Research Article

Neonatal Hospital Readmission Among Term Neonates In A Private Tertiary Hospital From 2012 To 2020

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Introduction: Neonatal readmissions is a distressing event and puts an undesirable burden on the healthcare system. Neonatal readmissions secondary to modifiable factors may be identified and altered to improve the quality of healthcare given to the patients.

Objectives: This study examined the trend and described the clinical profiles of term neonates readmitted within 28 days after birth.

Methodology: This is a retrospective cross-sectional descriptive study conducted in a private tertiary hospital from January 2012 to December 2020. The study participants included eighty-seven term neonates readmitted within 28 days of life. Data obtained was profiled into demographic characteristics, chief complaints, perinatal factors, readmission final diagnosis and readmission outcomes. Trends were analysed and presented.

Results: The neonatal readmission rates in our setting averages at 0.6% from 2013 to 2020. The most common presenting complaint was jaundice followed by fever. More than half of the readmitted neonates were born to mothers aged 30-39 years old (67%), primiparous mothers (56%) and via caesarean section (55.2%). Among the study participants, 39% had significant weight loss noted during birth admission while 32.2% had significant weight loss of more than 10% during readmission. The leading diagnoses on neonatal readmission were Hyperbilirubinemia (62%), Neonatal Sepsis (15%), Gastrointestinal Illnesses (10%), Respiratory Infections (5.7%) and Urinary Tract Infection (3%).

Conclusion: The neonatal readmission rates in our setting is at par with that of the developed countries. The top five leading diagnoses on neonatal readmission are mostly preventable. Majority of the readmitted neonates were discharged completely recovered.

Keywords: Term Neonate; Healthy Term Newborn; Readmission

INRODUCTION

Neonatal hospital readmissions, the hospital admission of a newborn less than 29 days old after getting discharged from birth admission, is a distressing event to parents and families of newborns and puts an undesirable cost on the hospital and health care system[1]. Hence, discharge criteria and guidelines regarding birth admission discharge of neonates have been recommended to decrease the rates of these neonatal readmissions. The health care team must establish that the newborn has met set criteria for discharge of the newborn which include identifying potential problems of the newborn as well as ensuring the readiness of the mother and their support system to take care of the newborn child. Failure to do this may result in newborn readmission. This study described the different factors surrounding neonatal hospital readmissions in a private tertiary hospital over 9 years. It points out possible modifiable factors that may be altered to improve the health care provided to the families.

There is paucity in the local studies identifying the prevalence and determining the associated factors for readmission among term neonates. Most studies were done in other countries and focused on the association of the length of hospital stay during the newborn delivery admission with the risk for readmission. An unpublished study done by Vosotros LA in 2011 discussed the risk of readmission for healthy term neonates discharged from the nursery at less than 28 hours of life but only covered readmissions over a two year period between January 2009 and December 2010. Despite the relatively low incidence of neonatal hospital readmissions per live births, it puts undesirable costs to the newborn's family, the hospital and the healthcare systems. Although not all hospital readmissions may be avoidable and some are foreseeable such as in cases where there are congenital anomalies, preventable readmissions in healthy term newborns is a quality and patient safety issue [2]. For these reasons, preventing hospital readmissions of healthy newborns should be a priority[1,2]. This study described the clinical profile of neonatal readmissions in our hospital including patterns and trends in neonatal readmissions. It alluded factors for these readmissions which, can be used to pinpoint the additional support needed by the mothers and their newborns as they transition from delivery admission to home. Furthermore, the results and recommendations of this study can be used to develop best practices, interventions and cost-effective measures to decrease the frequency of neonatal readmissions among healthy term newborns.

The general objective of this study is to examine the trend and describe the clinical profiles of term neonates readmitted within 28 days after birth at in a single private tertiary hospital from 2012 to 2020. The specific objectives of the study are as follows: (1) to describe the trend of the annual rates of neonatal readmission from 2012 to 2020; (2) to identify the common chief complaints that led the patients' family to seek health care; (3) to identify the perinatal factors that are present among the neonates readmitted, (4) to identify the final diagnoses during readmission of the readmitted neonates; and (5) to identify the outcome (during readmission) of these readmitted neonates.

METHODOLOGY

This a retrospective, single-centre, cross-sectional descriptive study of healthy term neonates born and readmitted in a private tertiary hospital in the National Capital Region of the Philippines between January 1, 2012 and December 31, 2020.

The study was started after approval of the study by the Institutional Review Board of the Makati Medical Centre. Using EpiInfo Companion™ sample size calculation, an aimed level of confidence of 95% and acceptable margin of error of 5%, and proportion of neonatal readmission at 1.6%[3], the computed minimum sample size for the study is 24. A list of all neonatal admissions during the study period was obtained from the hospital's Medical Records Department and reviewed to determine eligible participants in the study. Out of a list of 22,971 infant admissions given by the Medical Records Department, access to 434 charts of 216 neonates who met the inclusion criteria listed below were requested. These were quickly reviewed to determine eligibility in the study, i.e. if they will not be disqualified based on the exclusion criteria listed below.

