HARAMAYA UNIVERSITY

COLLEGE OF HEALTH AND MEDICAL SCIENCES

SCHOOL OF GRADUATE STUDIES

Prevalence and Associated factors of Jaundice among neonates admitted to Neonatal Intensive Care unit of Hiwot FanaSpecialized University Hospital, Harar, Eastern Ethiopia.

BY: Dr. Mohamed Abdirahman (MD. Pediatric resident)

College: Health and Medical Science

School/Department: Post graduate School

Program: Postgraduate specialty Pediatrics Program

Advisor: Dr. Netsanet Salmon (MD, Pediatrician)

CO-Advisor: Mr. Zelalem Teklemariam (Msc, Associate professor)

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Abbreviations and acronyms

ABE	Acute Bilirubin Encephalopathy
AAP	American Academy of paediatric
DCT:	Direct Coomb's Test
G6PD	Glucose 6 phosphate dehydrogenase
HFSUH	Hiwot Fana Specialized University Hospital
IVIG	Intravenous Immunoglobulin
NICU	Neonatal Intensive Care Unit
NNJ	Neonatal Jaundice
RH	Rhesus Blood group
SB	Serum Bilirubin
TBS	Total Serum Bilirubin
NH	Neonatal hyperbilirubinemia

Abstract

Background: - Jaundice is a yellow discoloration of the skin, sclera and mucous membranes caused by high serum bilirubin level. It is one of the most common clinical problems faced by neonates in the first week of life. Globally, every year about million babies develop it and the vast majority resides in sub-Saharan Africa and South Asia. Despite the national burden of the disease, studies that assess the national magnitude and their associated factors are limited. As far as our knowledge, no previous study is present to determine the magnitude and associated factors of neonatal jaundice in the study area.

Objectives: -The aim of these study is to determine the prevalence and associated factors of jaundice among Neonates admitted to Neonatal Intensive Care Units of Hiwot Fana Specialized University Hospital, Harar, Eastern Ethiopia from December 1/2020-December30/2020.

Methodology: -.Retrospective cross sectional study was conducted and systemic random sampling was used. The required sample size for these study was 328 by taking p=44.9 from previous study in Black lion hospital .Data was collected by two nurses using a structured questionnaire then it was entered into Epi Data version 8, transferred and analyzed using SPSS version 20.0 software. Descriptive statistics including frequency and proportions, was calculated. The odds ratio at 95% confidence interval was used to check for the strength of the association between dependent and independent variables. Statistically significant was declared at P-value < 0.05.

Result: . Result: Medical record of 328 neonates were reviewed and 145(44.2%) of them developed NH. 89(61.4%) of male and56 (38.6%) of females were developed neonatal hyperbilirubinemia. Among associated factors NH: Neonates ≤ 2 days old were [AOR=1.479, CI=95% (0.339-6.458), P-value=0.000]. Gestational age <37 [AOR=3.821, CI=95% (1.745-8.368), P-value=0.001], Sepsis 65(44.8%), Prematurity 32(22%), ABO incompatibility 15(10.3%), Breast feeding jaundice 13(8.9%) were significantly associated with neonatal jaundice.

Conclusion and Recommendation: Magnitude of neonatal hyperbilirubinemia in this study was high and nearly to half of selected neonates. Among identified associated factors of NH, Sepsis ,Prematurity ABO incompatibility and were the leading cause. So, early prevention and timely treatment of NH is important since it was a cause of long term complication and death in neonates.

Key WordsHyperbilirubinemia, kernicterus, neonates, phototherapy

1. INTRODUCTION

1.1. Background

Neonatal jaundice is yellowish discoloration of the skin, sclera and mucous membranes resulting from deposition of bilirubin(*Lauer and Spector 2011*).Neonatal hyperbilirbinemia is a serum bilirubin greater than 85µmol/l (5mg/dl. 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 hyperbilirbinemia(*Slusher, Angyo et al. 2004)*.

Hyperbilirubinemia in neonates can causes kernicterus (bilirubin encephalopathy). Kernicterus is caused by unconjugated hyperbilirubinemia that develops either as a result of hemolytic disease such as Rh incompatibility or because of inability of the liver to conjugate bilirubin due to either defect of glucuronic transferees enzyme or when this enzyme is not fully functional(Ndu et al. 2014).

Bilirubin induced neurologic dysfunction is the clinical signs associated with bilirubin toxicity such as hypotonic followed by hypertonia and is typically divided into acute and chronic phases. Acute features include: hypotonic, poor feeding, high pitched cry, lethargy. chronicFeatures include: cerebral palsy, sensory-neural deafness, seizures, and neurocognitive impairment. Study conducted by Ogunlesi TA et al on predictors of acute bilirubin encephalopathy in 2010 showed 49.7% had acute bilirubin encephalopathy out of 152 neonate(Ogunlesi and Ogunfowora 2011).

Neonatal jaundice is a very common condition worldwide occurring in up to 60% of term and 80% of preterm newborns in the first week of (klieg man R.2020).A variable magnitude of neonatal jaundice was reported.For instance a Study conducted in Pakistan and Nigeria showed that 27.6% and19.6% of neonates were found to have neonatal hyperbilirubinemia respectively. In the the Pakistani study neonates hyperbilirubinemia was also seen between 0-6 days old in 64%(Tikmani, Warraich et al. 2010). Neonatal hyperbilirbinemia have different complications , In this study the established factors associated with kernicterus among jaundiced neonates were infection 71.4%, ABO incompatibility 19.1%, and glucose-6-phosphate dehydrogenase(G6PD) deficiency 9.5%(Oteikwu Ochigbo, Venn et al. 2016). Among jaundiced neonates 25% were due to G-6PD deficiency, 19% were due to neonatal sepsis and 13% were due to fetomaternal ABO incompatibility. Prevalence of neonatal mortality in this hospital was 14.2% of all admissions at the hospital(Shapiro 2003).

Hyperbilirubinemia was among the cause of morbidity and mortality, It is one of the most common conditions requiring medical attention in newborn babies. According to study done in Nigeria, the most common cause of

admission(17%) to Children's Emergency room within neonatal period was hyperbilirbinemia which accounts for 17%(*Zipursky* et al. 2013)

There are also other certain factors thatincreases the risk of acute bilirubin encephalopathy. These are preterm birth, sepsis, hypoxia, seizures, acidosis and hypoalbuminemia. The rate of rise of the level of bilirubin is equally important hence the increased risk of kernicterus in babies with hemolytic disease such as G-6PD deficiency, ABO or Rhesus hemolytic dise. Study conducted by Shilongo SN et al in Namibia showed that the potential to develop prevalence of bilirubin encephalopathy was estimated to 12.4% and the most affected age group were 3-6 days old after birth which accounted of 9.6% of bilirubin encephalopathy cases(Shilongo, Mukesi et al. 2017).

1.2. Statement of the problem

Jaundice is an important cause of morbidity in the newborn period, especially in the first week of life. It is a cause of concern for the physician and a source of anxiety for the parents. most of the time elevated unconjugated hyperbilirubinemia at pathological range is potentially toxic to the developing brain of the infant and may lead to kernicterus (klieg man R. 2020).

Neonatal hyperbilirbinemia is a recognized cause of brain damagewith unconjugated bilirubin causing kernicterus which results in long-term sequel like sensory-neuronal hearing loss (Shilongo, Mukesi et al. 2017).

Global study estimates that about 1.1 million babies would develop hyperbilirbinemia with or without bilirubin encephalopathy worldwide yearly. Among those neonates 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,(Bhutani, Zipursky et al. 2013).

In Africa, neonatal jaundice is commonly associated with sepsis which is a major contributor to neonatal morbidity and mortality. A research conducted by Kamara IK in Seriation on factors associated with neonatal hyperbilirubinemia showed that hyperbilirubinemia was the cause of neonatal death which accounted 24% of death in neonatal intensive care unit(Kamara IK2014). hyperbilirubinemia were associated to 31.7% neonates admission and 23.1% of them were died(Kokeb and Desta 2016).

