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Prevalence and Associated Factors of Hyperbilirubinemia Among Neonates Admitted to Neonatal Intensive Care Unit of Saint Peter Specialized Hospital, Addis Ababa, Ethiopia

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Abstract: *Introduction*: Neonatal hyperbilirubinemia is a widespread and significant clinical problem among neonates worldwide. Globally, every year about 1.1 million babies develop it and the vast majority resides in developing countries like Ethiopia. It is a major cause of hospital neonatal intensive care unit admission and readmissions during the neonatal period. As far as our knowledge is concerned there is no such study conducted in St. peter specialized hospital so far. Hence the objective of this study is to determine Prevalence and associated factors of hyperbilirubinemia among neonates admitted to neonatal intensive care unit of Saint Peter Specialized Hospital, Addis Ababa, Ethiopia from January, 1/2022 to January 1, 2023. *Methods*: A Facility based Retrospective cross sectional study was conducted among one hundred forty two (142) neonates admitted at St. peter specialized hospital by using systematic random sampling technique. Data on socio-demographic characteristics and, potential associated factors for hyperbilirubinemia were collected by a structured data extraction checklist. For this study, a total serum bilirubin level ≥5 mg/dL was taken as the cutoff point to diagnose hyperbilirubinemia. Data entry was done by EPI info version 7, and analyzed using SPSS version 23.0. Binary logistic and multiple variable logistic regression models were used to identify associated factors. Association between were considered statistically significant only if A two-sided P-value <0.05 at 95% confidence level. *Result*: A total of 142 neonates were included in the study making response rate 100%. The overall prevalence of neonatal hyperbilirubinemia was 35 (24.6 %) with (95% CI: 17.6-31.7). Among several possible factors: Being male sex [AOR]:7.7, 95%CI (1.88, 32.1)], Birth trauma [AOR]: 17, 95%CI (3.8, 76.6), neonatal sepsis [AOR]: 10.9, 95%CI (2.9, 41.79)] and ABO incompatibility [AOR]: 22, 95%CI (4.7, 102.05)] were independent determinants of neonatal hyperbilirubinemia. *Conclusion and recommendation*: The prevalence of Neonatal Hyperbilirubinemia was quite high. Among identified associated factors for hyperbilirubinemia in this study: neonatal sex, Birth trauma, Sepsis and ABO incompatibility were the leading cause. Hence Health care provider working at NICU should undergo routine screening and investigations for TSB are imperative for early detection and timely intervention.

Keywords: Neonatal, Hyperbilirubinemia, St. Peter Specialized Hospital

1. Introduction

Hyperbilirubinemia is a condition defined by an increased total serum bilirubin level exceeding 5 mg/ dL and clinically characterized by the yellowish discoloration of the skin, sclera and mucous membranes resulting from accumulation of bilirubin in the skin and mucous membranes [1, 2]. It is caused by an increased production of bilirubin from senescent fetal red blood cells and/or limited bilirubin elimination in the newborn infant. Newborn's immature liver often cannot remove bilirubin quickly enough, causing hyperbilirubinemia [3].

There are many factors implicated in the development of pathological hyperbilirubinemia. it is frequently associated with both maternal factors, such as blood type, ABO or Rh incompatibility, breastfeeding, and maternal illness (e.g.,

gestational diabetes), and fetal factors, including cephalohematoma or cutaneous bruising, excessive weight loss after birth, infections, infrequent feeding, gender, polycythemia, G-6PD deficiency, and prematurity [4, 5]. Unlike the developed countries where feto-maternal blood group incompatibilities are the main causes of severe neonatal jaundice, it is mostly prematurity, G6PD deficiency, infective causes as well as effects of negative traditional and social practices such as consumption of herbal medications in pregnancy, application of dusting powder on baby, use of camphor balls to store baby's clothes that mainly constitute the aetiology in developing countries [6, 7].

According to a report by Global Burden of Disease (GBD) in 2016, Lack of facilities for rapid, routine bilirubin determination or suboptimal irradiance (<8–10 μW/cm2/nm) from poorly maintained phototherapy devices are levels of delay for effective intervention that result in higher rates of avoidable and potentially harmful exchange transfusion as well as bilirubin induced mortality in developing countries. It also mentions home deliveries do play a role in late detection and treatment of neonatal jaundice [8, 9]. Despite the government attention to the reduction of neonatal mortality and expansion of the neonatal health care system in Ethiopia, there are still significant number of neonatal jaundice admission at SPSH neonatal intensive care unit (NICU). There is also a limited studies carried out on the topic at SPSH demonstrating the status of neonatal hyperbilirubinemia and associated factors.

