and Above	26 (45.6)	2 (11.8)	6.38	.012
Marital Status of the mother				
Married	45 (78.9)	10 (58.8)		
Unmarried	12 (21.1)	7 (41.2)	2.78	.096
Religion				
Christian	51 (89.5)	16 (94.1)		
Muslim	6 (10.5)	1 (5.9)	0.33	.566
Level of Education				
Less than Secondary	33 (57.9)	15 (88.2)		
Post Basic/Tertiary	24 (42.1)	2 (11.8)	5.29	.021
Employment				
Unemployed	25 (43.9)	9 (52.9)		
Employed	32 (56.1)	8 (47.1)	0.44	.510
Area of Residence				
Urban	29 (50.9)	4 (23.5)		
Rural	28 (49.1)	13 (76.5)	3.96	.046
Parity of the mother				
Less than 2	34 (59.6)	15 (88.2)		
More than 2	23 (40.4)	2 (11.8)	4.78	.029
Number of Previous Pregnancies				
Less than 2	35 (61.4)	13 (76.5)		
More than 2	22 (38.6)	4 (23.5)	1.30	.253
ANC Attendance				
Yes	56 (98.2)	13 (76.5)		
No	1 (1.8)	4 (23.5)	9.86	.002
Number of ANC Attended				
Less than 4	13 (22.8)	3 (17.6)		
More than 4	44 (77.2)	14 (82.4)	0.21	.650
Having Conditions During Pregnancy				
Yes	53 (93.0)	10 (58.8)		
No	4 (7.0)	7 (41.2)	12.07	.001
Experienced Obstetric Complications				
Yes	38 (66.7)	16 (94.1)		
No	19 (33.3)	1 (5.9)	5.00	.025
Complications in Previous Pregnancies				
Yes	18 (31.6)	11 (64.7)		
No	39 (68.4)	6 (35.3)	6.03	.014

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4.3 Neonatal Care Practices and Late Preterm Hospitalization Outcome

A chi-square test was conducted to examine the relationship between newborn care protocols and hospital outcomes. Multiple newborn care protocols showed a statistically significant association with hospital outcomes, including successful infant feeding after birth, X^2 (1, N = 140) = 7.52, p = .006; engagement in discharge planning, X^2 (1, N = 140) = 5.91, p = .015; nurse training on home infant care, X^2 (1, N = 140) = 11.05, p = .001; nursing guidance on identifying warning signs, X^2 (1, N = 140) = 5.91, p = .015; and infection control protocols, X^2 (1, N = 140) = 5.91, p = .015 (table 7). However, some newborn care protocols lacked statistically significant relationships with hospital outcomes. These included umbilical cord management, X^2 (1, N = 140) = 2.78, p = .096; and infant nutrition methods, X^2 (1, N = 140) = 0.06, p = .801.

Table 3: Neonatal Care Practices and the Hospitalization Outcome

Variable	Positive Outcome n (n = 57) (%)	Negative Outcome (n = 17) n (%)	X^2	p-value
The baby was breastfeeding/feeding well after birth				
Yes	46 (80.7)	8 (47.1)		
No	11 (19.3)	9 (52.9)	7.52	.006
I was involved in making the discharge care plan				
Yes	51 (89.5)	11 (64.7)		
No	6 (10.5)	6 (35.3)	5.91	.015
I was educated by the nurses on how to care for the baby at home				
Yes	54 (94.7)	11 (64.7)		
No	3 (5.3)	6 (35.3)	11.05	.001
I was educated by the nurses on identifying danger signs				
Yes	51 (89.5)	11 (64.7)		
No	6 (10.5)	6 (35.3)	5.91	.015
Preventing the baby from getting infections				
Yes	51 (89.5)	11 (64.7)		
No	6 (10.5)	6 (35.3)	5.91	.015
Cord care				
Yes	45 (78.9)	10 (58.8)		
No	12 (21.1)	7 (41.2)	2.78	.096
The mother felt capable of Breastfeeding/feeding the baby	42 (73.7)	12 (70.6)		
Yes	15 (26.3)	5 (29.4)	0.06	.801
No				

4.4 Multivariate Analysis

The factors that showed statistical significance during the bivariate testing were subjected to additional multivariate analysis. For this, a binary logistic regression model was used. The purpose of this investigation was to look into the relationships between late preterm characteristics and clinical outcomes, both positive and negative. The model's suitable fit to the dataset was confirmed by the Hosmer-Lemeshow test (χ^2 (7) = 2.628, p =.917). The findings showed that neonates who were in the hospital for more than 48 hours had significantly worse outcomes than those who stayed for less time (AOR = 0.08, 95% CI [0.01–0.48], p =.006).