Despite the national burden of the disease, studies that assess the national burden and their associated factors are limited. As far as our knowledge concerned, no previous studies conducted to determine the burden of neonatal jaundice and its associated factors in the study area. Taking this into consideration, this study is aimed to determine theprevalenceof neonatal Jaundice and their associated factors among neonates admitted to the neonatology unit at Hiwot Fana Specialized University Hospital, Eastern Ethiopia.

1.3. Significance of the study

The result of this study will be used to Hiwot Fana University Hospital to develop its protocol on how to approach to reduce neonatal hyperbilirbinemia by identifying possible preventable associated factors and early treatment options. Besides, it will help Harari Regional Health bureau program planners, and supporting stakeholders on the measure to be taken in the prevention and treatment of neonatal hyperbilirbinemia based on this study. It also provides information on the magnitude of neonatal hyperbilirbinemia and associated factors for researchers who want a further study on the same area or topic.

1.4 OBJECTIVES

1.4.1 General objective

To assess Prevalence and associated factorsof neonatal jaundice among neonates admitted to neonatal intensive care unit of Hiwot Fana Specialized University Hospital from December 1 /2020 to December 30/2020**.**

1.4.2 Specific objectives

- To determinePrevalence of neonatal jaundice among neonates admittedtoneonatal intensive care unit of Hiwot Fana Specialized University Hospital.
- To identify associated factors of neonatal jaundice among neonates admitted to neonatal intensive care unit of Hiwot Fana Specialized University Hospital.

2. LITERATURE REVIEW

2. 1. Prevalenceof Neonatal Jaundice

There were studies done on magnitude of neonatal hyperbilirubinemia and its associated factors in different parts of the world. As a study conducted by Narayan in level II Care NICU at Sikkim Mani pal Institute of Medical Sciences at Gangtok, on the pattern of admissions and outcome in NICU, more than half percent, 54%, of total (212) neonatal admission were due to neonatal jaundice. These jaundiced neonates were due to physiologic jaundice in 48%, breast milk jaundice in 4% and the rest (2%) were due to other cause*(Narayan 2012).* A research that was conducted by S.S Tikmani et al in Pakistan 2300 were admitted to neonatal ward among these the magnitude of neonatal hyperbilubinemia was 27.6%*(Tikmani, Warraich et al. 2010).*

A study that was conducted by Ogunlesi TAand Ogunfowra OB*(Ogunlesi and Ogunfowora 2011*) 15.2% of neonates among admitted develops neonatal jaundice and 49.7% of them develops bilirubin encephalopathy. The study that was conducted from Osijek Croatia On the prevalence of neonatal jaundice among neonates admitted at neonatal intensive care unit was 24.8 % (Mesić, Milas et al. 2014). there was also another study that was conducted in Tehran, Iranian on the prevalence and associated factors neonatal jaundice showed that the prevalence of neonatal jaundice 12.6 % (Oteikwu *Ochigbo, S., et al. 2016).*

Studies done in Warri, Delta State, Nigeria showed that prevalence of neonatal hyperbilirubinemia was 33%(Chime, Egenede et al. 2012) and other study in Federal Medical Center of AbakalikiNigeria revealed that neonatal hyperbilirbinemia accounted 35% of all NICU admissions(*Onyire et al. 2011).*Another study done in Benin in 2012 showed that prevalence of NH was 26.5% of which 12.7% of them died and majority of those neonates who died were due to bilirubin encephalopathy. Study that was done by Oteikwu Ochigbo Set al in calabar teaching hospitalshowed that prevalence of NH was 19.6% of which3.8% develops encephalopathy and 4(19%) with bilirubin encephalopathy were died.*(Oteikwu Ochigbo, Venn et al. 2016).*Another research that was conducted by Abdul aziz on the magnitude of neonatal hyperbilirubinemia in Egypt for assessment of predictors of neonatal jaundice was 16.6%*(Abdel-Aziz, Azab et al. 2014).*

A hospital based crossectional study that was conducted mekkele public hospitals in Tigre region northern Ethiopia that assesse the magnitude and associated factors of neonatal jaundice the proportion of neonatal jaundice was found to be37.3%*(Abera et al. 2019).*The study conducted at NICU of Black Lion hospital Addis Ababa Ethiopia among admitted 4800 neonates 44.9% develops neonatal hyperbilirubinemia*(Gudeta et al. 2018).*

A study done retrospectively by Worku B and Kassie A in 2012 on predictors of early neonatal mortality at a neonatal intensive care unit of a specialized referral teaching hospital in Gondershowed that 13.5 % of neonates admitted in TASH with hyperbilirubinemia were died and 86.5% of them were survive.*(Kassie et al. 2012).*

2.2 Associated factors of hyperbilirbinemia in Neonates

2.3.1. Physiologic Factors

Physiologic Jaundice becomes visible on the 2nd-3rd day usually peaking by the 3rd day at 85-102µmol/l and decreasing to below 34µmol/l between 5th and 7th day of life. Study in India on predictors of neonatal hyperbilirubinemia showed that the 3rd day serum bilirubin of greater than 10.15 mg/dl was used as early predictors of neonatal hyperbilirubinemia. Serum bilirubin in terms is usually less than 12mg/dl and less than 15mg/dl in preterm infants which resolves spontaneously in the first week in terms and 2nd week in preterm infants (klieg man R 2020). Study conducted by Narayan in Sikkim Mani pal Institute of Medical Sciences showed that 48% of the total admitted at NICU were physiologic jaundice(*Narayan 2012*) .Study in Iran by (Najib, Saki et al. 2013)on causes and incidence of hyperbilirubinemia among jaundiced neonates (170) showed that 19(11.4%) developed jaundice after the first 24 hours after birth and other study conducted in India by *(Goyal M et al in 2015).*showed that prevalence of physiologic jaundice among the study was 44.4%.A hospital based crossectional study conducted in Ethiopia Samuel M.(2019) showed that the prevalence of physiologic jaundice among the study was 15%.

2.3.2. Rh Isoimmunization

Erythroblastosis due to Rh incompatibility is still an important cause of hyperbilirubinemia. There are no inborn antibodies in the Rhesus blood group system. The Rh antibody is produced by an Rh-negative mother in response to the presence of Rh antigen on the fetal red blood cell membrane. The initial maternal response to this antigenic stimulus produces immunoglobulin (IgG) antibodies, which do not cross the placenta. Later IgG antibodies are formed that cross into the fetus and attaches to antigenic sites on the red blood cells membrane *(Osaro E 2014).* According to study done by Palmer and Drew in Australia Rhesus erythroblastosis was 3% of jaundiced neonates. Trot man et al in their study on epidemiology of neonatal jaundice at the university hospital of the West Indies showed that prevalence of neonatal jaundice due to Rh Isoimmunization was 3.5 %(*Henny-Harry and Trotman 2012).* Other hospital based crossectional study conducted in mekelle public hospitals inTigtre region of Ethiopia showed thathospital based crossectional study conducted in Black lion hospital Addis Ababa Ethiopia *(Kassa, Gudeta et al. 2018)*showed that the prevalence of pathologic jaundice among the study was 8.8%. Study that was conducted Mekelle puplic hospitlsTigre region of Northern Ethiopia shows that the

odds of neonates with blood type incompatibility was 18 higher odds of neonatal jaundice compared with those neonates

without blood type incompatibility [AOR = 18.21; 95% CI(6.36-52.13)] *(Lake, Abera et al. 2019).*