The prevalence of Neonatal hyperbilirubinemia (NHB) is not precisely known, however, estimates suggest that approximately 60% of term and 80% of preterm newborns develops hyperbilirubinemia in the first week of life [10, 11]. Globally, each year about 1.1 million neonates develop hyperbilirubinemia in the world [4]. The global burden of neonatal hyperbilirubinemia impacts mostly the world's poorest countries (low-income countries), especially in South Asia and sub-Saharan Africa [9]. Latin America, sub- Saharan Africa and South Asia account for 4%, 32% and 39% of cases of extreme hyperbilirubinemia (total bilirubin exceeding 428 μmol/L) respectively [9]. Among those recently born infants 481,000 were term neonates of whom 114,000 were die annually and more than 63,000 survive with moderate or severe disability. The vast majority, 75% of affected neonates reside in sub-Saharan Africa, the region where Ethiopia located [3]. Data from the Global Burden of Disease study showed that neonatal jaundice accounted for 1309·3 deaths per 100 000 live births and ranked 7th globally among all causes of neonatal deaths in the early-neonatal period (0–6 days) [8].

Globally, researches show that newborns who require phototherapy were estimated at 14.1 million babies annually, while approximately 100,000 reach extreme hyperbilirubinemia of Total Serum Bilirubin (TSB) ≥ 30 mg/dL; a threshold associated with brain damage [6]. Excessive bilirubin induces acute and chronic bilirubin encephalopathy. Acute bilirubin encephalopathy involves clinical presentation of lethargy, hypotonia, poor suck, high-pitched cry, fever, and irritability. Chronic bilirubin encephalopathy (kernicterus) is severe irreversible and devastating clinical tetrad consisting of movement disorders, auditory dysfunction, oculomotor impairments, and dental enamel hypoplasia [12].