Inclusion Criteria

(1) delivered in the study hospital between January 1, 2012 to December 31, 2020; and

(2) those that have at least one admission within 28 days of life (or that is, during the neonatal period) after being discharge from birth admission as healthy

Exclusion Criteria

(1) preterm neonates (maturity index less than 37 weeks);

(2) post term neonates (maturity index above 41 weeks);

(3) neonates with congenital anomalies, with suspected/proven syndromes or with history of perinatal asphyxias(neonates with APGAR score of five at 10 minutes with continued need for resuscitation, was diagnosed or suspected to have cerebral palsy, had metabolic acidosis upon delivery with a pH <7.0 or BE -12, was diagnosed or suspected to have clinical neurologic sequelae in the immediate neonatal period, had evidence of multi organ system dysfunction in the immediate neonatal period)[4]; and

(4) neonates transferred from another institution to the study venue/hospital for specialized care or further interventions.

A total of 87 neonates admitted from 2012 to 2020 were enrolled in the study; their charts were then extensively reviewed using the Archive One database and the electronic medical records (EMR) system of the hospital. The collected medical data were encoded in an encrypted Microsoft Excel Spread sheet File. Descriptive statistics was used to analyse the collected medical data. Data were summarized in tables and graphs and trends were described. Readmission rates, proportion of perinatal risk factors and readmission final diagnoses were described.

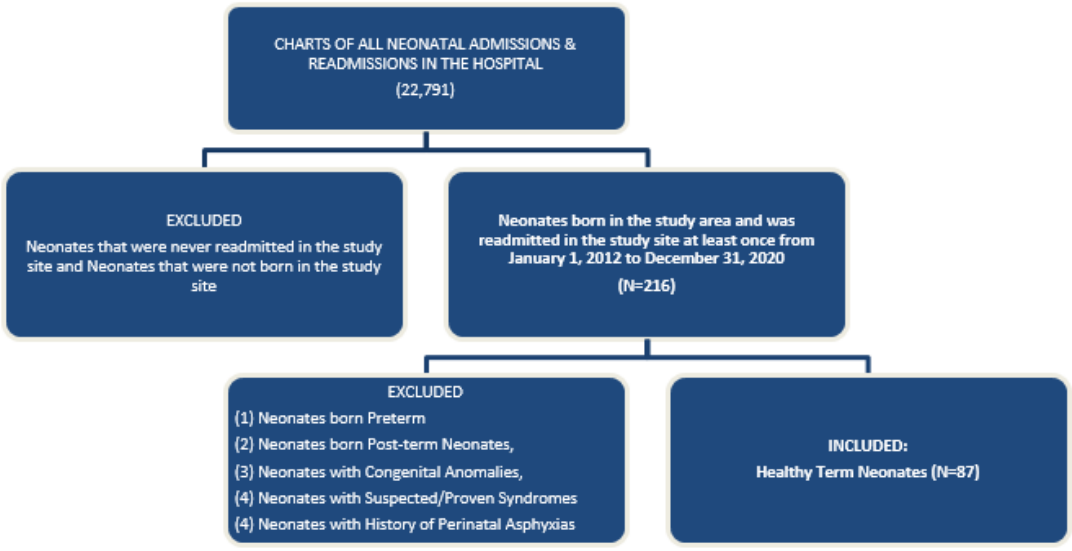

Figure 1 Data Collection Process

RESULTS

A total of 87 neonates were included in the study who were born and readmitted in our institution from 2012 to 2020. A higher percentage of the neonatal readmissions are female (54.02%) compared to male (45.98%); and the plurality are of Filipino race (96.51%). The majority of the neonates readmitted were private patients (78%) that comprise of those who availed of the birthing package as well as those who did not avail of the birthing package.

Table 1 Demographic Characteristics of Readmitted Neonates

	Number (N=87)	percentage
Sex		
• Male	40	45.98%
• Female	47	54.02%
Race / Nationality		
• Filipino	83	96.51%
• Japanese	2	2.33%
• Chinese	1	1.16%
• Canadian	1	1.16%
Admission (Financial) Status		
• Private	68	78%
• HSP	19	22%

Figure 1 depicts the number of neonatal readmissions annually and the neonatal readmission rate (among health term newborns) per 1000 live births from 2013 to 2020. There was a noticeable peak in the readmission rate in 2018 followed by a gradual decrease in the following years.