2.3.3. ABO incompatibility

ABO incompatibility most commonly occurs when the mother has type O blood and the baby has type A, B or AB blood. The cause of ABO incompatibility is reaction of maternal anti-A or anti-B antibodies to the A or B antigen on the red blood cells of the fetus or newborn. It is seen usually only in type A or B neonates born to type O mothers. Jaundice of ABO incompatibility usually appears within the first 24-72hrs after birth *(maislesMJ ,2006*). A study done by H. Boskabadi et al revealed that ABO incompatibility, Rh incompatibility and G-6PD deficiency were the most common associated factors of neonatal jaundice (*Oscar Eand and Khalid S ,2016*). According to study done by Goyal M inMaharashtra in India on prevalence among associated factors of neonatal jaundice were ABO incompatibility which contributed 11.1% of them. As Trot man et al in their study showed that the prevalence of neonatal jaundice due to ABO incompatibility was 35% *(GordnL,et al,2005).* Other study conducted by Oteikwu Ochigbo S on prevalence of bilirubin encephalopathy showed that 19.1% among neonates with kernicterus were due to ABO incompatibility*(Ochigobo S2016).*

2.3.4. Infectious causes of jaundice(pathologic)

Pathological jaundice appears within 24 hours, increase in serum bilirubin beyond 5mg/dl (85µmol/l)/24hrs, serum bilirubin more than 255µmol/l, direct bilirubin greater than 34µmol/l at any time, presence of clinical jaundice beyond 2 weeks and conjugated bilirubin would be pathological jaundice*(Goyal M et al in 2015).*Study conducted in India revealed that Study conducted in India by Goyal M in 2015 showed that prevalence of pathological jaundice was 55.6%.%. A hospital based crossectional study conducted in Black lion hospital Addis Ababa Ethiopia showed that the prevalence of pathologic jaundice among the study was 8.8%(*Kassa, Gudeta et al. 2018)*

Study conducted in hospital of Nigeria in 2011 showed that 35% neonates were admitted due to neonatal jaundice and 5.2% of them were died. Those died neonates were due to sepsis and kernicterus. Half among died were due to sepsis and the rest were due to bilirubin encephalopathy *(Onyearughaet al2016*). Intrauterine infections may cause giant cell hepatitis and jaundice anytime during neonatal period. Jaundice is a recognized feature of congenital and neonatal malaria. According to study done by Onyearugha C et al on prevalence and associated factors of neonatal hyperbilirubinemia in Federal Medical Centre Abakaliki showed that 3.2% of jaundiced neonates were due cephalohematoma and 32.5% were due to septicemia *(Onyearugha C andOnyire, B*

2011). Infectious causes of bilirubin encephalopathy were 71.4% according to study done by Oteikwu Ochigbo S in 2016. A sudy was conducted Mekale Tigre region of northern Ethiopia thatthe odds of neonatal jaundice among neonates who had sepsis was 2.6 times higher compared with those neonates who had no sepsis diagnosis [AOR = 2.64; 95% CI (1.15-6.05)].*(Lake, Abera et al. 2019*).Study that was donein neonatalintensive unit at St Paul's hospital in Addis Ababa shows neonatal infection or sepsis were four times likely to have jaundice than those who don't have sepsis. [AOR=4.690 ,95%(1.529-14.390)] (Girma 2020). According to the study at Black Lion Hospital in 2017 the etiologic factors of Neonatal Hyperbilirubinemia according to the study sepsiswas 18%*(Onyearughaet al2016)*

2.3.5. Breast feeding Jaundice

Breastfeeding jaundice usually occurs early in life (2-3days) after birth due to insufficient milk intake. Decreased frequency of breastfeeding is associated with exaggeration of physiological jaundice. Jaundice associated with breastfeeding in the first few days after birth appears to be related to an increase in enter hepatic circulation of bilirubin. This occurs in the first few days because until the milk has 'come in' breastfed infant nutrient intake is limited, with fewer calories thereby prolonging the intestinal transit time and passage of fewer stools in the first few days of life suggesting that increased amount of bilirubin is absorbed into the enter hepatic circulation (*Goyal Met al 2015).*

A research conducted on severe neonatal hyperbilirubinemia leading to exchange transfusion in 2014, the prevalence of breastfeeding jaundice of neonates was 35%. In this study onset of jaundice in 40.5% of 93 neonates was on the 2nd day and 10 of them were on the 1st day after birth According to Rennie J et al national institute for health and clinical excellence, at one month of age, approximately 10% of breastfed babies remain jaundiced*(Teheri PA 2014).*

Study that was study conducted in neonatal intensive unit at St Paul's hospital in Addis Ababa shows that inadequate breast feeding (breast feeding jaundice) have thirty times likelihood developing neonatal jaundice than well fed infants,[AOR =30.770,95% (9.974-94.929)]*(Girma etal ,2020).*

2.3.6. Breast milk Jaundice

The etiology of breast milk jaundice is not clearly understood, but the following factors have been suggested to play a role: increased concentration of non-esterified free fatty acids; increased enter hepatic circulation of bilirubin due to increased content of beta glucuronidase activity in breast milk; inflammatory cytokines in human milk; and high epidermal growth factor levels in breast milk which leads to reduced gastrointestinal

motility and increased bilirubin absorption and uptake are thought to be responsible for breast milk jaundice in these neonates (*Kamara IK 2014*). It is of late onset (after 4-7 days) and has an incidence in term newborns of 2 to 4%. A strong familial predisposition is suggested by the recurrence of breast milk jaundice in siblings. Study conducted in Iran in 2014 magnitude of hyperbilirubinemia in neonates with history of neonatal jaundice in siblings was reported in 50% of cases (*Ekwochi U et al, 2014*) and other study in Iran by Najib KS et al in 2013 showed that 27.9% had history of jaundice in their siblings. Prevalence of breast milk jaundice accounts 4% causes of neonatal admission at Sikkim Mani pal Institute of Medical Sciences in India. According to this study relatively increased incidence of neonatal jaundice was occurred *(Henny-HaryC ,2012).*

2.3.7. Prematurity

Although preterm infants develop hyperbilirubinemia by the same mechanisms as term infants, it is more common and more severe in preterm infants and lasts longer. This outcome is related to the relative immaturity of the red blood cells, hepatic cells, and gastrointestinal tract. Sick preterm newborns are more likely to have a delay in initiating enteral nutrition, resulting in an increase in enter hepatic circulation. A study conducted by Palmer and Drew in Australia showed that 20% among jaundiced neonates were due to prematurity *(SlusherTM et al 2010).* Prematurity was among the leading associated factors of neonatal jaundice in Federal Medical Centre Abakaliki, Nigeria, which accounts to 17.5% of neonate. Study conducted by Kokeb M, Desta T in 2016 in Gondar University Hospital showed that 27.4% of neonates were admitted due to prematurity *(Kokeb M ,2016).*

2.3.8.Neonatal and maternal sociodemographic factor

A study done by revealed that preterm babies develop hyperbilirubinemia early after birth than term babies. The average gestational age in preterm babies was 32.78-34.82 weeks and hyperbilirubinemia started 1.88-5.52 days after birth. But, in term babies the average gestational age was 37.28-39.12 weeks and hyperbilirbinemia started 3.36-6.44 days after birth*(Bahbah, ElNemr et al. 2015*) .