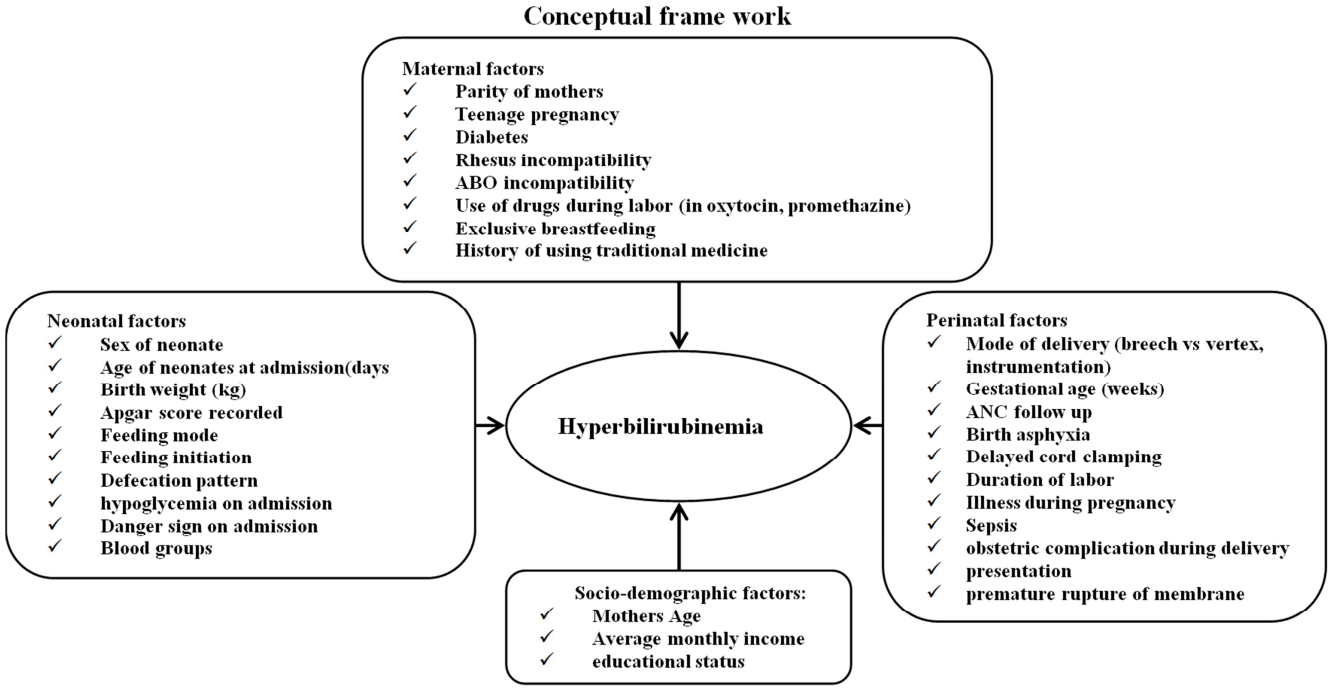

Figure 1. *Conceptual frame work developed after reviewing similar literatures [3, 4, 6, 14, 15].*

Neonatal hyperbilirubinemia is among the leading causes of neonatal morbidity and mortality in Ethiopia [9]. The prevalence of neonatal hyperbilirubinemia in Ethiopia vary in different geographical settings for instance a study from Mekelle City Public Hospitals 37.3% [13], University of Gondar Comprehensive Specialized Hospital 31.6% [4] and

Jimma Medical Center 42.3% [12]. This findings indicated hyperbilirubinemia are still common problem among neonates. Hence identification of predisposing factors and initiations of appropriate management is paramount in Preventions of hyperbilirubinemia complications. However, there are very little data available on the prevalence of neonatal hyperbilirubinemia and associated factors in Ethiopia particularly in Saint peter specialized hospital, as to the knowledge of the principal investigators no study conducted yet on the topic regardless of the burdens of the problems Therefore; the present study designed to determine the prevalence of hyperbilirubinemia and associated factors among neonates admitted to NICU in Saint peter specialized hospital.

2. Methods and Materials

2.1. Study Area / Setting

The research were conducted in St. Peter's specialized hospital; one of the referral hospital in Addis Ababa, Ethiopia. The hospital was founded in 1953. It is managed by Ethiopia's Federal Ministry of Health (FMoH). In April 2009, it became Ethiopia's first national hospital to offer MDR-TB treatment. It is one of the pediatric neurosurgery specialized referral hospital in Ethiopia. It also served as a training center and a center of excellence. Patients come from all across the country to get treated at this hospital. There are about 1080 Neonates admitted to the NICU of this hospital per/year of which 480 cases were suspected for jaundice annually.

2.2. Study Design and Period

Institutional based retrospective cross-sectional study was conducted among neonates admitted to neonatal intensive care unit (NICU) from January, 2022 to January, 2023 at St. Peter's specialized hospital in Addis Ababa, Ethiopia.

2.3. Population

2.3.1. Source Population

All neonates admitted to NICU of St. Peter's specialized hospital.

2.3.2. Study Population

Those randomly selected neonates admitted to NICU of St. Peter's specialized hospital during the study period.

2.3.3. Inclusion and Exclusion Criteria

Inclusion criteria

All the inborn and out born neonates with the age of less than or equal to 28 days admitted in NICU of SPSH with complete Documentation of History, physical examination and laboratory investigation of serum bilirubin level.

Exclusion criteria

1) All the inborn and out born neonates with the age of less than or equal to 28 days admitted in NICU of SPSH between With incomplete documentation of history, physical examination and laboratory investigation of serum bilirubin level.
2) Neonates with lab requests feedback with hemolysis sample.