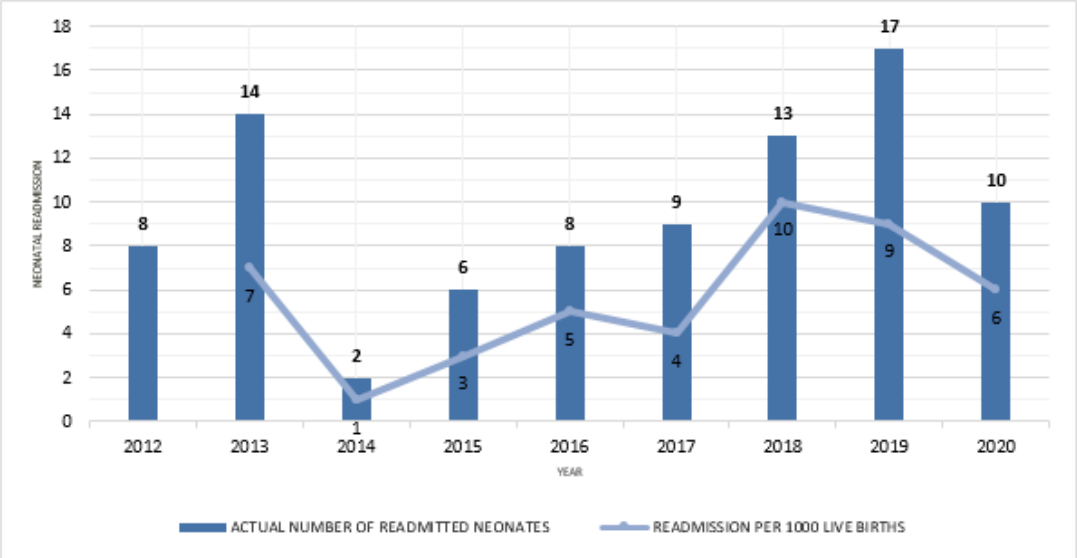

Figure 2 Annual Neonatal Readmission and Neonatal Readmission Rate Per 1000 Live Births from 2013 to 2020

Table 2 lists the chief complaints on readmission of neonates. The majority of the neonates readmitted had chief complaints of jaundice (49%) and fever (28%). Feeding concerns such as poor suck were only at 3% in our setting, based on data collection, 18 out of the 87 participants or 21% among neonatal readmissions had feeding concerns at home (poor suck, poor latch, perception that the baby is not satisfied after breastfeeding and decreased feeding) prior to admission regardless of their chief complaint. Significant weight loss was often discovered upon readmission; and it was found that 32.2% (28 out of 87) among readmitted patients had significant weight loss (more than 10% weight loss from birth weight) upon readmission.

Table 2 Chief Complaints on Neonatal Readmission

Chief Complaint	Number (N=87)	percent
jaundice	43	49%
fever	24	28%
poor suck	3	3%
vomiting	3	3%
blood in urine	3	3%
cough	3	3%
cyanosis	2	2%
diarrhea	2	2%
bloody stools	1	1%
dry mouth	1	1%
tachypnea	1	1%
convulsions	1	1%

The largest portion of neonates that were readmitted were born to mothers aged 30-34 years (41%), followed by those born to mothers 35-39 years of age (26%). More than half of the neonates that were readmitted were born to primarous mothers (56%). The majority of the neonates that participated in the study were delivered via caesarean section (55.2%) and less than half of the study population were delivered vaginally (44.8%). APGAR scores on the first minute of life were good (7-10) in the majority of the participants (97.7%); and on the fifth minute of life, all participants (100%) have good APGAR scores. Majority of the readmitted neonates were term at 37 to 39 weeks gestation by maturity index. The neonates included in this study were mostly appropriate for gestational age (87.36%); the neonates who are borderline small and small for gestational age comprises 2.3% each while the neonates who are borderline large and large for gestational age comprises 2.3% and 5.75%, respectively. ABO incompatibility set-up was only present in 33% of cases, while the rest had no blood group incompatibility set-up.

Table 3 Birth and Maternal History of Readmitted Neonates

	Number (N=87)	percentage
Maternal Age		
<20	2	2%
20-24	8	9%
25-29	11	13%
30-34	35	41%
35-39	22	26%
≥40	9	11%
Maternal Parity		
1	49	56%
2-4	37	43%
≥ 5	1	1%
Type of Delivery		
Spontaneous Vaginal	33	37.9%
Assisted Vaginal	6	6.9%
Scheduled Cesarean Section	25	28.7%
STAT Cesarean Section	23	26.4%
APGAR Score (1st minute)		
0-3 (severely depressed)	0-3	0%
4-6 (moderately depressed)	4-6	2.3%
7-10 (good condition)	7-10	97.7%
APGAR Score (5th minute)		
0-3 (severely depressed)	0	0%
4-6 (moderately depressed)	0	0%
7-10 (good condition)	87	100%
Maturity Index		
37 weeks	29	33.3%
38 weeks	23	26.4%
39 weeks	30	34.5%
40 weeks	3	3.4%
41 weeks	2	2.3%
Size for Gestational Age		
Small for Gestational Age	2	2.3%
Borderline Small for Gestational Age	2	2.3%
Appropriate for Gestational Age	76	87.4%
Borderline Large for Gestational Age	2	2.3%
Large for Gestational Age	5	5.7%
Blood Group Incompatibility		
ABO set-up	29	33%
Confirmed ABO incompatibility	1	1%
Rh Incompatibility	0	0%
No Blood Group Incompatibility	57	66%

During the first hospitalization (birth) of the patients enrolled in the study, the minimum age on discharge is 1-day-old (a little more than 24 hours), the maximum age on discharge is 6-days-old, and the mode and median age on discharge is 3-days-old. Among patients delivered via cesarean section, the average length of stay is 3.2 days, while the median and mode length of stay is 3 days. On the other hand, among patients delivered via vaginal delivery – whether spontaneous or with instrumentation – the average length of stay is 2.5 days, while the median and mode length of stay is 2 days. Excluding the patient with missing data on weight, a little more than 50% of the patients (51 out 87%) had no significant weight loss, while onlly 39% of the study participants

(34 out of 87) had weight loss of either more than 10% within the first week of life, more than 5% in a 24 hour period or both.