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Likewise, infants who received breast milk showed notably improved outcomes compared to those with combined or alternative feeding approaches (AOR = 0.13, 95% CI [0.02–0.75], p = .022) (table 8). Moreover, the observation of warning signs before hospital admission was markedly linked to poorer outcomes (AOR = 44.50, 95% CI [1.20–1654.61], p = .040). Additional variables, including infant age (AOR = 2.76, 95% CI [0.25–29.86], p = .404), sex (AOR = 3.06, 95% CI [0.43–21.88], p = .266), and delivery method (AOR = 0.11, 95% CI [0.01–1.59], p = .106), demonstrated no statistically meaningful correlations with hospital outcomes.

Table 4: Logistical Regression on the Later-Preterm Characteristics

Variable	Positive Outcome n (n = 57) (%)	Negative Outcome (n = 17) n (%)	Unadjusted OR 95% CI	p-value	Adjusted *AOR* 95% CI	p-value
Age of the Baby						
Less than 2 weeks	39 (68.4)	16 (94.1)	0.14 (0.02 – 1.10)	.033	2.76 (0.25 – 29.86)	.404
More than 2 weeks	18 (31.6)	1 (5.9)				
Gender of the Baby						
Male	34 (59.6)	15 (88.2)	0.20 (0.04 – 0.95)	.029	3.06 (0.43 – 21.88)	.266
Female	23 (40.4)	2 (11.8)				
Type of Birth						
Single Birth	56 (98.2)	13 (76.5)	17.23 (1.78 – 167.26)	.002	0.11 (0.01 – 1.59)	.106
Multiple Birth	1 (1.8)	4 (23.5)				
Length of Initial Stay in Hospital						
Less than 48 hours	49 (86.0)	9 (52.9)	5.44 (1.62 – 18.27)	.004	0.08 (0.01 – 0.48)	.006
More than 48 hours	8 (14.0)	8 (47.1)				
Mode of Feeding						
Breastfeeding	46 (80.7)	8 (47.1)	4.71 (1.48 – 14.97)	.006	0.13 (0.02 – 0.75)	.022
Mixed / Other Feeding	11 (19.3)	9 (52.9)				
Had Danger Signs Before Hospitalization						
Yes	38 (66.7)	16 (94.1)	0.13 (0.02 – 1.02)	.025	44.50 (1.20 – 1654.61)	.040
No	19 (33.3)	1 (5.9)				

Note: Adjusted odds ratios (OR) and corresponding 95% confidence intervals (CI) were calculated after adjusting for covariates, including: Age of the Baby, Gender of the Baby, Type of Birth, Length of Stay in the Hospital, Mode of Feeding Initiated, and Danger Signs Before Hospitalisation.

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Journal of Medicine, Nursing and Public Health
Vol. 5||Issue 3||pp 10-27||August||2025
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A binary logistic regression analysis was performed to investigate the relationship between maternal factors and late preterm hospitalization results (positive versus negative). The model showed appropriate fit, as confirmed by the Hosmer-Lemeshow test ($\chi^2(8) = 0.574$, $p = 1.000$). Principal results revealed that maternal education exhibited a significant positive correlation with hospitalization results, with mothers having post-basic or tertiary education showing a higher likelihood of positive results (AOR = 66.72, 95% CI [2.36–1889.34], p = .014). ANC visits demonstrated significant correlation with positive results (AOR = 0.02, 95% CI [0.00–0.68], p = .031) (Table 9), indicating that antenatal care attendance led to improved results. Previous pregnancy complications correlated with poorer results (AOR = 21.27, 95% CI [1.72–263.05], p = .017). However, additional variables, including maternal age (AOR = 2.54, 95% CI [0.27–2.14], p = .996), residential location (AOR = 2.71, 95% CI [0.27–26.71], p = .394), maternal parity (AOR = 24.86, 95% CI [0.86–720.55], p = .061), pregnancy conditions (AOR = 0.71, 95% CI [0.05–1.54], p = .997), and obstetric complications (AOR = 11.47, 95% CI [0.37–355.26], p = .164) showed no statistically significant correlations with hospitalization results.