2.4. Sample Size Determination and Sampling Procedure

2.4.1. Sample Size Determination

Sample size was determined using single population proportion formula by taking overall proportion of hyperbilirubinemia from St Paul's Hospital Millennium Medical College in Addis Ababa 13.3% [9]. We follow basic assumption of sample size calculation in that by taking p=0.0.316 and Using the following assumptions where = margin of error (d^2) of 5% at 95% confidence level. Adding 10% non-response rate sample size becomes 142.

$$n = \frac{(Z_{\alpha/2})^2 p(1-p)}{d^2}$$

$$n = \frac{(1.96)^2 0.133(1-0.133)}{0.05^2} = 177$$

Since sampling was from finite population less than 10,000. A finite population correction formula was used to minimize the sample size.

$$n = \frac{n_0}{\left(1+\frac{n_0}{N}\right)}$$

$$n = \frac{177}{\left(1+\frac{177}{480}\right)} = 129$$

By adding 10% of non-response (Incomplete charts) 129+13=142

2.4.2. Sampling Procedure

Systematic random sampling was used to select study participants. The data obtained from St. peter specialized hospital in the last one year shows more than 480 neonates suspected for jaundice were admitted at NICU of this hospital per year. Totally there were 480 eligible neonates: Therefore by dividing total eligible Neonates to our sample size 142 (480/142); we obtained sampling interval k of 3. From1-3 neonates, the first case were selected using lottery method, and then the neonates were selected systematically by adding 3 until our sample size gets saturated.

2.5. Variables

2.5.1. Dependent Variables

Hyperbilirubinemia

2.5.2. Independent Variables

Socio-demographic factors: Mothers Age, Average monthly income, educational status

Perinatal factors; Mode of delivery (breech vs vertex, instrumentation), Gestational age (weeks), ANC follow up, Birth asphyxia, Delayed cord clamping, Duration of labor, Illness during pregnancy, Sepsis, obstetric complication during delivery, presentation.

Neonatal factors: Sex of neonate, Age of neonates at admission days, Birth weight (kg), Apgar score recorded, Feeding mode, Feeding initiation, Defecation pattern,

hypoglycemia on admission, Danger sign on admission, Blood groups.

Maternal factors; Parity of mothers, Teenage pregnancy, Diabetes, Rhesus incompatibility, ABO incompatibility, Use of drugs during labor (in oxytocin, promethazine), Exclusive breastfeeding, history of using traditional medicine.

2.6. Operational Definitions

Neonatal hyperbilirubinemia: is defined as serum bilirubin level of neonates greater than 85μmol/l (5mg/dl) [3].

Bilirubin encephalopathy: Complicated neonatal hyperbilirubinemia (kernicterus) which causes brain toxicity, death, long term sequel like sensorial hearing loss and cerebral palsy [3, 14].

Breast Milk Jaundice: Late onset jaundice beginning after 4-7th day of life which is caused by increased reabsorption of unconjugated bilirubin, perhaps due to unidentified factor in human milk. History of jaundice in sibling may indicate occurrence of breast milk jaundice [5].

Breast feeding jaundice: Occurs in first few days (2-3 days) of life and related to decreased breast milk intake and decreased frequency of feeding as well as history of formula feeding may indicate occurrence of breastfeeding jaundice [10].

2.7. Data Collection Procedures and Quality Assurance

The records of the neonates were reviewed, and the medical files of patients with the diagnosis of neonatal jaundice are selected. A structured data extraction checklist was prepared in English language by investigator. The checklists were includes mainly four parts to be completed as socio-demographic characteristics, maternal information, neonatal information, and associated medical information of the newborn which helps to trace related factors. Data extractions were made by two intern doctors after thorough discussion made to have common understanding. The check list were daily evaluated, cross checked for the completeness and consistency and necessary adjustments were made. The supervisors were invited to comment on the work of each step. Pediatrics department case team leader were invited. Regarding the patients chart with incomplete data, the chart was replaced by another patient chart that was randomly selected. Finally, hyperbilirubinemia and associated factors are screened based on history, physical examination, and laboratory investigation of serum bilirubin level documented in patient chart that support the diagnosis of neonatal jaundice. The questionnaires were prepared in English and half days training were provided to the data collectors and supervisors on the data collection tool and the data collection procedures. Then the questionnaire was pretested on 5% of the sample size out of the study area to ensure its validity. Data collectors were supervised closely by the supervisors and the principal investigators. Completeness of each questionnaire was checked by the principal investigator and the supervisors on daylily basis. Double data entry was done by two data clerks and consistency of the entered data was cross checked by comparing the two separately entered data on EPI Data.