Table 4 Age on Discharge and Significant Weight Loss on Discharge During Birth (First Hospitalization)

AGE in days	more than 10% within 7 days of life	more than 5% in a 24-hour period	more than 5% in a 24-hour period and more than 10% within 7 days of life	No significant weight loss	Missing Data	TOTAL
1	-	-	-	1	-	**1**
2	-	8	1	24	-	**33**
3	8	2	7	17	-	**34**
4	1	2	4	8	-	**15**
5	-	-	-	1	1	**2**
6	-	1	-	1	-	**2**
TOTAL	**9**	**13**	**12**	**51**	**1**	**87**

Among neonates readmitted who had significant weight loss on birth admission, 65% (22 out of 34) had a diagnosis of hyperbilirubinemia on readmission; while the rest had a diagnosis of nneonatal sepsis (5 out of 34), dehydration (2 out of 34), urinary tract infection (1 out of 34) and cow's milk protein Allergy (1 out of 34).

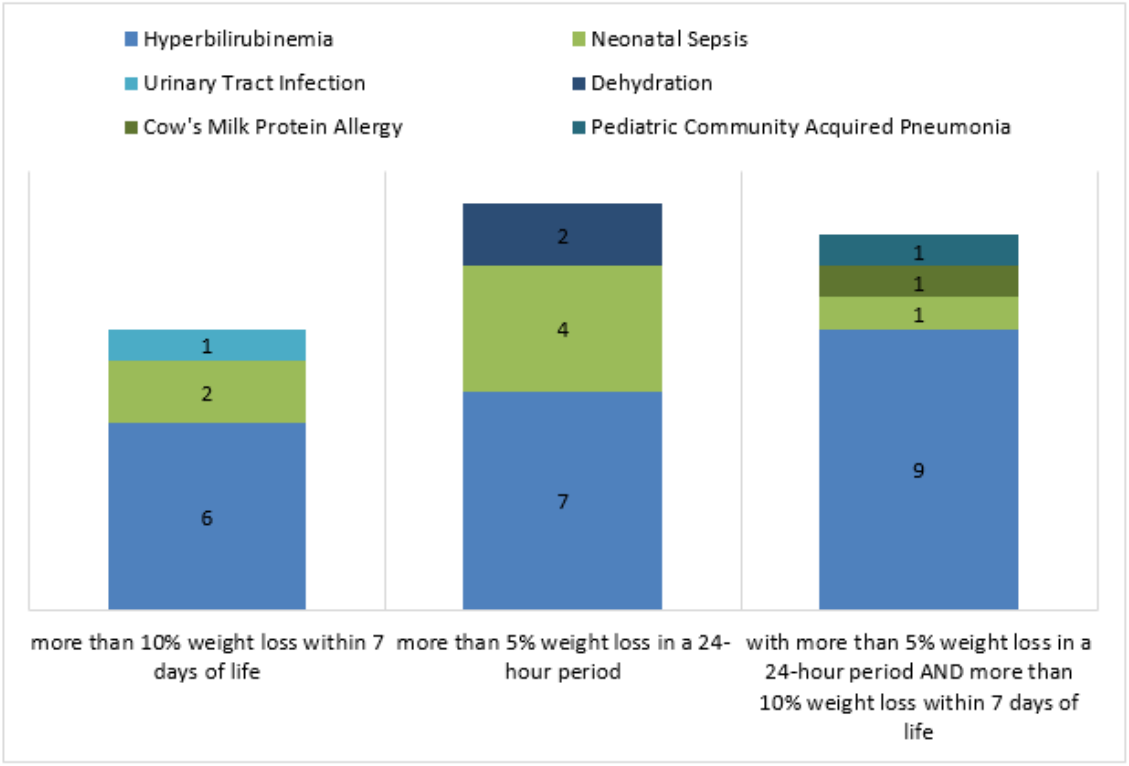

Figure 3 Distribution of Neonates with Significant Weight Loss during Birth Admission According to Final Diagnosis on Readmission

Table 5 lists the readmission final diagnosis among the study participants. The the leading diagnoses on neonatal readmission were Hyperbilirubinemia (62%), Neonatal Sepsis (15%), Gastrointestinal Illnesses (10%), Respiratory Infections (5.7%) and Urinary Tract Infection (3%). The top aetiologies of hyperbilirubinemia are breastfeeding jaundice, exaggerated physiologic jaundice, breast milk jaundice, multifactorial causes (ABO incompatibility with breastfeeding jaundice and Breastfeeding jaundice with dehydration) and dehydration.