Study conducted in Paris puteh district in Malaysia The odds of neonatal jaundice among male neonates was 2.61 times higher compared with female neonates[AOR=2.61,95%CI(1.25-5.45)] (Nyangabyaki-Twesigye, Mworozi et al. 2020) .in these study The odds of neonatal jaundice after caesarian section delivery was 5 times higher than spontaneous virginal delivery[AOR=5.34,,95CI(1.61-28.38)] *(SlusherTM et al 2010).*

According to hospital based crossectional study in Black Lion Hospital Addis Ababa Ethiopia in 2017 shows that neonates ≤ 2 days old were 6.89[AOR=6.89, CI=95% (3.46-13.69), P-value=0.000] more likely to develop hyperbilirubinemia and those from 3 to 6 days old at admission were 2.2[AOR=2.2, CI=95% (1.23-3.93), P-

value=0.008] times more likely to develop hyperbilirubinemia than those neonates greater than 6 days old*(Gudeta et al. 2018).*

There was no famly history of hyperbilirubinemia in sibling in these study but study conducted in Iran showed that 20% of jaundiced neonates had history of jaundice in sibling*(Sadeghi et al. 2014, Angela et al. 2015).*

According to study conducted at Black Lion pointed out that 13.75% mothers of jaundiced neonates had no antenatal follow up and did not know their gestational age*(Gudeta et al. 2018).* Similarly study done in Benin 2012 showed that 38.6% mothers of jaundiced neonates had no antenatal follow up and did not know their gestational age.*(Israel-Aina and Omoigberale 2012)*

Institution based cross-sectional study conducted at Mekelle city public hospitals showed that the odds of havingneonatal jaundice among neonates who were delivered withlong duration of labor were almost 4.4 times higher comparedwith those who were delivered with a normal duration oflabor [AOR = 4.39; 95% CI (1.8-10.69). And also the odd of neonatal jaundice among male neonates in these study was 3.7 times higher compared with those female neonates [AOR= 3.7; 95% CI (1.54-8.87*(Abera et al. 2019).*Study that was done in neonatal intensive unit at St Paul's hospital in Addis Ababa shows that cephalhematoma after instrumental delivery were nine fold at risk of developing jaundice than without cephalhematoma [AOR=9.627,95%(2.651-34.958)] *(Girma A etal 2020).*

2.4. Conceptual framework

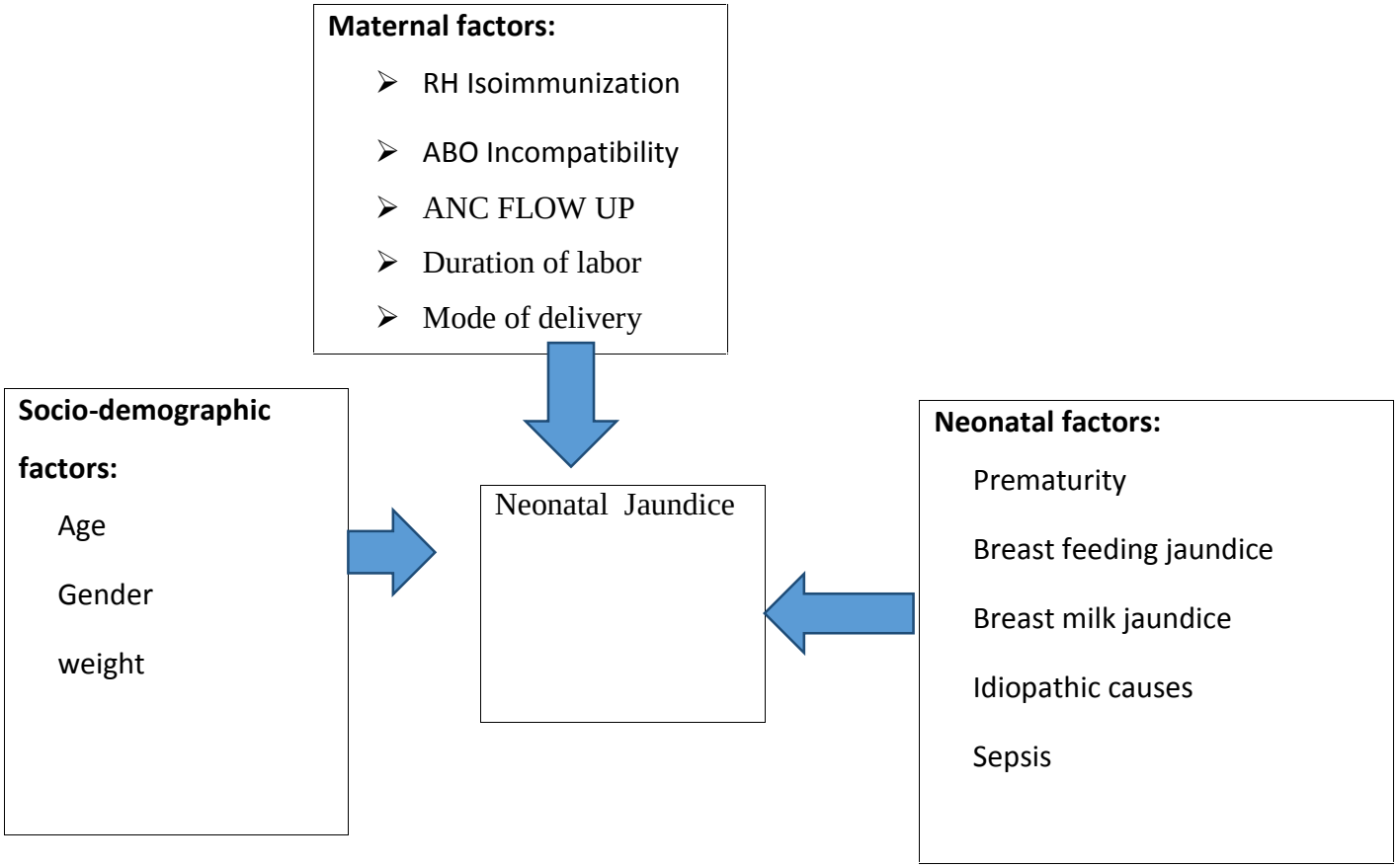

Figure 1. Conceptual framework of factors assumed to affect neonatal hyperbilirbinemia in HFSUH, Harar, 2020 (*Gudeta et al. 2018)*

3. Methodology

3.1 Study area and period

This study was conducted in Harar, the capital city of Harari regionalgovernment and its one of the oldest cities of Ethiopia. It islocated inEastern Ethiopia 525KM away from Addis Ababa. The total number of kebeles of city are19 .The state's size is estimated at 343.2 km2 with total population of 183,415 among which 50% are male. There are six hospitals in Harari region from which isone university hospital, one regional hospital, one army hospital, one police hospital and two private hospitals. In addition, one fistula hospital, eight health centers among which 4 of them are found in Harar town and the rest in rural part of the city.There is one regional laboratory found in the region(CSA,2016).

This study was conducted in Hiwot Fana Specialized University Hospital an affiliate of Haramaya University.which is found in Harar town, Harari region, Ethiopia. HFSUH is a university teaching hospital and is used as a referral hospital for Eastern Ethiopia. The hospital has four major departments (medical, surgery, pediatrics and gynecology-obstetrics) and 6 minor departments (psychiatry, dental clinic, radiology unit, dermatology, ophthalmology, and chronic follow-up clinic visit). Department of Pediatrics has six units which include, the Pediatric Intensive Care Unit, ward, Nutritional Rehabilitation Unit, Neonatal Intensive care Unit, Outpatient Department and chronic follow up (Source: verbal communication with the hospital HMIS head).The study will be conducted from Dec 1,2020 to Dec 30,2020.

3.2. Study design

Hospital based cross-sectional stud was employed

3.3 populations

3.3.1 Source population

All neonates admitted to NICU of HFSUH from Jan1, 2020 to December 30, 2020G.C

3.3.2 Study population

Selected neonates among those admitted at NICU of HFSUHHFSUH from Jan 1, 2020 to December 30, 2020G.C

3.4. Inclusion and exclusion criteria

3.4.1 Inclusion Criteria

All neonates of age group from birth to 28 days who wereadmitted to NICUof HFSUH during the study period.

3.4.2 Exclusion Criteria

Patients whose diagnosis was neonatal jaundice but (Incomplete charts) serum bilirubin level was not measured will not be part of study.

3.5. Sample size determination and sampling technique

3.5.1 Sample Size determination

Single population proportion formula was used to calculate sample size by considering P= 44.9% from the previous study conducted in Black lion hospital(Kassa, Gudeta et al. 2018) at 95% confidence interval) and 5% of the degree of precision. The sample will be calculated with the following formula:N=$(z\propto 2/)2*p(1-p)/d2$, where

Ni= initial sample size required

z= 1.96 (normal deviate corresponding to 95% confidence interval)

d= degree of precision

P= proportion of neonatal hyperbilirbinemia

Ni=(1.96)2(0.449)(1-0.449)\(0.05)2

Ni=380

By adding 5% (19) non-response rate, the final sample size will be calculated.