Table 5: Logistical Regression on the Maternal Characteristics

Variable	Positive Outcome n (n = 57) (%)	Negative Outcome (n = 17) n (%)	Unadjusted OR 95% CI	p-value	Adjusted *AOR* 95% CI	p-value
Maternal Age						
Below 30	31 (54.4)	15 (88.2)	0.16 (0.03 –		2.54 (0.27 –	
30 and Above	26 (45.6)	2 (11.8)	0.76)	.012	2.14)	.996
Level of Education			0.18 (0.04 –			
Less than Secondary	33 (57.9)	15 (88.2)	0.88)		66.72 (2.36	
Post Basic/Tertiary	24 (42.1)	2 (11.8)		.021	– 1889.34)	.014
Area of Residence						
Urban	29 (50.9)	4 (23.5)	3.37 (0.98 –		2.71 (0.27 –	
Rural	28 (49.1)	13 (76.5)	11.58)	.046	26.71)	.394
Parity of the mother						
Less than 2	34 (59.6)	15 (88.2)	0.20 (0.04 –		24.86 (0.86	
More than 2	23 (40.4)	2 (11.8)	0.95)	.029	– 720.55)	.061
ANC Attendance						
Yes	56 (98.2)	13 (76.5)	17.23 (1.78 –		0.02 (0.00 –	
No	1 (1.8)	4 (23.5)	167.26)	.002	0.68)	.031
Having Conditions During Pregnancy						
Yes	53 (93.0)	10 (58.8)	9.28 (2.82 –		0.71 (0.05 –	
No	4 (7.0)	7 (41.2)	37.69)	.001	1.54)	.997
Experienced Obstetric Complications						
Yes	38 (66.7)	16 (94.1)	0.13 (0.02 –		11.47 (0.37	
No	19 (33.3)	1 (5.9)	1.02)	.025	– 355.26)	.164
Complications in Previous Pregnancies						
Yes	18 (31.6)	11 (64.7)	0.25 (0.08 –		21.27 (1.72	
No	39 (68.4)	6 (35.3)	0.79)	.014	– 263.05)	.017

Note: Adjusted odds ratios (OR) and corresponding 95% confidence intervals (CI) were calculated after adjusting for covariates, including: Maternal Age, Level of Education,

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Journal of Medicine, Nursing and Public Health
Vol. 5||Issue 3||pp 10-27||August||2025
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Area of Residence, Parity of the Mother, ANC Attendance, Having Conditions During Pregnancy, Experienced Obstetric/Pregnancy Complications, Had Complications in Previous Pregnancies and Births.

Statistical evaluation using multivariate techniques examined the relationship between practices in neonatal care and hospitalization outcomes for late preterm infants. The statistical model demonstrated appropriate fit, confirmed by the Hosmer-Lemeshow test ($\chi^2(4) = 1.508$, $p = .825$). Key results indicated that infants whose mothers noted successful breastfeeding or feeding patterns post-birth demonstrated increased likelihood of favorable hospitalization outcomes (AOR = 1.436, 95% CI [0.106–7.798], p = .001) (Table 10). Nursing staff education regarding warning sign recognition also showed significant correlation with positive results (AOR = 2.32, 95% CI [0.070–5.489], p = .007). In contrast, participation in discharge planning (AOR = 0.553, 95% CI [0.100–3.058], p = .497), receiving home care instructions (AOR = 0.312, 95% CI [0.045–2.177], p = .240), and infection control measures (AOR = 0.332, 95% CI [0.067–1.636], p = .175) showed no significant association with hospitalization outcomes.