Among patients with hyperbilirubinemia, the most common test requested is a fractionated bilirubin determination (in 37 out of the 54 patients). Of note, other patients had done the fractionated bilirubin test prior to admission (in 13 out of 54 patients), while for 4 patients a serum total bilirubin was requested within the first 24 hours of admission. Among the patients who were admitted for hyperbilirubinemia and with an ABO incompatibility set-up, only 3 were diagnosed with ABO incompatibility. Tests that were requested in addition to serum bilirubin also include a complete blood count with or without C-reactive protein in 93.75% (51 out of 54) of the patients, a reticulocyte count in 62.5% (34 out of 54), a peripheral blood smear in 12.5% (7 out of 54 patients), and a Coomb's test (direct and indirect) in 12.5% (7 out of 54 patients). Among these patients with hyperbilirubinemia, 44 out of 54 (81.5%) were placed under double phototherapy, 4 out of 54 (7.4%) were on triple phototherapy, 3 out 54 (5.5%) were on single phototherapy and one underwent double exchange transfusion (1.8%). Most of these diagnosed were hyperbilirubinemia were started supplemental feeding (67%) with either expressed breast milk, formula milk or glucose water.

Among patients who were diagnosed with Neonatal Sepsis – both early onset and late onset – a Complete Blood Count, C-reactive Protein and Blood Culture (from 1-site or 2-sites) were consistently requested for all patients upon admission. Among patients with blood culture and sensitivity, only one had bacterial growth of Oxacillin Resistant Staphylococcus aureus, which was diagnosed to have late onset neonatal sepsis. Urinalysis was requested for 8 out of 13 patients (61.5%), while urine culture and sensitivity was requested for 5 out of the 13 patients with neonatal sepsis. Lumbar puncture and cerebrospinal fluid analysis were only done in three patients – 2 of which were diagnosed with early onset sepsis and 1 was diagnosed with late onset sepsis. Blood sugar determination was done in 4 out of 13 patients with neonatal sepsis; of which, two (2) of the patients were noted to have concomitant hypoglycaemia. Other tests requested within the first 24 hours of admission for the patients with neonatal sepsis include procalcitonin, electrolytes (sodium, potassium) and random blood sugar.

Among patients who were diagnosed with gastrointestinal diseases in the neonatal period, septic work up – i.e. complete blood count, C-reactive protein and blood culture – were among the requested tests in the majority of the patients (7 out of 9 patients).

The average length of hospital stay among readmitted neonates, regardless of diagnosis is 3.5 days while the median and modal length of stay is 3 days. Table 6 shows the length of hospital stay for each diagnosis. Majority of the neonates with hyperbilirubinemia, the top diagnosis for readmission, were readmitted for 2 days. The average length of hospital stay for patients with neonatal sepsis for both early onset sepsis and late onset sepsis

is 5.3 days. The longest length of hospital stay was 13 days, for a patient with early onset neonatal sepsis. Hypoglycaemia, for which the causes were work-up, had the longest average length of hospital stay followed by paediatric community acquired pneumonia.

Table 5 Readmission Final Diagnosis

Diagnosis	Number (N=87)	Percentage Readmissions
Hyperbilirubinemia	**54**	**62%**
▪ *Breastfeeding Jaundice*	*18*	*33%*
▪ *Exaggerated Physiologic Jaundice*	*8*	*15%*
▪ *Multifactorial*	*8*	*15%*
▪ *Breastmilk Jaundice*	*7*	*13%*
▪ *Dehydration*	*5*	*9%*
▪ *ABO Incompatibility*	*3*	*6%*
▪ *Hemolysis*	*2*	*4%*
▪ *Minor Blood Group Incompatibility*	*1*	*2%*
▪ *Unknown*	*1*	*2%*
Neonatal Sepsis	**13**	**15%**
▪ *Early Onset*	*10*	*77%*
▪ *Late Onset*	*3*	*23%*
Gastrointestinal Illnesses	**9**	**5.7%**
▪ *Acute Gastroenteritis*	*4*	*5%*
▪ *Dehydration*	*2*	*2%*
▪ *Aspiration*	*1*	*1%*
▪ *Cow's Milk Protein Allergy*	*1*	*1%*
▪ *Hirschsprung Disease*	*1*	*1%*
Respiratory Infections	**5**	**10%**
▪ *Neonatal Pneumonia*	2	2%
▪ *Acute Bronchiolitis*	1	1%
▪ *Pediatric Community Acquired Pneumonia*	1	1%
▪ *Pertussis*	1	1%
Urinary Tract Infection	**3**	**3%**
Hypoglycaemia	**2**	**2%**
Environmental Hyperthermia	**1**	**1%**

Table 6 Readmission Diagnosis and Average Length of Hospital Readmission

READMISSION FINAL DIAGNOSIS	LENGTH OF ADMISSION (days)											Total Number of Patients	Average Length of Stay (days)
	1	2	3	4	5	6	7	8	9	10	13		
Hyperbilirubinemia	6	21	17	5	2		1	2				54	2.8
Early Onset Neonatal Sepsis		1	3		2		1	1	1		1	10	5.3
Late Onset Neonatal Sepsis			1			1	1					3	5.3
Acute Gastroenteritis	2		1		1							4	2.5
Dehydration		1	1									2	2.5
Aspiration	1											1	1
Cow's Milk Protein Allergy						1						1	6
Hirschsprung's Disease				1								1	4
Neonatal Pneumonia		1					1					2	4.5
Acute Bronchiolitis				1								1	4
Pediatric Community Acquired Pneumonia							1					1	7
Pertussis			1									1	3
Urinary Tract Infection				1	1	1						3	5
Hypoglycemia						1				1		2	8
Environmental Hyperthermia			1									1	3

Among the readmitted neonates, only 5 out of the 87 participants (6%) were discharged with a sequelae condition (namely: hereditary stomatocytosis, G6PD deficiency, benign febrile convulsion, and cow milk protein allergy, hirschsprung disease); (one) 1 was transferred to another institution while the remaining (93%) were discharged completely recovered and well.