Ni=399 By correction formula:

Nf = ni/1+ni/N. were N=total neonats admitted during the study period

Nf=399/1+39/1844=328

For the second objective: Double population proportion formula was used to determine the sample size. Accordingly, the sample size was calculated for some of the associated factors obtained from different works of literature by using Open Epi data statistical software version 3.1 with the following assumptions: confidence level = 95%, Power = 80%, the ratio of unexposed to exposed almost equivalent to 1.

1.Table. Sample size determinations using double population proportions formula for the study that wasl assess the magnitude and associated factors of jaundice among neonates admitted to HFSUH neonatal ICU, January 2019-de 2020cember

Factors	Neonatal jaundice		Odds ratio	Non-response rate	Sample size	Reference
	Exposed	Non-exposed				
Sepsis	49	27	2.64	10%	170	*Gudeta et al. 2018)*
Blood group incompatibility	84.8	23.9	18.21	10%	26	*Gudeta et al. 2018)*
Duration of labor	34	44	4.39	10%	76	*(Abera et al. 2019).*
Place of delivery	36.4	44.3	4.37	10%	78	(*Abera et al. 2019*).

3.5.2 Sampling techniques

sample of this study was selected every Kth value, where K=6 among those neonates admitted at NICU of HFSUH from January 1/2020 to December 30/2020.

K=N\nf=1844/328=6

(were N= total neonats admitted at NICU of HFSUH from January 1/2020 to December 30/2020, nf= final sample size of the study).

3.6. Data collection method

3.6.1. Datacollectiontool and procedure

A prepared checklist developed in English language containing variable to be measured was employed which adopted from different literatures (.*Gudeta et al. 2018,Abera et al. 2019*).Cards of neonates admitted atNeonatal Intensive Care Unit of Hiwot Fana Specialized University Hospital from January 1/2020 to December30/2020 was isolated and counted. Then card number of those neonates was put in their order of admission. By using systemic sampling, Necessary information of neonate at every (K-value) in the order was collected and reviewed.

3.6.2 Data collectors

Two BSC nurses and one resident was trained and recruited for data collection byprincipal investigator.

3.7 Study variable

3.7.1 Dependent variables

Neonatal jaundice.

3.7.2 Independent variables

Mothers:- blood group and Rh, ANC follow up

Neonates:-age, gestational age, birth weight, blood group and Rh, hematocrit, TSB, mode of delivery, birth trauma,breast milk jaundice,sepsis,breast feeding jaundice,

3.8 .Operational definitions

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.(*American academy of pediatrics 2017)*

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 breast-feeding jaundice (*American academy of pediatrics 2017)*

Neonatal hyperbilirubinemia: is defined as serum bilirubin level of neonates greater than 85µmol/l (5mg/dl). (*Klieg R.2020).*

Bilirubin encephalopathy: Complicated neonatal hyperbilirubinemia (kernicterus) which causes brain toxicity, death, long term sequel like sensorial hearing loss and cerebral palsy. *(Ochigbo S.2016)*

3.9. Data quality control

The questionnaire was prepared in English and two days training was 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 was 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. Finlay multivariate analysis was run in the binary logistic regression model to control the confounding factors.

3.10. Methods of data analysis

The collected data was checked for its completeness and cleaned before entry into computer. Then, data was coded, cleaned, edited, and entered into EPI data version 8.1 to minimize logical errors and design skipping patterns. Then, the data was exported to SPSS window version 22 for analysis .descriptive analysis was done by

computing proportions and summary statistics .Then ,the information was presented by using simple frequencies, summary measures ,tables and figures .Bi-variate analysis and multivariate analysis was done to see the association between each independent variables and outcome variables by using binary logistic regression. The assumption for binary logistic regression was cheeked. The goodness of fit was checked by Hosmer-Lemeshow statistic and omnibus testes.All variables with $p<0.25$ in the Bi variate analysis was included in the final model of multivariate analysis in order to control all possible confounders).The direction and strength statistical association was measured by odd ratio with 95%CI.Adjusted odds ratio along with 95%CI was estimated to identify predictors for Jaundice and its associated factors by using multivariate analysis in binary logistic regression. In this study, P-value<0.05 was considered to declare a result statistically significant

3.11. Ethical consideration

Before starting the data collection process, the study protocol was approved by the Haramaya University College of Health and Medical Sciences, the Institutional Research Ethics Review Committee (IHRERC). Official letters of co-operation was submitted to HFSUH and concerned bodies to obtain their co-operation and consent in facilitating the study. Permission was obtained from the medical director, pediatric ward, NICU of HFSUH.The purpose of the study was explained to each worker to proceed the data collection from patient registration; data collectors was strictly oriented about patient confidentiality and the patient's name or card number will never used by any means throughout the research.

3.12. Information Dissemination

The study will be presented to Haramaya University, College of Health and Medical Science School of Medicine. The hard copy will be available in the library of Haramaya University, College of Health and Medical Science for postgraduate students as well as for other concerned readers. The finding of this study will be disseminated through presentation, publication, and distribution to relevant bodies

4. RESULT OF THE STUDY

4.1. Socio-demographic characteristics of neonates in the study, HFSUH.

A retrospective cross sectional study was done on systematically selected 328 neonates among total neonates admitted at NICU of HFSUH from January 1, 2020 to December 30, 2020 to assess magnitude and associated factors of neonatal hyperbilirubinemia. Number of male and female in this study were 176(53.7%) and 152(46.3%) respectively. Among neonates included in this study 145(44.2%) of them were developed neonatal hyperbilirubinemia. Age of 138(42%) neonates were 3-6 days old at the time of admission. Weight of 247 (75.3%) neonates was 2500gm-4000gram at admission. Duration of hospital stay of the neonates were from 1 to 31days. 211(64.3%) of them were discharged from hospital within a week after admission and 10(10.6%) of neonates were discharged after 21 days. Premature neonates among selected neonates were 116(35.4%) and mother of 60(18.3%) neonate s did not know their gestational age (table 2).

Table 2: Socio-demographic characteristics and frequency of neonates according to their category, HFSUH,HARAR, Ethiopia, 2020

Socio-demographic characteristics	Category	Frequency/percentage among all neonates(328)	Frequency(percentage) among jaundiced neonates(145)
Sex	Male	176(53.7%)	89(61.4%)
	Female	152(46.3%)	56(38.6%)
Age at admission (days)	Less/ equal 2	93(28.4%)	21(14.5%)
	3-6	138(42%)	65(44.8%)
	Greater than 6	97(29.6%)	59(40.7%)
Weight (grams)	Less than 2500	71(21.6%)	21(14.5%)
	2500-4000	247(75.3%)	118(81.4%)
	Greater /equal to 4000	10(3.1%)	6(4.1%)
Gestational age (weeks)	Less than 37 weeks	116(35.4%)	36(24.8%)
	Greater /equal to 37 weeks	152(46.3%)	70(48.3%)
	Unknown	60(18.3%)	39(29.9%)
Hospital stay(days)	Less than 7	211(64.3%)	87(60%)
	Greater/ equal to 7	117(35.7%)	38(40%)

4.2. Magnitude of neonatal hyperbilirubinemia in the study, HFSUH.

Among neonates reviewed in this study 145(44.2%) of them were developed neonatal hyperbilirubinemia of which 2(1.4%) neonates were developed bilirubin encephalopathy. Prevalence of neonatal hyperbilirubinemia among male neonates was 89(61.4%) and 56(38.6%) among female neonates. Age of neonates with hyperbilirubinemia at admission was 65(44.8%)of them were 3-6days old at admission. Weight of 118(81.4%)o jaundiced neonates at admission was from 2500-4000gram and 116(35.4%) of jaundiced neonates were premature. Duration of jaundiced neonates in hospital after admission ranges from 1 day to 30 days and of 87(60%) them were discharged with in the 1st week of admission (table 2). The onset of jaundice in < 3 days old , from 3 – 6 days old and > 6 days old after birth were 21(14.5%), 65(44.8%) and 59(40.7%) respectively. The onset of jaundice among neonates with bilirubin encephalopathy 2(1.4%) were from 3-6 days old after birth. Onset of neonatal hyperbilirubinemia mostly occurred between 3and 6 days old after birth.