2.8. Data Processing and Analysis

Before data entry, questionnaires was checked for errors, cleaned, coded and entered into epi-info version 7 then exported to SPSS version 23 software package for analysis. Descriptive statistics such as measures of frequency, central tendency and dispersion of participants' characteristics were computed as appropriate. Bivariate binary logistic regression analyses were done to see the association between each independent variable and the outcome variable. Variables will be entered into SPSS using a backward stepwise multivariable logistic regression to control for all possible confounders. P-value less than 0.25 were used as a cutoff point to select candidate variables of the final model to improve the chances of retaining meaningful confounders. The adjusted odds ratios with its 95% confidence interval were estimated to identify the determinants of hyperbilirubinemia. The level of statistical significance were declared at a p-value <0.05.

2.9. Ethical Consideration

The official permission letter was obtained from AGHMC; then it was submitted to SPSH student dean office. The office in turn was writing a permission letter SPSH academic research office which was give me final permission and direction to medical record office. The confidentiality about patient profile and other ethical aspects were strictly maintained throughout the study and then after. Additional Consent was also being granted from the appropriate personnel in the record office.

2.10. Dissemination of Result

The result of this study was presented to AGHMC. The manuscript was sent to local journals and international journals for publication. Hard copy provisions to stake holders and Presentation on scientific meeting were also other option of dissemination.

3. Results

3.1. Socio-Demographic Characteristics of the Study Subjects

Out of 1080 neonates who were admitted to the NICU of SPSH of which 480 neonates were requested for serum bilirubin level. Accordingly among 480 eligible neonates 142 of them were included in this study making response rate100%. Among total half (50%) of neonates were 24-72hrs old at the time of admission. Regarding neonatal sex, about half (50.7%) of them were male. When we look maternal educational status, about 108 (76.1%) of them were secondary school and above. Majority (83.1%) of mother's age were within 18-35yrs. In terms of neonatal weight, nearly two-third (59.9%) of neonates was within 2.5-4 kg in their

weight (Table 1).

Table 1. *Socio-demographic characteristics of neonates and mothers admitted to the NICU of SPSH, Addis Ababa, Ethiopia, 2023 (n=142).*

Variables	Category	Frequency	Percent (%)
Neonatal age	<24hrs	51	35.9
	24-72hrs	71	50.0
	>/=72hrs	20	14.1
Neonatal sex	Male	72	50.7
	Female	70	49.3
Maternal educational status	Unable to read and write	2	1.4
	Elementary	32	22.5
	Secondary school and above	108	76.1
Maternal age	18-35yrs	118	83.1
	>/=35yrs	24	16.9
Weight of Neonates	<2.5kg	52	36.6
	2.5-4kg	85	59.9
	>/=4kg	5	3.5

3.2. Neonatal Clinical Characteristics

Among total neonates, 113 (79.6%) of them were fed breast milk exclusively. Regarding blood group of neonates, 51 (35.9%) of them were blood group B. One hundred one (71.1%) of study neonates were rhesus positive. About 39 (27.5%) and 61 (43%) of neonates encounter birth trauma and sepsis during their admission. Among study neonates, 98 (69.0%) were developed jaundice at age 24hrs-7days. About 5 (3.5%) of neonates were develop kernicterus. Regarding mode of management of neonates, 18 (12.7%) was phototherapy. When we look at outcome of management, 126 (88.7%) of neonates were improved (Table 2).

Table 2. *Neonatal clinical characteristics among neonates admitted to NICU of SPSH, Addis Ababa, Ethiopia, 2023 (n=142).*

Variables	Category	Frequency	Percent (%)
Neonatal blood group	A	50	35.2
	B	51	35.9
	AB	25	17.6
	O	16	11.3
Neonatal Rh factor	Negative	41	28.9
	Positive	101	71.1
Birth trauma	Yes	39	27.5
	No	103	72.5
Neonatal sepsis	Yes	61	43.0
	No	81	57.0
Age at which jaundice developed	<24hrs	29	20.4
	24hrs-7days	98	69.0
	>/=7days	15	10.6
Feeding mode	EBF	113	79.6
	Mixed feeding	27	19.0
	Not fed at all	2	1.4
Phothorange bilirubin	Yes	76	53.5
	No	66	46.5
Exchange range bilirubin	Yes	22	15.5
	No	120	84.5
kernicterus	Yes	5	3.5
	No	137	96.5
Mode of management	Phototherapy	18	12.7
	Exchange therapy	7	4.9
	Others	117	82.4
Outcome	Improved	126	88.7
	Referred out	10	7.0
	Dead	6	4.2