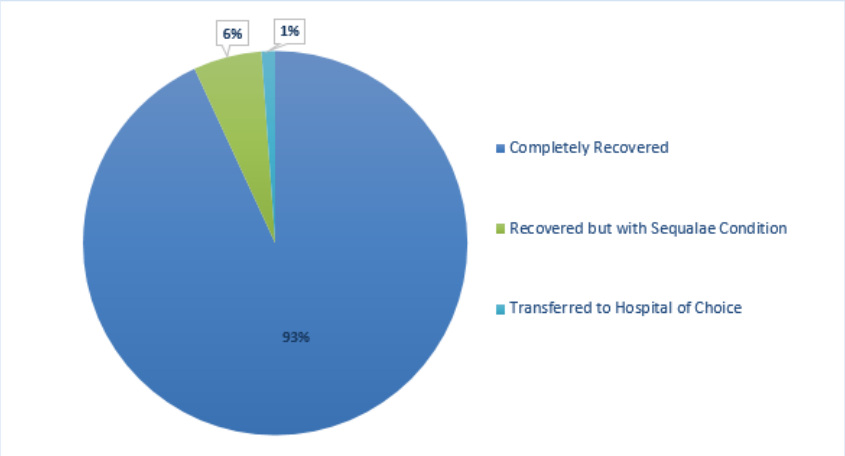

Figure 4 Distribution of outcome during neonatal readmission

Limitations of the Study

This study was conducted in only one study site, a tertiary private hospital; thus, the results and recommendations may not be generalizable to other institutions. The study only included neonates who were readmitted in the study hospital thereby, other neonates who may have been born in the hospital but readmitted in other institutions or hospitals are not included in the study; thus, the readmission rates reported in this study may be low. Since this is a retrospective cross-sectional descriptive study, medical data in this study were only obtained from the patient's charts, some information are incomplete or limited. The years included in this study was from 2012 to 2020. Lastly, since the focus of the study was on term neonates, the results and recommendations of the study may have limited applicability to the excluded population of neonates who are preterm or post-term, with known congenital anomalies, syndromes, or birth asphyxia.

DISCUSSION

This study examines the trends and describes the clinical profile of term neonates readmitted within 28 days of life in our setting. Due to time constraints, neonatal readmissions only from 2012 to 2020 were described in this study.

The neonatal readmission rates among healthy term newborns within the first 28 days of life in our setting ranges from 0.1% to 1% or 1 per 1000 live birth up to 10 per 1000 live births and averages at 0.6% or 6 per 1000 live births from 2013 to 2020. This neonatal admission rate is well within the readmission rates among term infants in the United States, which is less than 1.3%, and lower than the neonatal readmission rate globally, which is less than 8%, in the past decade as described by Hensman in 2018 and Bawazeer M et al in 2021.[5,6] The obtained neonatal readmission rates are also lower than the neonatal readmission rate in 2009 (1.6%) and 2010 (1.4%) reported in the study of Vosotros in 2011.[3] The neonatal readmission rates from 2014 to 2017 in our study were lower than the obtained average neonatal readmission rate of 0.6%. There was a noted peak in the neonatal readmission rate in 2018 at 1% followed by a gradual decrease in the subsequent years. Several factors both clinical and non-clinical like accessibility of professional help could have caused these changes in the trends of neonatal readmission however, this was not further investigated in this study.

Among the readmitted neonates, the most common presenting complaint and/or chief complaint was jaundice (49%) while the second most common presenting complaint was fever (28%). Feeding concerns as a chief complaint was low (6%) but was present in 21% of readmitted neonates in our settings. In other published studies, jaundice and feeding concerns were the most commonly cited presenting complaints on admission[1,7,8,9]. In earlier studies, fever is also one of the most commonly reported reasons for readmission of neonates[9]. In this study, fever was found to be a common chief complaint by caregivers in our setting leading to admission and different diagnoses including hyperbilirubinemia, urinary tract infection, neonatal pneumonia and neonatal sepsis.

Among the perinatal factors investigated, this study found that more than half of the readmitted neonates were born to mothers aged 30-39 years old (67%) and primiparous mothers (56%). This was consistent with the findings of the study of Paul et al (2006) which found that first time mothers and mothers 30 years and older were most likely to have a newborn readmitted [10] and similar to the findings of the study of Edwards Q and Trudgeon R (2017) which found that mothers 25 years old and above who are primiparous are more likely to have newborns warranting readmission compared to younger mothers or multiparous mothers[11], respectively. On the other hand, Perme et al discussed in their study in 2016, that parity is not a significant determinant in the likelihood of neonatal readmission nevertheless, they suggested that having a first child purports that mothers might be more prone to seeking help earlier.[12] This study also found that more than half of the readmitted neonates were born via cesarean section (55.2%). This is contrary to the findings of the study by Perme et al (2016), where they found that delivery via cesarean section was protective from neonatal readmission, however the study did not further explain the reason behind this finding. [12]