Among neonates with hyperbilirubinemia serum bilirubin level of 33(22.8%) and 83(57.2%) neonates were ≥20mg/dl and from 10mg/dl-20mg/dl, respectively. Serum bilirubin level of the two neonates with bilirubin encephalopathy was 28mg/dl and 25mg/dl and both of them had more than one associated factors.

4.3. Associated factors of neonatal hyperbilirubinemia in the study, HFSUH.

The major causes of neonatal hyperbilirubinemia in this study were sepsis and prematurity which accounts 65(44.8%) and 32(22%) respectively. Hemolytic disease causing neonatal hyperbilirubinemia was Rh and ABO incompatibility accounts 7(4.8%) and 15(10.3%) respectively (table 3). There were more than one associated factors of neonatal hyperbilirubinemia causing increased level of bilirubin level in16 (11%) neonate. Among them ABO incompatibility plus prematurity and sepsis plus prematurity accounts 9(6.2%) and 7(3.8%) each respectively.

Neonates with NH who developed bilirubin encephalopathy had more than one associated factors.

Sepsis was among the leading cause of NH in this study. Among 145 neonates with NH blood culture of 2(1.4%) neonates was done and blood culture of both neonates were positive result of blood cultur

Table 3: Associated factors of NH among neonates with hyperbilirubinemia in HFSUH,HARAR, Ethiopia,2020

Associated factors of hyperbilirubinemia	Frequency	Percentage
Prematurity	32	22%
Breast milk jaundice	6	4.1%
Breast feeding jaundice	13	8.9%
Sepsis	65	44.8%
Rh incompatibility	7	4.8%
ABO incompatibility	15	10.3%
Physiologic cause of jaundice	12	8.3%
Hemolytic cause of jaundice	11	7.6%

In binary logistic regression age was significantly associated with the occurrence of neonatal hyperbilirubinemia. For example, neonatal age of ≤ 2 days old at admission were 5.323(2.823-10.039) P-value=0.000] times more likely to occur than those neonates above 6 days old after birth. Weight of neonates was also significantly associated with neonatal hyperbilirubinemia. Neonates weighed less than 2500gm at admission were 3.571(0.913-13.970), P-value=0.067] times more likely to develop hyperbilirubinemia than those weighed ≥4000 gram at admission. gestational age of the neonate at the time of delivery <37 weeks was significantly associated with neonatal hyperbilirubinemia which was 4.127(2.132-7.988),p-value=0.000] times more likely to develop hyperbilirubinemia than those of unknown gestational age.

In multivariate logistic regression age was significantly associated with neonatal hyperbilirubinemia. For example neonates ≤ 2 days old were 1.479[AOR=1.479, CI=95% (0.339-6.458), P-value=0.000] more likely to develop hyperbilirubinemia than those from 3 to 6 days old at admission. Gestational age <37 weeks was significantly associated with neonatal hyperbilirubinemia which was 3.821[AOR=3.821, CI=95% (1.745-8.368), P-value=0.001] times more likely to develop hyperbilirubinemia than those neonates with Gestational age greater than or equal to 37 weeks of gestational age (table 4).

Table 4: Socio-demographic variables associated to neonatal hyperbilirubinemia in HFSUH, HARAR, Ethiopia, 2020

Variables	Neonatal jaundice		95% CI		P-value
	Yes	No	COR	AOR	COR AOR
Sex					
Male	89(61.4%)	87(47.5%)	1.754(1.126-2.730)	0.356(0.277-1.036)	.013 0.064
Female	56(38.6%)	96(52.5%)	1	1	
GA					
<37 wks	36(24.8%)	80(43.7%)	4.127(2.132-7.988)	3.821(1.745-8.368)	0.000 0.001
>=37 wks	70(48.3%)	82(44.8%)	2.176(1,171-4.040)	3.657(1.651-8.100)	0.014
Unkown	39(26.9%)	21(11.5%)	1	1	0.001
Weight/gram					
<2500	21(14.5%)	50(27.3%)	3.571(0.913-13.970)	1.479(0.339-6.458)	0.067 0.603
2500-4000	118(81.4%)	129(70.5%	1.640(0.45-5.954)	0.410(0.096-1.751)	0.452
>4000	6(4.1%)	4(2.2%)	1	1	0.229
Age in day					
<=2	21(14.5)	72(39.3%)	5.323(2.823-10.039)	1.479(0.339-6.458)	0.000 0.000
3-6	65(44.8%)	73(39.9%)	1.744(1.029-2.954)	0.410(0.096-1.751)	0.039
>6	59(40.7%)	38(20.8%)	1	1	0.426

4.4. Condition at discharge and management of neonates with hyperbilirubinemia at NICU OF HFSUH.

Most of the neonates with hyperbilirubinemia were treated either by phototherapy alone or both phototherapy and blood transfusion. Among jaundiced neonates, 128 (82.3%) of themwere treated by

phototherapy alone and 11(7.6%) were treated with blood transfusion combined with phototherapy, among these 2(1.4%) neonates managed by combined treatment were developed bilirubin encephalopathy. The tow neonates with bilirubin encephalopathy were planned to be treated with combination of phototherapy and exchange blood transfusion but was treated only by phototherapy and blood transfusion rather than exchange blood transfusion because of unavailable blood in the hospital at the time of neonatal admission. This neonate was died at last. Neonatal death among those with neonatal hyperbilirubinemia was 2 (1.4%) in this study. And their causes of death were due to bilirubin encephalopathy.

93.8% of jaundiced neonates were improved and discharged to home. Family of 7(4.8%) neonates among jaundiced neonates took their neonate home without completing management (left against medical advice).

5. DISCUSSION

Neonatal jaundice is a very common condition worldwide occurring in up to 60% of term and 80% of preterm newborns in the first week of life (Ndu et al. 2014). In contrary recent study conducted in Nigeria by Oteikwu DE et al.*(Oteikwu Ochigbo, Venn et al. 2016)* showed that among preterm neonates 40.7% and 56.8% of term neonates were developed hyperbilirubinemia which is similar with present study that showed 48.3% among term neonates and 24.8% among preterm neonates were developed hyperbilirubinemia. In this study prevalence of neonatal hyperbilirubinemia was 145 (44.2%) of which 2(1.4%) neonates were developed bilirubin encephalopathy.

A similar study conducted in mekkele public hospitals in Tigre region northern Ethiopia that assesse the magnitude and associated factors of neonatal jaundice the proportion of neonatal jaundice was found to be37.3%*(Abera et al. 2019)*.The study conducted at NICU of Black Lion hospital Addis Ababa Ethiopia among admitted 4800 neonates 44.9% develops neonatal hyperbilirubinemia of which 5(3.1%) of them were died due to bilirubin encephalopathy *(Gudeta et al. 2018)*. Another Study that was conducted in neonatal intensive unit at St Paul's hospital in Addis Ababa 2018 shows that the prevalence of neonatal jaundice was 13.3% *(Girma etal ,2020).*Magnitude of NH in Pakistan studied by S. S. Tikmani et al (*(Tikmani, Warraich et al. 2010)* and in Osijek Croatia 2014 (Mesić, Milas et al. 2014)was 27.6% and 24.8 % , respectively.

Magnitude of NH in HFSUH is comparable studies done at mekelle puplic hospitals and Blacklion quite higher compared to other studies conducted except the study conducted byNarayan in level II care at neonatal intensive care unit in India that showed magnitude of NH in this hospital was 54%*(Narayan 2012).* This may be dueto difference in study area or socio demographic characteristics.

