Prevalence and Contributing Factors of Neonatal Jaundice in Neonatal Intensive Care Unit at St Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia, 2019

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Abstract

Purpose : The aim of the study is to assess prevalence and contributing factors of neonatal jaundice among neonates admitted to neonatal intensive care unit at St. Paul Hospital Millennium Medical College, from January 1 to December 31, 2018. Addis Ababa, Ethiopia, 2019. **Methods :** A cross-sectional institution based retrospective study was conducted on 338 samples selected using systematic random sampling taken from a one-year retrospective review of medical records. These neonates were admitted to neonatal intensive care unit at St. Paul Hospital Millennium Medical College from January 1 to December 31, 2018. Addis Ababa Ethiopia. Data was collected by a structured checklist format then entered and analyzed using SPSS 23. Bivariate and multivariate logistic regressions were conducted to identify contributing factors of neonatal jaundice considering p-value less than 0.05. **Results :** Among 338 total neonates enrolled under this study the prevalence of neonatal jaundice was found to be [p=45 (13.3%), CI=1.83-1.90]. The factors which show statistically significant relationship between hyperbilirubinemia were inadequate breast feeding with AOR = 30.770 (CI=9.974-94.929), followed by presence of cephalhematoma AOR=9.627(CI=2.651-34.958) and neonatal infection or sepsis having AOR =4.690 (CI=1.529-14.390), maternal age AOR=.092 (CI=.016-.528), and breast milk jaundice AOR=.026 (CI=.003-.206) both do not reach statistical significance. **Conclusion :** By identifying the contributing factors earlier, we may be able to modify them and reduce the need for neonatal intensive care unit admissions for Neonatal Hyperbilirubinemia.
Keywords: hyperbilirubinemia, neonates, infection, prematurity
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Introduction

Neonatal Hyperbilirubinemia is the yellowish discoloration of the skin, sclera and mucous membranes resulting from deposition of bilirubin. It happens when a serum bilirubin greater than 85 μmol/L (5 mg/dl).[1] In a proportion of infants, jaundice may become severe, typically with total plasma/serum bilirubin (TSB) ≥20mg/dL or 342μmol/L, necessitating prompt hospitalization for phototherapy and/or exchange transfusion (ET) to halt potential progression to acute bilirubin encephalopathy (ABE) or kernicterus.[2,]

Neonatal hyperbilirubinemia (NH) is associated with a variety of conditions. It poses a direct risk of permanent neurological sequel due to neurotoxicity resulting in hearing loss and intellectual deficits. Therefor the early identification of neonates who are at a greater risk of developing severe neonatal hyperbilirubinemia is of paramount importance to preventing brain damage.[3] Neonatal jaundice(NNJ) is very common and is present in 60% of term babies and up to 80% of premature babies.[4] The known risk factors for the occurrence of neonatal hyperbilirubinemia are exclusive breast feeding, ABO incompatibility, premature birth, infection, cephalohematoma, and asphyxia.[5]

Even though United Nations Children's Fund (UNICEF) targets to decrease in death rates occurring at neonatal age, Global Burden of Disease (GBD) indicates that first attempt to estimate the burden of severe NNJ estimated to affect 481,000 late-preterm and term neonates annually, with 114, 000 dying and >63, 000 surviving with moderate or severe long-term neurologic impairments. [6,13] That's why we need to further research and interventions to put the alarming problem under control.