The majority of the readmitted neonates included in the study (77%) were discharged during their birth admission on the 2nd to the 3rd day of life; it was also found that the percentage of neonates that stayed longer until 4th to the 6th day of life during birth admission was higher (21%) than those that stayed for around 24 hours or less (1%). This is consistent with the findings in the studies of Metcalfe A et al (2016), Vosotros A (2011), and Harron K et al (2017) which discusses that longer length of newborn stay were not associated with decreased neonatal readmissions.[3,9,13] In the study of Harron K et al (2017), they concluded that longer newborn length of stay could benefit late preterm newborns, but not term newborns. Metcalfe et al (2016), discussed that neonatal readmission rates are lowest among those who were admitted for 2-4 days after caesarean delivery and 1-2 days after vaginal delivery and that the increase in birth readmission, in their setting could have been due to the lowering of the threshold for readmission.[9,13]

During birth admission, only a total of 39% of study participants had weight loss of either more than 10% within the first 7 days of life, more than 5% in a 24 hour period or both; in addition, significant weight loss of more than 10% from birth was only present in 32.2% of participants during neonatal readmission. On further investigation, 65% of the study participants with significant weight loss on birth admission had a diagnosis of hyperbilirubinemia on readmission, while the rest had a diagnosis of dehydration, neonatal sepsis on urinary tract infection on readmission. Weight loss more than 7% from birth weight signifies possible feeding problems in the newborn[14]. Blumovich et al in 2020 concluded in their study that substantial weight loss of 5% from birth weight increases the risk of neonatal readmission due to hyperbilirubinemia despite being low risk for jaundice during birth hospitalization (e.g. no blood incompatibility set-up, no haemolytic disease, etc)[15]; thus, weight loss and its surrounding factors should be taken into consideration when discharging neonates during birth admission.

In this study, the leading diagnoses on neonatal readmission were Hyperbilirubinemia (62%), Neonatal Sepsis (15%), Gastrointestinal Illnesses (10%), Respiratory Infections (5.7%) and Urinary Tract Infection (3%). This study findings are similar to that from the study of Young P et al in 2013 that reported the following leading diagnoses for neonatal readmission in their center in Utah, USA: feeding problems (40.9%), jaundice (35.3%), respiratory distress (33%), rule out sepsis (22.5%) and infection (21.2%)[8] and to that from the study of Metcalfe A et all that reported the following leading readmission diagnoses: jaundice (49.9%), respiratory conditions (8.1%), feeding problems (5.2%), sepsis (4.0%) and dehydration (3.3%)[9]. Young P et al, relays that these leading of causes of admissions may be preventable and can be possibly decreased with proper interventions targeted to decrease the need for readmission.[8] In the same way, the majority of the diagnosis (conditions) found in this study such as breastfeeding jaundice, acute gastroenteritis, dehydration, aspiration, community acquired pneumonia, bronchiolitis, pertussis and others can be argued to be preventable as well.

The average length of hospital stay during readmission is 3.5 days while the median and modal length of stay is 3 days, regardless of cause of admission. This is slightly longer than that reported in the study of Bawazeer M et al (2021), where the median length of stay for neonatal readmission was 2 days.[6] In our study, majority of the neonates with hyperbilirubinemia - the top diagnosis for readmission – were readmitted for 2 days. This finding is consistent with the study of Edwards Q and Trudgeon R (2017) where they found that over 92% of healthy tern neonates readmitted for hyperbilirubinemia had a length of stay of 1 to 3 days during readmission. In this study, the longest length of hospital stay was 13 days, for a patient with ealy onset neonatal sepsis.[11] Albeit this might be an isolated case, no other studies were found were describing hospital length of stays as long as 13 days among healthy term neonates readmitted for any cause.

Among the readmitted neonates, only 5 out of the 87 participants (6%) were discharged with a sequelae; one was transferred to another institution while the remaining (93%) were discharged completely recovered and well. In our literature review, no other studies have described the outcomes of neonatal readmissions among healthy term newborns.

CONCLUSIONS AND RECOMMENDATIONS

The neonatal readmission rates in our setting, at an average of 0.6% from 2013 to 2020, is at par with that of the developed countries. Jaundice and fever were the most common chief complaints on neonatal readmission. The majority of the readmitted neonates were born to mothers in their 30s, to primiparous mother and via caesarean section; and a large portion of neonates with significant weight loss prior to hospital discharge had hyperbilirubinemia during readmission. The top five leading diagnoses on neonatal readmission namely hyperbilirubinemia, neonatal sepsis, gastrointestinal illnesses, respiratory infections and urinary tract infection are mostly preventable. Majority of the readmitted neonates were discharged completely recovered.

Based on the findings in this study, health care providers to newborns and their families are recommended to focus closely on the health education of parents and caregivers of neonates born to primiparous mothers and

mothers in their 30s, born via caesarean section, those with significant weight loss upon discharge (more than 5% in a 24-hour period during birth admission or more than 7% during the first 7 days of life) as these are factors that are highly present among readmitted neonates. Close monitoring for jaundice should be done and parental complaints of fever should be properly investigated and addressed early on, even before these complaints warrant hospital readmission. It was found that parents and caregivers of neonates may not voluntarily disclose the feeding difficulties that they encounter when presenting to the clinics, hence these difficulties must be intently probed into, in order to properly address them.