3.3. Maternal Clinical Characteristics of the Admitted Neonates to Neonatal ICU

Regarding ANC follow-up, 131 (92.3%) mothers had at least one follow-up during their pregnancy. About 138 (97.2%) neonates were delivered at health institutions. Home delivery was reported by 9 (4.1%) mothers. Concerning the mode of delivery, spontaneous vaginal delivery accounted for 87 (61.3%). Regarding parity of mothers, 102 (71.8%) they were multiparty. Concerning GA, 110 (77.5%) of them were within 37-42wks (Table 3).

Table 3. *Maternal characteristics of the admitted neonates to NICU of SPSH, Addis Ababa, Ethiopia, 2023 (n=142).*

Variables	Category	Frequency	Percent (%)
Maternal blood group	A	47	33.1
	B	51	35.9
	AB	16	11.3
	O	28	19.7
Maternal Rh factor	Negative	30	21.1
	Positive	112	78.9
parity	Primipara	40	28.2
	Multipara	102	71.8
GA	<37wks	32	22.5
	37-42wks	110	77.5
ANC visit	Yes	131	92.2
	No	11	7.7
Place of delivery	Health Institutions	138	97.2
	Home	4	2.8
Mode of delivery	CS	48	33.8
	SVD	87	61.3
	Instrumental	7	4.9

3.4. Prevalence of Neonatal Hyperbilirubinemia

Among 142 neonates, a prevalence rate of neonatal hyperbilirubinemia was 35 (24.6 %) with (95% CI: 17.6-31.7).

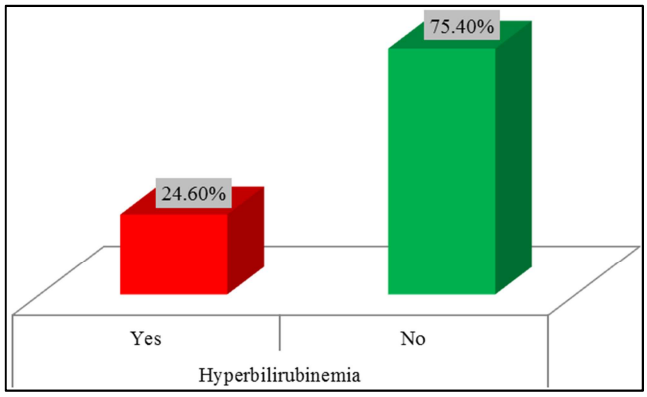

Figure 2. *Prevalence of Neonatal Hyperbilirubinemia among neonates admitted to NICU of SPSH, Addis Ababa, Ethiopia, 2023 (n=142).*

3.5. Associated Factors of Neonatal Hyperbilirubinemia

From the result of binary and multivariable logistic regression analysis four variables: Being male sex [AOR]: 7.7, 95%CI (1.88, 32.1)], Birth trauma [AOR]: 17, 95%CI (3.8, 76.6), neonatal sepsis [AOR]: 10.9, 95%CI (2.9, 41.79)] and ABO incompatibility [AOR]: 22, 95%CI (4.7, 102.05)] were significant determinants of neonatal hyperbilirubinemia

(p-value <0.05). Whereas factors like neonatal age, neonatal weight, Parity, GA and ANC follow up did not had significant association with neonatal hyperbilirubinemia (p-value >0.05).

Accordingly the odds of Hyperbilirubinemia were 8 times more likely higher among male neonates as compared to female neonates [AOR]: 7.7, 95%CI (1.88, 32.1)]. The finding of present study also showed that the odd of Hyperbilirubinemia increased by 17 fold among neonate that face birth trauma as compared to those that did not [AOR]: 17, 95%CI (3.8,76.6). In addition our study showed that the odds of Hyperbilirubinemia almost 11 times more likely higher among neonates with neonatal sepsis as compared to those that did not [AOR]: 10.9, 95%CI (2.9,41.79)]. In the same way; this study also revealed that the odds of neonatal hyperbilirubinemia 22 times more likely higher among neonates with ABO incompatibility as compared to those ABO compatibility [AOR]: 22, 95%CI (4.7, 102.05)].