Every year approximately 10.8 million children under the age of five years die worldwide and 38% of these mortalities are said to occur in the first month of life.[8] Recent global study estimates that about 1.1 million babies would develop hyperbilirubinemia with or without bilirubin encephalopathy worldwide yearly. The global burden of neonatal hyperbilirubinemia impacts mostly the world's poorest countries (low-income countries), especially in South Asia and sub-Saharan Africa. 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]

According to a report by 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.[6]

In Africa, neonatal jaundice is a common pediatric problem particularly in West Africa that is associated with sickness and death.[10] A study conducted in Southeast Nigeria found that neonatal jaundice accounted for 35% of hospital admissions and 9.7% of newborns developed kernicterus.[11] In Ethiopia, according to a study done in Tikur Anbessa Hospital, among 356 total neonates, 160(44.9%) of them were diagnosed for hyperbilirubinemia. From these, 11(6.9%) neonates developed bilirubin encephalopathy.[12]

As the above studies indicate bilirubin induced mortality is highly prevalent in developing countries, in which our country belongs to. So the main aim of our study is to determine its prevalence and factors leading to this problem in SPHMMC and to look ways to decrease associated morbidity, severe complications and mortalities which can easily be treated only if identified and treated earlier.

Neonatal jaundice is among the leading causes of neonatal morbidity and mortality in Ethiopia.[12] Even though neonatal jaundice is not totally preventable, with early detection and treatment it is possible to avert irreversible complications. There are limited studies done in Ethiopia on neonatal Jaundice. Therefore, this study focused on the assessment of recent prevalence of neonatal jaundice and factors contributing in NICU of SPHMMC, which help for better preparedness and resource allocation in the unit. The study findings also can help policy makers and other sectors working on neonatal health to plan for early detection and treatment. The study also helps as a scientific reference for further related studies.

Material and methods
Study area, period and design
Institution based, retrospective cross-sectional study was conducted among neonates admitted to neonatal intensive care unit (NICU) from January 1 to December 31, 2018 at St Paul's Hospital Millennium Medical College (SPHMMC)., Addis Ababa, Ethiopia The study was conducted on the period of July 1- July 15, 2019 using a one-year retrospective data.

Source Population
The source population includes all neonates admitted to NICU of SPHMMC from January 1 to December 31, 2018.

Study population
All randomly selected neonates admitted to NICU of SPHMMC during the study period.

Sample Size and Sample Size Determination
Sample size for the study was determined by using single population formula, by taking the proportion of previous similar study conducted at Tikur Anbessa hospital, Addis Ababa, 2018.[12] Sample size is calculated by using single population proportion formula by taking the proportion (p) of 44.9%, with CI=95%, margin of error =0.05 with a correction formula used to determine the sample size.

So, $n_f = 338$.

Sampling Technique
To sort out our final sample participants $n_f = 338$, we used systematic random sampling with a formula K=N/n where,

N=the total number of neonates admitted to NICU during the study period, and n=the population under study as, K=3067/338= 9

As K=, we selected every 9 th chart and found 338 charts to be reviewed, after selecting the first serial number using a lottery method.

Operational definitions
- Neonatal jaundice: is a yellowish discoloration of a newborns skin and eyes.
- Fetal Asphyxia: A complete lack or inadequate supply of oxygen by a baby before birth.
- Breast Milk Jaundice: Jaundice due certain substance in breast milk which blocks bilirubin breakdown.
- Breast Feeding Jaundice: Jaundice caused by inadequate intake of breast milk.

Eligibility Criteria
Inclusion criteria
All neonates admitted in NICU of SPHMMC between   January 1 to December 31, 2018, with complete documentation of History, physical examination and management.

Exclusion Criteria
All neonates admitted in NICU of SPHMMC between September 1 and August 30 with incomplete documentation of History, physical examination and management.

Data collection methods
Data was collected using check list prepared by Investigators after reviewing related literatures.   It has four parts which was filled by reviewing chart of medical records of patients. The checklist had parts to be completed as sociodemographic characteristics, maternal information, and neonatal information. It also contains associated medical information of the newborn which helps to trace related factors.

Data quality assurance
The quality of data was assured by using careful data collection procedures which was checked by supervisors for

completeness, consistency and accuracy. Pretest was conducted on 5 % of the sample before the actual data collection period. Corrective measures were taken, when necessary by the research team, to ensure a common understanding of each record.