The data from this single-centre retrospective cross-sectional descriptive research is limited based on what can be obtained from the patient's charts. To validate these data, a prospective study and analytical study is recommended to determine the strength of associations and possible causality of the factors described is this study and the likelihood of neonatal readmission. Furthermore, studies to evaluate outpatient interventions and outpatient follow-ups that address the causes of readmission presented in this study would be helpful to guide birth admission management and discharge planning in order to further reduce the number of neonates being readmitted.

ETHICAL CONSIDERATION

The study was conducted in accordance with the ethical principles set by the World Medical Association Declaration of Helsinki. Prior to the commencement of this study, a research committee approval by the Makati Medical Centre Institutional Review Board (IRB) was secured. A waiver of informed consent was requested from the Institutional Review Board for this study and submitted to the Department of Medical Records of the hospital prior to data collection. All study information were obtained from hospital records. Information collected were de-identified (names, medical record numbers, hospital episode numbers were not recorded) and data was coded prior to analysis; all information were kept confidential and all files containing patient records are password protected and stored only in the principal investigator's computer hard drive. The researcher has no conflicts of interest in the conduct of this study.

REFERENCES

1. Damda, F., Zerb, T., Field, A., Rogerson, K. and Chukwudi, N., 2022. G533(P) Neonatal Readmission Audit.
2. Reed, R., Morgan, A., Zeitlin, J., Jarreau, P., Torchin, H., Pierrat, V., Ancel, P. and Khoshnood, B., 2019. Assessing the risk of early unplanned rehospitalisation in preterm babies: EPIPAGE 2 study. BMC Pediatrics, 19(1).
3. Vosotros, L., 2011. Risk for readmission of healthy term newborns discharged from the nursery at less than 48 hours of life in a tertiary hospital: a case-control study. Unpublished.
4. Gillam-Krakauer, M. and Jr, C., 2022. Birth Asphyxia. [online] Ncbi.nlm.nih.gov. Available at: <https://www.ncbi.nlm.nih.gov/books/NBK430782/> [Accessed 21 July 2021].
5. Hensman, A., 2018. Neonatal readmission in term infants: maternal, infant, provider and institutional factors. Ph.D. University of Rhode Island.
6. Bawazeer, M., Alsalamah, R., Almazrooa, D., Alanazi, S., Alsaif, N., Alsubayyil, R., Althubaiti, A. and Mahmoud, A., 2021. Neonatal hospital readmissions: Rate and associated causes. Journal of Clinical Neonatology, 10(4), pp.233-238.
7. Ahmed, R., Shori, N., Bone, A. and Jawad, M., 2022. P645 An audit to improve neonatal readmission number at wexford general hospital.
8. Young, P., Korgenski, K. and Buchi, K., 2013. Early Readmission of Newborns in a Large Health Care System. Pediatrics, 131(5), pp.e1538-e1544.

9. Metcalfe, A., Mathai, M., Liu, S., Leon, J. and Joseph, K., 2016. Proportion of neonatal readmission attributed to length of stay for childbirth: a population-based cohort study. BMJ Open, 6(9), p.e012007.
10. Paul, I., Lehman, E., Hollenbeak, C. and Maisels, M., 2006. Preventable Newborn Readmissions Since Passage of the Newborns' and Mothers' Health Protection Act. Pediatrics, 118(6), pp.2349-2358.
11. Edwards, Q. and Trudgeon, R., 2017. Readmission Rates, Risk Zones and Demographic Factors of Healthy term Breastfed Newborns with Hyperbilirubinemia: A Retrospective Chart Review. Journal of Nursing and Health Sciences, [online] 3(3), pp.46-53. Available at: <https://static1.squarespace.com/static/5745a62cf850829c62cf17be/t/600c78a2a2159228baeaaea1/1611430051195/HYPERBILIRUBINEMIA+READMISSIONS.pdf> [Accessed 21 November 2021].
12. Perme, T., Škafar Cerkvenik, A. and Grosek, Š., 2016. Newborn Readmissions to Slovenian Children's Hospitals in One Summer Month and One Autumn Month: A Retrospective Study. Pediatrics & Neonatology, 57(1), pp.47-52.
13. Harron, K., Gilbert, R., Cromwell, D., Oddie, S. and van der Meulen, J., 2017. Newborn Length of Stay and Risk of Readmission. Paediatric and Perinatal Epidemiology, 31(3), pp.221-232.
14. Salas, A., Salazar, J., Burgoa, C., De-Villegas, C., Quevedo, V. and Soliz, A., 2009. Significant weight loss in breastfed term infants readmitted for hyperbilirubinemia. BMC Pediatrics, 9(1).
15. Blumovich, A., Mangel, L., Yochpaz, S., Mandel, D. and Marom, R., 2020. Risk factors for readmission for phototherapy due to jaundice in healthy newborns: a retrospective, observational study. BMC Pediatrics, 20(1).