Table 4. *Associated factors of neonatal hyperbilirubinemia among neonates admitted to NICU of SPSH, Addis Ababa, Ethiopia, 2023 (n=142).*

Variables	Category	Hyperbilirubinemia		COR (95% CI)	AOR (95% CI)	p-value
		Yes	No			
Sex	Male	25	51	2.7 (1.2,6.26)	7.7 (1.88,32.1)	0.005
	Female	10	56	1.00	1.00	
Neonatal age	<24hrs	14	37	3.4 (0.69,16.6)		
	24-72hrs	19	52	3.3 (0.69,15.5)		
	>/=72hrs	2	18	1.00		
Neonatal weight	<2.5kg	13	39	1.3 (0.13,13.02)		
	2.5-4kg	21	64	1.3 (0.14,12.4)		
	>/=4kg	1	4	1.00		
Birth trauma	yes	21	18	7.4 (3.2,17.3)*	17 (3.8,76.6)	0.000
	no	14	89	1.00	1.00	
Neonatal sepsis	yes	26	35	5.9 (2.5,14)*	10.9 (2.9,41.79)	0.000
	no	9	72	1.00	1.00	
Parity	Primi-para	12	28	1.47 (0.6,3.3)		
	multipara	23	79	1.00		
GA	<37wks	12	20	2.27 (0.9,5.3)		
	37-42wks	23	87	1.00		
ANC visit	yes	32	99	0.86 (0.21,3.4)		
	no	3	8	1.00		
Rh incompatibility	yes	18	26	3.3 (1.5,7.3)*	2.56 (0.77,8.5)	0.125
	no	17	81	1.00		
ABO incompatibility	yes	22	20	7.4 (3.17,17)*	22 (4.7, 102.05)	0.000
	no	13	87	1.00	1.00	

Key words:* refers significant at binary logistic regression COR: refers Crude Odd Ratio; AOR: Adjusted Odd Ratio 1: reference category

4. Discussions

In this study the overall prevalence of neonatal hyperbilirubinemia was 24.6 %, [95% CI: 17.6-31.7]. This finding lower as compared to different studies like tertiary Care Hospital Nepal 39.85% [16], Punakha District Hospital from Australian National University 33% [17], Nigeria 40.18% [18], District Hospital in Rwanda 44.3% [19], Federal Medical Centre Abakaliki of Southeast Nigeria for 35% [7], Hiwot Fana Specialized University Hospital 44.2% [3], Jimma medical center 42.3% [12], Mekelle City Public Hospital 37.3% [13] and (Gondar University Hospital, Jimma University Hospital, St. Paul's Hospital Millennium Medical College, Ghandi Memorial Hospital and Tikur Anbessa Hospital) 46.2% [20]. This disparity could be due to sampling size, study period difference, study design, study area, methodology difference, and coverage of obstetrics care and definitions of hyperbilirubinemia. However the finding of current study is consistent with St Francis hospital of Uganda 22.7% [21] and Gonder hospital 31.6% [4]. This similarity might be due similar study design (retrospective cross-sectional study) were employed all studies like present study. The finding of present study was higher as compared to St Paul's Hospital Millennium Medical College in Addis Ababa 13.3% [9]. The probable justification for higher prevalence in current study might be geographical location of the hospital is relatively periphery and a referral center for many primary and general hospital as well as health centers in oromia region.

This study revealed the odds of Hyperbilirubinemia were 8 times more likely higher among male neonates as compared to female neonates [AOR]: 7.7, 95%CI (1.88, 32.1)]. This finding is consistent with study by Lake et al in Mekele city public hospitals that the odd of neonatal jaundice among male neonates was 3.7 times higher compared with those female neonates [13] and Bizuneh et al from five referral hospitals in Amhara region also reported that the chance of developing neonatal hyperbilirubinemia among male neonates was 3.54 times higher than female neonates [13]. The plausible justification for this association might be that male newborns have relatively immature liver which may not be able to process all the bilirubin formed from red blood cells. Besides, a male has a higher concentration of bilirubin and hige risk of acute bilirubin encephalopathy as compared with females [13].