Data processing and Analysis

Data was entered into SPSS 23 after checking for completeness then analyzed and expressed using descriptive methods and logistic regression was applied to sort out relationship between variables. Using binary logistic regression variables were identified for having association ($p<0.05$) with neonatal jaundice and these significant factors were further analyzed with multivariate logistic regressions to find out a statistically significant association.

Ethical Considerations

Ethical clearance was obtained from St Paul's Hospitals Millennium Medical College Institutional Review Board to conduct the research. Since the study is record review confidentiality about patient profile and other ethical aspects were strictly maintained throughout the study and then after. Additional Consent was also granted from the appropriate personnel in the record office.

Results

Socio demographic characteristics of the study population

The study population consisted of 338 (n=338) neonates admitted in St. Paul Hospital Millennium medical college. The study involved a one-year retrospective record review. Out of the 338 cases analyzed, 252 (74.6%) were males. Most of births is through spontaneous Vaginal delivery, 274 (81.1%) Majority of the neonates had no infection 310 (91.7%) **(Table 1)**.

Table 1: Socio-demographic and clinical characteristics of the study population at SPHMMC, 2018

Characteristics	Category	Number (%)
Gravidity	Primigravida	118 (34.9%)
	Multigravida	220 (65.1%)
PPROM	No PPROM	313 (92.6%)
	Had PPROM	25(7.4%)
Mode of delivery	Cesarean section	48 (14.2%)
	Spontaneous vaginal	274 (81.1%)
	Instrument assisted	16 (4.7%)
Newborns sex	Male	252 (74.6%)
	Female	86 (25.4%)
Gestational age	Preterm (<37wks)	8 (2.4%)
	Term (37-42 wks.)	317 (93.8%)
	Post term (>42 wks.)	13 (3.8%)
Infection	No infection	310 (91.7%)
	Has infection	28 (8.3%)

Maternal Age

The age of mothers is highly concentrated around the age 25-29 years which were 156 (46.25%) **(Figure 1)**.

Figure: 1 Maternal age distribution who delivered at SPHMMC in 2018.
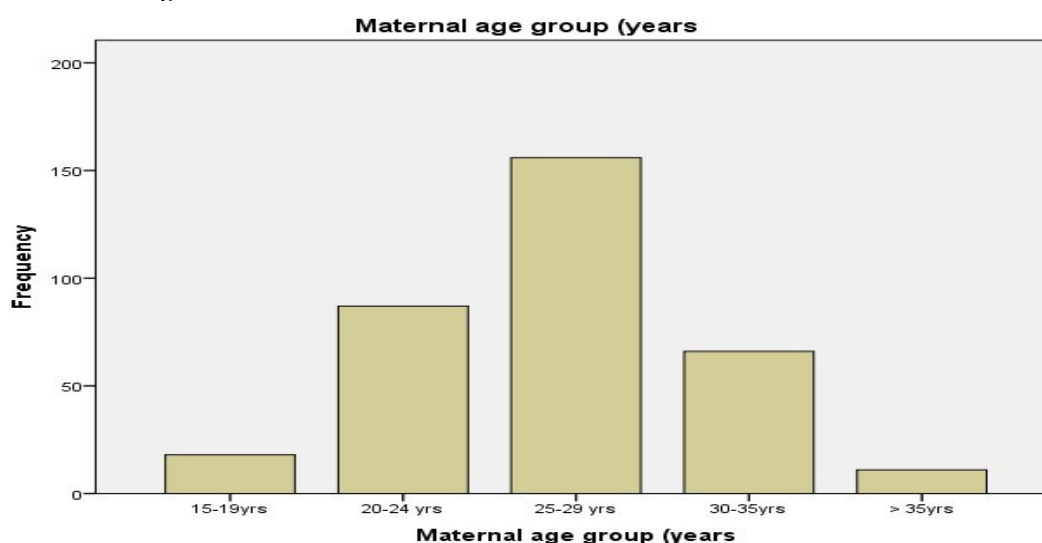
Prevalence of neonatal jaundice

The finding of this study shows that the prevalence of neonatal jaundice is [p= 13.3% (CI=1.83-1.90)], which were diagnosed and confirmed by laboratory to have a raised bilirubin level **(Figure 2)**.