Study conducted by Onyearugha C et al in Nigeria showed that prevalence of NH was 35%(*Onyire et al. 2011)* of which 9.7% neonates were developed bilirubin encephalopathy. Other study by Oteikwu Ochigbo S et al in Calabar teaching hospital showed that prevalence of NH was 19.6% of which 3.8% of neonates were developed bilirubin encephalopathy and 4(19%) with bilirubin encephalopathy were expired *(Oteikwu Ochigbo, Venn et al. 2016).*

In this study neonatal death due to NH was 2(1.4%) of which both of them were due to bilirubin encephalopathy. This indicated that hyperbilirubinemia is a serious problem leading to long term sequel in survivors and death inneonates. This confirms Naghavi M et al 2015 that showed after several years of neglect and exclusion from the global child health agenda under the million development goal initiative,

neonatal hyperbilirubinemia are increasingly acknowledged as important contributors to global neonatal deaths (Naghavi M et al 2015).

Current study found that most affected age group by NH were 3-6 days old at admission which was 44.8% and those > 6 days old were 40.7%.).similar study conducted at Black lion shows that most affected age group by NH were 3-6 days old at admission which was 52.5% and those > 6 days old were 32.5%. Other study conducted in Namibia 2017 showed similar age group of neonates were 3-6 days old *(Oteikwu Ochigbo, Venn et al. 2016)*. study conducted in Egypt by Muhammad A showed that prevalence of neonatal hyperbilirubinemia in 4-7 days old neonates was 27.9% and ≥8 days old neonates were 26.8%(Muhammad A et al 2016This showed that as age of neonate increases prevalence of neonatal hyperbilirubinemia decreases;prevalence of neonatal hyperbilirubinemia is inversily proportional to age of the neonate.

Onset of hyperbilirubinemia in current study was 36.1%, on 1st day and 27% on 2nd day and other study in West Indies University 2012 showed that onset of jaundice was 27% on the 1st day and 43% on 2nd day(*Henny-Harry and Trotman 2012*. Other study done in Iran 2013 (38) indicated that 11.4% neonates were developed NH on the 1st day of life after birth*(Teheri PA 2014).* This may be due to newborn's immature liver that often cannot remove bilirubin quickly enough, causing hyperbilirubinemia in neonates. Onset of hyperbilirubinemia in current study was neonates ≤ 2 days old were 1.479[AOR=1.479, CI=95% (0.339-6.458), P-value=0.000] more likely to develop hyperbilirubinemia than those from 3 to 6 days old at admission. Similar study in Black lion the odds of neonates with hyperbilirubinemia ≤ 2 days old were 6.89[AOR=6.89, CI=95% (3.46-13.69), P-value=0.000] more likely to develop hyperbilirubinemia and those from 3 to 6 days*(Gudeta et al. 2018).*

Current study showed that 70.4% of neonates were developed NH in the 1st week of life. study done at Black lion hospital showed that 99.2% of neonates were developed NH in the 1st week of life Similarly study done in Benin 2012 showed all neonates were developed NH in the 1st week of life after birth (Omoigberale et al 2012) and in Nigeria 2011 , 89.6% of jaundiced neonates developed NH in the 1st week of life. (Chime, Egenede et al. 2012). In Pakistan by S. S. Tikmani et al 64% of neonates were developed hyperbilirubinemia between 0 and 6 days after birth*(Tikmani, Warraich et al. 2010).*

Among associated factors of NH in this study sepsis (44.8%), prematurity (22%) ABO incompatiblity (10.3%), RH incompatibility (4.8%), breast feeding (8.9%), and other known causes were15.9%.

Similar study in in Black lion hospital 2017 among associated factors of NH was ABO incompatiblity (35.6%), sepsis (18.8%), breast feeding (10%), prematurity (8.1%) and other known causes were 8.1% *(Gudeta et al. 2018).* Similar study in west India University 2012 indicated that among associated factors were ABO incompatiblity 35%, prematurity 11%, Rh incompatiblity 3.5%, idiopathiccause 9%. (*Henny-Harry and Trotman 2012)*.Prevalence of ABO incompatibility was the same in both studies. Study in Benin showed that associated factors of NH were ABO incompatiblity(7.6%) and sepsis(45%).(Omoigberale et al 2012). There was no history of hyperbilirubinemia in sibling in current study similar to that in Blackl lion hospital but study in St Paul's hospital in Addis Ababa 2018 shows history of hyperbilirubinemia in sibling was 2.64 times higher than those without famly history, study in Iran 2013 showed that 20% of jaundiced neonates had history of jaundice in sibling *(Teheri PA 2014).* In current study 18.3% mothers of jaundiced neonates had no antenatal follow up and did not know their gestational age. similar study done 2017 in Black lion 13.75% of mothers of jaundiced neonats had no antenatal follow up and did not know their gestational age. Similarly study done in Benin 2012 showed that 38.6% mothers of jaundiced neonates had no antenatal follow up and did not know their gestational age(Omoigberale et al 2012). This may cause difficulty in early detection of hyperbilirubinemia in neonates and increases its complication.The cause of bilirubin encephalopathy in present study were sepsis plus prematurity (1.4%) Study done in Iran 2013 showed that cause of bilirubin encephalopathy were ABO incompatiblity + Rh issoimmunization (5.9%), sepsis (12%).

In current study serum bilirubin level of 33 (22.8%) neonates were >20mg/dl and they were among those with complicated hyperbilirubinemia. Study by Ogunlesi TA and Ogunfowora OB showed that serum bilirubin level of 36 (48%) neonates among those with bilirubin encephalopathy was >30mg/dl. In present study most neonates with more than one associated factors had markedly elevated bilirubin level than those with one associated factors. This supports the study conducted by Bahbah, ElNem et al on understanding of newborn jaundice showed that as the number of associated factors increases, the potential to develop markedly elevated bilirubin levels also increase*(Bahbah, ElNemr et al. 2015*).

This may be the added effect of each associated factors causing elevated bilirubin level. Sepsis and prematurity were among the most common associated factors causing NH and blood culture was done only two neonats both culture result were positive. Similar study done in Black lion blood culture of 39 (24.4%) jaundiced neonates were done of which 35 (89.7%) had positive result. Other study in Nigeria 2010 showed that blood culture of 48 neonates among152 jaundiced neonates were done of which 14 (29.25%) positive result(*Onyire et al. 2011)*.

IN present study culture coverage in HFSUH is highly inferior than other studies done in Black lion, Nigeria which have higher coverage of blood culture.

In the present study duration of hospital stay among neonates with NH was 1-2 days in 12.7% and after 2 days in 88.3%. There was no neonate discharged before one day after admission but previous study done in west India showed that 15% of jaundiced neonates were discharged before one day . In present study 128 (82.3%) of neonates with NH were treated by phototherapy alone. two neonats were planned for exchange transfusion but neither of the neonats were transfusion because luck blood at the time of admission. and the rest 11 (6.7%) were treated by combination of blood transfusion and phototherapy. Similar study in St Paul's hospital in Addis Ababa 2018 al were treated by phototherapy alone and none of the jaundiced neonats were exchange transfusion similar to the present study.

Other similar study in Black lion 139 (86.9%) of neonates with NH were treated by phototherapy alone .two neonats were planned for exchange transfusion but neither of the neonats were because luck blood at the time of admission. and the rest 21 (13.1%) were treated by combination of exchange blood transfusion and phototherapy. Study in Benin indicated that 45% of jaundiced neonates were treated by phototherapy alone(Omoigberale et al 2012). Study in Iran by Najib KS et al showed that 64.5% of neonates need phototherapy alone and 35.5% of them need combination of exchange blood transfusion and phototherapy (Nejib ks et al 2013). In present study 7 (4.8%) of neonates were left against medical advice .

similar study in Black lion 3 (1.9%) of neonates were left against medical advice and similarly in study done in Nigeria by Onyearugha C showed that 3 neonates among NH were discharged against medical (Onyearugha, C., et al. 2011). In Benin teaching hospital 8.7% of jaundeced neonates were discharged against medical advice

6. STUDY LIMITATION AND STRENGTH

6.1. Strength: Medical records of neonates were properly handled and information related to neonatal hyperbilirubinemia was obtained.

6.2. Limitation: This is a retrospective study; Inability to locate and follow up documentation on the discharge subjects to ascertain if they were developed long term sequel.