The present study indicated that birth trauma was a significant determinant factor for neonatal hyperbilirubinemia. The odd of Hyperbilirubinemia increased by 17 fold among neonate that face birth trauma during delivery as compared to those that did not [AOR]: 17, 95%CI (3.8, 76.6). The finding of current study is supported by Tamiru et al From Gonder hospital that showed birth trauma were the main statistically significant factors associated with neonatal hyperbilirubinemia [4]. The probable justification for this association could be birth trauma predisposes individuals to severe jaundice because of a combination of excess destruction of red blood cells [17, 22].

This study revealed that neonatal sepsis was another determinant factor for neonatal hyperbilirubinemia. The odds of neonatal Hyperbilirubinemia were 11 times more likely among neonates with neonatal sepsis than neonates without neonatal sepsis [AOR]: 10.9, 95%CI (2.9, 41.79)]. The finding in agreement with study by Lake et al, Aynalem and Bizuneh et al that all of them reported that the odds of neonatal hyperbilirubinemia were more likely higher among neonates with neonatal sepsis than neonates without neonatal sepsis [13, 14, 20]. The possible explanation for this association might b due to the fact that sepsis might cause hemolysis of red blood cells and hepatic dysfunction that leads to accumulation of serum bilirubin in the body [4, 14].

Another contributing factor of neonatal hyperbilirubinemia was ABO incompatibility. Our study finding indicated that the odds of neonatal hyperbilirubinemia 22 times more likely higher among neonates with ABO incompatibility as compared to those ABO compatibility [AOR]: 22, 95%CI (4.7, 102.05)]. This finding was parallel with previous studies by Lake et al, Asaye et al and Aynalem that they reported as neonates with blood type incompatibility had higher odds of neonatal Hyperbilirubinemia compared with those neonates blood type compatibility [10, 12, 13]. The plausible evidence for this association might be the possibility of ABO-associated hemolysis as one of the causes of Neonatal hyperbilirubinemia in our study population.

Strength and Limitation of Study Finding

Strength of Study

1) Random selection of study population from registration.
2) Those neonate with serum bilirubin level measured were included.

Limitation of Study Finding

1) Since the present study evaluated only the hospitalized newborns and status of outpatient infants is not known.
2) The studies also could not do blood film and G6PD assay to comment and confirm infection and hemolysis.
3) The reliability of the data registered on the patient chart may also be the other limitation of this study.

5. Conclusion and Recommendation

5.1. Conclusion

The prevalence of Neonatal Hyperbilirubinemia among neonates admitted to NICU of SPSH was quite high. Neonatal hyperbilirubinemia was a common cause of neonatal morbidity and mortality in this hospital. The major determinants of neonatal hyperbilirubinemia in this study were: neonatal sex, birth trauma, Sepsis and ABO incompatibility were the leading cause.

5.2. Recommendation

Health care provider working at NICU should undergo routine screening and investigation for TSB is imperative for early detection and timely intervention. St. peter specialized hospital should prepare appropriate, relevant guidelines for the management of neonatal hyperbilirubinemia need to be established to prevent unnecessary admissions and ensure safe and timely treatment is given to those who require it. We also recommend Health professionals to transfuse cross-matched ABO group and availability of fresh blood should be prioritized in this age group. Furthermore, the ministry of health should formulate and evolve strategies to identify high-risk cases and optimize early recognition and management strategies for the identified modifiable determinants to reduce the incidence of Neonatal hyperbilirubinemia. We invite other researchers to undergo larger longitudinal studies to establish factors associated with neonatal hyperbilirubinemia in this study setting.

Acronyms and Abbreviations

AAP: American Academy of Pediatrics
AGHMC: Adama General Hospital Medical College
GBD: Global Burden of Disease
NHB: Neonatal hyperbilirubinemia
NICU: Neonatal Intensive Care Unit
SPSH: Saint Peter Specialized Hospital

Author Contributions

Hussein Abiti: Conceptualization, Methodology Data entry, interpretation.

Legese Lemma: Data collection, Laboratory Investigation, data analysis, and Writing –original draft.

Abdulkerim Dedefo: Writing –review & editing of manuscript.

Compliance with Ethical Standards

Conflict of Interest

The authors declare that they have no competing interests.

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Ethics Approval

Ethical Approval was obtained from Adama general

hospital medical college, Adama woreda Health Office.

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