Figure: 2 Prevalence of neonatal jaundice among neonates admitted at SPHMMC in 2018.

Presence of neonatal jaundice

YES (Jaundiced)
NO (Non Jaundiced)

45(13.3%)

293(86.7%)
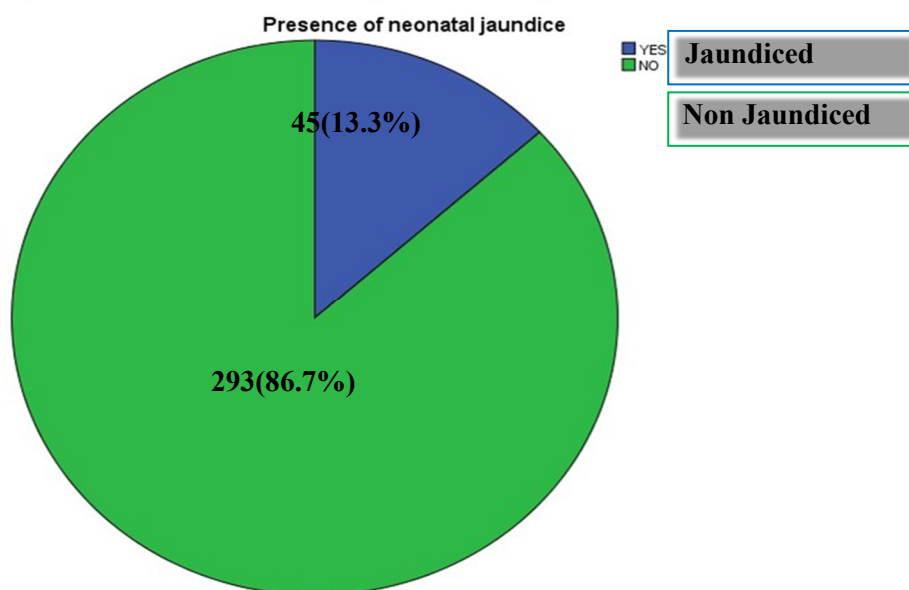
Contributing factors of Neonatal Jaundice

Maternal age, infection, inadequate breast feeding, cephalhematoma and breast milk jaundice were included in the final model for the contributing factors of neonatal jaundice. The multivariate logistic regression reveled that inadequate breast feeding (breast feeding jaundice) AOR = [30.770 (9.974-94.929)] is the major contributor for neonatal jaundice followed by cephalhematoma AOR= [9.627(2.651-34.958)] and neonatal infection having an AOR= [4.690 (1.529-14.390)]. Conversely, maternal age group of 30-35 years AOR= [0.092 (.016-.528)] and 25-29 years AOR=[0.250(.070-.900)] have less likelihood of contributing to neonatal jaundice. The other factors such as breast milk jaundice [AOR=.026 (.003.206)] and maternal age [AOR=.092 (.016-.528)] do not reach statistical significance level **(Table 2)**.