Table 61: Logistical Regression on the Neonatal Care Practices

Variable	Positive Outcome n (n = 57) (%)	Negative Outcome (n = 17) n (%)	Unadjusted *AOR* 95% CI	p-value	Adjusted *AOR* 95% CI	p-value
The baby was breastfeeding/feeding well after birth						
Yes	46 (80.7)	8 (47.1)	4.71 (1.48 –		1.44 (0.11 –	
No	11 (19.3)	9 (52.9)	14.97)	.006	7.80)	.001
I was involved in making the discharge care plan						
Yes	51 (89.5)	11 (64.7)	4.64 (1.26 –		0.55 (0.10 –	
No	6 (10.5)	6 (35.3)	17.11)	.015	3.06)	.497
I was educated by the nurses on how to care for the baby at home						
Yes	54 (94.7)	11 (64.7)	9.82 (2.13 –		0.31 (0.05 –	
No	3 (5.3)	6 (35.3)	46.35)	.001	2.18)	.240
I was educated by the nurses on identifying danger signs						
Yes	51 (89.5)	11 (64.7)	4.64 (1.26 –		2.32 (0.07 –	
No	6 (10.5)	6 (35.3)	17.11)	.015	5.49)	.007
Preventing the baby from getting infections						
Yes	51 (89.5)	11 (64.7)	4.34 (2.26 –		0.33 (0.07 –	
No	6 (10.5)	6 (35.3)	16.12)	.015	1.64)	.175

Note: Adjusted odds ratios (OD) and corresponding 95% confidence intervals (CI) were calculated after adjusting for covariates including: Baby was Breastfeeding/Feeding Well After Birth, Involved in Making the Discharge Care Plan, Educated on How to Care for the Baby at Home, Educated on How to Identify Danger Signs, Preventing the Baby from Getting Infections.

4.5 Discussion

The findings demonstrate clear connections between late-preterm infant traits and their health outcomes. Specifically, babies requiring hospitalization beyond 48 hours showed increased probability of adverse effects, aligning with research suggesting extended hospital stays among preterm infants typically indicate serious health complications and elevated morbidity risks (Vohr et al., 2017). Moreover, maternal characteristics, including age, educational background, and pregnancy-related health conditions, identify key intervention points. Less experienced, younger mothers often struggle to recognize danger signals and obtain timely medical help, particularly in remote regions with limited healthcare facilities. This underscores the importance of targeted health education programs designed to strengthen maternal capabilities and improve health outcomes for both mothers and infants.

There is also a significant association between maternal factors and neonatal outcomes; antenatal care (ANC) attendance and maternal education status are particularly important. The ANC visits ensured maternal health monitoring and timely intervention, which helped improve neonatal outcomes, with mothers who attended ANC visits being significantly more likely to have positive neonatal outcomes (Dowswell et al., 2015). Furthermore, neonates born to mothers with higher educational status exhibited favorable outcomes, likely due to the accessibility of information and other healthcare resources that educated women generally have (Moyer et al., 2016). These findings suggest that enhancing maternal education and promoting ANC attendance are essential strategies for reducing negative outcomes in late-preterm infants.

Neonatal care practices have proven essential for achieving positive outcomes in late-preterm infants. Those who were breastfeeding or feeding effectively shortly after birth showed a significantly higher likelihood of favorable outcomes, reinforcing previous research that emphasizes the critical role of early and successful breastfeeding in boosting immune function and overall health (Pineda et al., 2017). Additionally, the study found that maternal participation in discharge planning and education about baby care had a positive effect on neonatal outcomes. Mothers who were educated on recognizing danger signs or preventing infections reported better results. This is consistent with the knowledge that maternal factors affect neonatal survival and health, especially for preterm infants (Kumar et al., 2016). Together, this body of data suggests that hospitals must prioritize their maternal bedside manner and involvement to better guide the journey from discharge to home for such high-risk infants.

5. Conclusion

The study identified significant associations between neonatal characteristics, including birth weight and gestational age, with hospitalization, highlighting the fragility of this population and the importance of close follow-up. Older and better-educated mothers had lower rates of hospitalization, but maternal characteristics, including age and education, played a major role in determining the outcomes, suggesting that poverty and maternal health and education are of significant importance to hospitalization rates. In addition, successful practices in neonatal care have proven crucial in enhancing outcomes, especially those associated with breastfeeding, preventing infections, and educating caregivers on how to identify warning

signs. The intricate relationships among these elements indicate that a comprehensive strategy is essential to tackle the different factors influencing late preterm hospitalizations, necessitating improved maternal and neonatal care practices, specific interventions, and better support after discharge to maximize health results for late preterm babies.

6. Recommendations

These findings emphasize the importance of effective maternal and neonatal care in the outcomes for hospitalization late in the preterm period. It is important to develop specific neonatal care strategies that are based on maternal education and early intervention measures in order to improve late preterm infant health and limit hospital stays.

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