7. CONCLUSION AND RECOMMENDATION

7.1. Conclusion: Magnitude of neonatal hyperbilirubinemia in this study was quite high compared to other researches done on neonatal hyperbilirubinemia. Major factors causing hyperbilirubinemia in neonates were sepsis prematurity ABO incompatibility,Rh Isoimmunization, breast feeding jaundice ,other cause. Neonatal hyperbilirubinemia was a cause of neonatal death in NICU. Among neonates died all of them of them were due to complicated neonatal hyperbilirubinemia. Therefore, early prevention and timely treatment of hyperbilirubinemia in neonates is important to prevent or reduce neonatal death due to hyperbilirubinemia.

7.2. Recommendation

According to findings of this study, we recommend the following points:

Ministry of Health, Regional Health Bureau and Health care providers

NH prevention program should be incorporated as part Antenatal clinic record that covers prenatal screening for blood group should be held by women to ensure that all essential information is readily available to the caregiver.

Prematurity,ABO incompatibility and Rh isoimmunization were among the major cause of neonatal hyperbilirubinemia which can be prevented. Therefore, all women should be tested for ABO and Rh as early as possible during each pregnancy and Rh negative women should be administered prophylactic Rh immunoglobulin both during pregnancy and after delivery.

Checking bilirubin level of neonates in the 1st 3 days of life for all neonates would be important for early detection, treatment of NH and prevent its complication.

Plan and deliver necessary training programs for health professionals to give attention and care for neonates regarding to NH. Community based training and health education about clinical symptoms, complication of NH and importance of checking bilirubin level of all neonates including those delivered at home would create community awareness to take action timely before complication of hyperbilirubinemia occurred

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9.APPENDIXES

Appendix 1: Information Sheet and Informed voluntary Consent form for Hiwot-Fana Specialized University Hospital Administration

My name is DR. MOHAMED ABDIRAHMAN. I am a Pediatrics and Child Health student at the School of Graduate Studies in the College of Health and Medical Science of the Haramaya University. I am going to do my research for the partial fulfillment of the Clinical specialty certificate in Pediatrics and Child Health on the Prevalence, Associated factors and Outcome of Neonatal Hyperbilirbinemia on Neonates Admitted to Neonatology Unit, at Hiwot Fana Specialized University Hospital. I kindly request you to lend me your attention to explain about this study.

The Study Title: The study title of my thesis is prevalence, associated factorsand Outcome of Neonatal Hyperbilirbinemiaamong Neonates Admitted to Neonatology Unit, at Hiwot Fana Specialized University Hospital.

The purpose/Aim of the Study: The purpose of this study is to establish a local hospital based information on the prevalencetheir associated factors and outcome of Neonatal Hyperbilirbinemiaamong Neonates Admitted to Neonatology Unit, at Hiwot Fana Specialized University Hospital. The finding of this study will provide up-to-date information for the health professionals working in Hospital. The finding of this study can be used as a guide for health care providers and health institution to take the appropriate intervention. It will be also used for the regional health bureau and respective woreda health offices to plan and set strategies and expand services about health information dissemination. Moreover, the main aim of this study is to write a thesis as a partial fulfillment of Clinical specialty certificate in Pediatrics and Child Health.

Procedure and Duration: The data was collected from Dec15-28,2019G.C using systematically prepared check list from patients chart review.

Risk and Benefit: The risk of participating in this study is very minimal; since it is secondary data from chart only taking staffs of this hospital. But the findings from this research may reveal important information for the hospital.

Confidentiality: Participant's information will be confidential. The finding of the study will be general for Neonates Admitted to Neonatology Unit and will not reflect anything about particular

individual information. No reference will be made in oral or written reports that could link participants in the study.

Rights: The Hospital has the right to stop the study at any time if found any unethical activities. Contact address If there are any questions or enquires any time about the study or the procedures, please contact: Principal investigator: mobile phone +251915103314, Gmail dr.barud@gmail.com,Institutional health research Ethics Review committee (IHRERC): office phone 0254662011 or P.O.Box 235, Harar-Ethiopia.

Declaration of Informed Voluntary Consent

I have read the participant information sheet. I have clearly understood the purpose of the study, the procedure, the risk and benefit of the study, and issues of confidentiality. The contact address was given to me for any queries. I have been given the opportunity to ask questions about things that have been unclear. I understand that participant has the right to withdraw from the study at any time or not to answer any question that they do not want. Therefore, I declare my voluntary on behalf of the Hospital Management to allow this study to be conducted in our Hospital with my signature.

Name of the Manager: _____Signature: _____ Date: ____/____/2019

Name of the data collector:----------Signature:----------Date:-------/------/20019

Appendix II:semi structured questioners

Code	Questions	Response	Remark
1	What was the age of neonate at admission?	_____days	
2	What is the sex of the neonate?	1. Male 2. Female 3. Both genitalia	
3	How long the neonate stayed in hospital?	_____days/weeks	
4	What was the Weight of neonate on admission?	_____gram	
5	What was the gestational age of neonate's mother?	_____weeks	
6	Did the neonate developed hyperbilirubinemia (jaundice)?	1.Yes 2.No	
7	Age of neonate at onset of jaundice	_____days	
8	What was the neonate's bilirubin level on admission?	_____mg/dl and/or _____µmol/L)	
9	Did the neonate developed bilirubin Encephalopathy (Kernicterus)?	1. Yes (write if there is any sequel due to BE)._____ 2. No	
10	What was/were the associated factor/s (cause) ofhyperbilirubinemia? (Why the neonate developed Jaundice?) (It is possible to choose more than one)	1. Jaundice due to prematurity 2Jaundice due to breast milk 3. Jaundice due to breast feeding 4. Jaundice due to sepsis(infection) 5. Jaundice due to RH Isoimmunization 6. Jaundice due to ABO incompatibility 7. Jaundice due to Unknown(idiopathic) 8. Other reason _____.	
11	What was the result of blood culture?	1. negative 2. positive 3. None(not done)	

12	What type of management was given to neonatal hyperbilirubinemia for the neonate?	1. photo therapy 2. blood transfusion 3. both phototherapy and exchange blood transfusion 4. other ____	
13	Condition at discharge	1. improved 2. expired 3. referred 4. other(specify)	

Appendix III: Curriculum vitae

1. Background information.

Full name: Mohamed abdirahman shukri

Sex: male

Date of birth: 1887E.C

Nationality: Ethiopian

Age: 25 years

Marital status: married

Address: Harar

Email:dr.barud@gmal.com

Tell: +251915103314

2. Educational back ground

No	Name of school	Place	Grade	Year in E.C
1	Omer primary School	Jigjiga	1- 8	1994-1998
2	Jigjiga secondary School	Jigjiga	9 – 12	1999-2002
3	Haramaya university	Harar ,Eastern Ethiopia	Medical doctor	2003-2009

3. Qualification

General practitioner (medical doctor)

4. Working Experiences

Karamara general Hospital as general practitioner in pediatric ward from 2009-2010

5. Language Skills

No	Language	Listening	Reading	Speaking	Writing
1	Afaan Oromo	Good	Good	Goog	Good
2	English	Excellent	Excellent	Excellent	Excellent
3	Amharic	Good	Good	Good	Good
4	Somali	Excellent	Excellent	Excellent	Excellent

6. References

Dr.ahmed (pediatrician, MPH) nkaramarageneral Hospital Staff.

Dr.Harrago (pediatrician) karamara general Hospital Staff.

Appendix IV: Approval sheet

HARAMAYA UNIVERSITY

POST GRADUATE PROGRAM DIRECTORATE

Submitted by:

_____	_____	_____
Name of Student	Signature	Date

Approved by:

1. _____	_____	_____
Name of Major Advisor	Signature	Date
2. _____	_____	_____
Name of Co-Advisors	Signature	Date
3. _____	_____	_____
Chairman, DGC/ SGS	Signature	Date
4. _____	_____	_____
PGPD	Signature	Date