Table 2: Contributing factors of neonatal jaundice in NICU at SPHMMC, 2018

S/N	Variable	Jaundice		COR (95% CI)	AOR (95% CI)	PV
	Maternal Age	No	Yes			
1	15-19 Years	13 (3.8%)	5 (1.5%)	0.0	0.0	
	20-24 Years	72 (21.3%)	15 (4.4%)	.542 (.168-1.748)	.356(.092-1.373)	.134
	25-29 Years	139 (41.1%)	17 (5.0%)	.318 (.101-1.002)	.250(.070-.900)*	.034
	30-35 Years	61 (18.0%)	5 (1.5%)	.213 (.054-.844)	.092(.016-.528)*	.007
	Above 35 Years	8 (2.4%)	3 (0.9%)	.975 (.182-5.235)	.565(.069-4.643)	.596
2	**Infection**					
	No	278 (82.2%)	32 (9.5%)	0.0	0.0	
	Yes	15 (4.4%)	13 (3.8%)	.133 (.058-.304)	4.690 (1.529-14.390)*	.007
3	**Inadequate Breast feeding**					
	No	288 (85.2%)	26 (7.7%)	0.0	0.0	
	Yes	5 (1.5%)	19 (5.6%)	42.094 (14.529-121.950)	30.770 (9.974-94.929) **	.000
4	**Cephalhematoma**					
	No	285 (84.3%)	37(10.9%)	0.0	0.0	
	Yes	8 (2.4%)	8 (2.4%)	9.627(2.651-34.958)	9.627(2.651-34.958) *	.001
5	**Breast Milk Jaundice**					
	No	291 (86.1%)	41(12.1%)	0.0	0.0	
	Yes	2 (0.6%)	4 (1.2%)	.070 (.013-.397)	.026 (.003-.206)	.001

*: Significant association at p-value < 0.05, **: Significant association at p-value < 0.001

Discussion

The findings of this study revealed that the prevalence of neonatal jaundice is [p=13.3% (CI=1.83-1.90)] which is much lower than similar studies conducted on the magnitude at Black Lion specialized Teaching Hospital which

was 44.9% and another study at Mekelle city, both in Ethiopia public hospitals, reported the prevalence of neonatal jaundice to be 37.3%. Additionally, Africa studies of south east Nigeria and Kenyan district hospital both report relatively higher prevalence of 35%. This variation might be linked with the fact that differences do appear among study designs and study areas we have selected for the study.

The contributing   factors identified in this study were inadequate breast feeding (breast feeding jaundice) [AOR =30.770 (9.974-94.929)] meaning inadequately fed infants have thirty times likelihood developing neonatal jaundice than well fed infants, followed by cephalhematoma [AOR=9.627(2.651-34.958)] , showing babies having cephalhematoma after instrumental delivery are nine fold at risk of developing jaundice than without cephalhematoma ,and neonatal infection or sepsis having an [AOR=4.690 (1.529-14.390)] ,demonstrating neonates with infection or sepsis are four times likely to have jaundice than those who don't have sepsis.

Institution based cross-sectional study conducted from February to April 2016 at Mekelle city public hospitals states that the odds of neonatal jaundice among neonates who had sepsis was 2.6 times higher compared with those neonates without sepsis [AOR = 2.64; 95% CI (1.15-6.05)] which had comparable result with the finding of this study, neonatal infection or sepsis having an [AOR=4.690 (1.529-14.390)].

The etiologic factors of Neonatal Hyperbilirubinemia according to the study at Black Lion Hospital are ABO Incompatibility (35.6%), sepsis (18.8%), breast feeding (10%) and Prematurity (8.1%). Breast feeding jaundice demonstrated a strong significant association in our study [AOR =30.770 (9.974-94.929)] which comprises 10% of the etiologic factors of the study at Black Lion Hospital, Ethiopia.

In the similar cross-sectional study done on national district hospital, Bloemfontein, South Africa normal vaginal delivery was the only risk factor associated with neonatal jaundice even if the majority of babies included in this study were born via C-section (64.6%). Normal vaginal delivery was associated with neonatal jaundice statistically, (p = 0.04) and the use of oxytocin was not associated with a higher incidence of neonatal jaundice (p = 0.44)] which is seen in our study that shows spontaneous vaginal delivery having significant association during bivariate analysis with neonatal jaundice [P=.007, CI= (1.319-6.011)] and also oxytocin use [P=.036 (CI=1.055-5.150)] though both do not reach statistical significance during multivariate analysis.

Conclusion
As the findings of this research indicate, the prevalence of neonatal jaundice was found to be 13.3 % and the major contributors were breast feeding jaundice followed by cephalhematoma and neonatal infection. So effort has to be made to decrease the prevalence of neonatal jaundice due these preventable factors.

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Disclosure
The author reports no conflicts of interest in this work.

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