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THE PREVALENCE OF NEONATAL JAUNDICE AMONG BABIES BORN AT MPILO CENTRAL HOSPITAL, BULAWAYO FROM 1 JANUARY 2022 TO 31 DECEMBER 2022

By

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A DISSERTATION IS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF BACHELOR OF MEDICAL LABORATORY SCIENCES (HONORS) IN THE COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES, AFRICA UNIVERSITY

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Abstract

Neonatal jaundice is a common preventable and treatable condition affecting babies, causing skin and eyes to turn yellow due to elevated blood bilirubin levels. In 2022, 38.5% babies at Mpilo Central Hospital were tested for neonatal jaundice, indicating the need for better treatment to prevent brain damage in neonates. The study objectives were to determine the prevalence of neonatal jaundice in babies born at Mpilo Central Hospital, identify risk factors associated with neonatal jaundice and to find out the strategies to reduce neonatal jaundice. The study employed a retrospective descriptive research design and convenience sampling technique was used to select 364 records of babies with neonatal jaundice. Data were collected using a checklist in form of an Excel sheet comprising columns for the date the test was done, patient identification number, patient's age, unconjugated bilirubin, conjugated bilirubin and Total serum Bilirubin. The collected data were analysed using SPSS software. The study results showed that the prevalence of neonatal jaundice was 47.8%, with female babies constituting 46% while male babies accounted 49.2%. The finding reveals that the majority of the babies with neonatal jaundice are males (49.2%), full-term babies (48.0%) and had no evidence of infection (47.5%). Babies of a significant number (25%) mothers of a mixed race and a large number (43.9%) from rural areas developed neonatal jaundice. The findings suggest that any baby is prone to neonatal jaundice irrespective of race or place of residence of the mother. Significant correlation risk factors were gender (p=0.003), mode of delivery (p=0.37), term (p=0.13) and infection (p=0.178). The results reflected a high prevalence of neonatal jaundice with risk factors predominantly being maternal demographics and neonatal clinical presentation. The study results showed that after initial phototherapy treatment, the number of babies with neonatal jaundice decreased from 47.8% to 4.1%. The finding confirms that phototherapy effectively reduces neonatal jaundice. However, babies who had phototherapy after the first test trial were few owing to financial constraints. It is, therefore, imperative that the Government financially supports the mothers with newly born babies in need of clinical tests and treatment as regards to neonatal jaundice. It is also recommended that further research be conducted to find effective preventive measures and new treatments to manage babies with neonatal jaundice.

Key words: Neonate, neonatal jaundice, risk factors, bilirubin

Declaration

I declare that this research is my original work except where sources have been cited and acknowledged. The work has been never submitted, nor will it ever be submitted to another university for the award of a degree.

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List of abbreviations

AU:	Africa University
AUREC:	Africa University Research and Ethics Committee
CFR:	Care fatality rate
CHANS:	College of Health, Agriculture and Natural Sciences
DLS:	Diagnostic Laboratory Services
ET:	Exchange transfusion
G6PD:	Gluco-6-phosphate dehydrogenase
NNJ:	Neonatal jaundice
SCBU:	Special Care Baby Unit
TSB:	Total serum bilirubin
UNICEF:	United Nations Children's Fund
WHO:	World Health Organisation

Definition of terms

Conjugated bilirubin:	Conjugated bilirubin is the form of bilirubin that has been conjugated with glucuronic acid and is excreted in the bile. The metabolite's measurement aids in the diagnosis and surveillance of numerous illness states linked to elevated bilirubin. Another name for this is direct bilirubin (Chowdhury & Chowdhury, 1983).
Hyperbilirubinemia:	Hyperbilirubinemia refers to elevated serum bilirubin levels above the reference range <180μmol/L, and it is due to disorders of bilirubin metabolism. It is further classified as classified as unconjugated (indirect) or conjugated (direct) hyperbilirubinemia (Hedayati, Rahman, & Ullah, 2016).
Neonatal jaundice:	Neonatal jaundice is a condition characterized by the yellow coloration of the skin and sclera in newborns as a result of the accumulation of unconjugated bilirubin (Ansong-Assoku, Shah, & Adnan, 2023).
Neonates:	Neonates are newborn babies who are under 28days old (WHO, 2024).
Unconjugated bilirubin:	Unconjugated bilirubin is a form of bilirubin that is albumin-bound and usually results from increased production, impaired hepatic uptake, and decreased conjugation of bilirubin. Due to it not being expelled from the body, it accumulated thus causing unconjugated hyperbilirubinemia. This is also known as indirect bilirubin (Chowdhury & Chowdhury, 1983).

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CHAPTER 1: INTRODUCTION

1.1 Introduction

Neonatal jaundice, also called neonatal hyperbilirubinemia, is a common condition in babies in which the skin and eyes turn yellow as a result of elevated blood bilirubin levels. It develops during the lysis of red blood cells. Due to their immature livers' inability to properly process bilirubin, newborns frequently develop jaundice. Within the first week of life, jaundice is thought to affect 60% of full-term babies and 80% of preterm babies (Ansong-Assoku, Shah & Adnan, 2023). Symptoms of neonatal jaundice typically appear within a few days after birth and may include, yellowing of the skin, starting from the face and progressing downward to the chest, abdomen, and extremities, yellowing of the eyes, pale-colored stools, and dark urine.

As the baby's liver develops and becomes more adept at processing bilirubin, the majority of cases of neonatal jaundice are benign and go away on their own and this condition is referred to as physiological jaundice. Occasionally, bilirubin levels can increase to the point where medical intervention is necessary (hyperbilirubinemia) (Kainat, 2023). Excessive bilirubin levels can be harmful to the brain and cause kernicterus, a condition that can cause long-term neurological damage if left untreated. As a result, it Is critical to appropriately monitor and treat newborn jaundice. This chapter addresses the background to the study, problem statement, purpose of the study, study objectives and research questions. The significance of the study, delimitations and limitations of the study are also presented.

1.2 Background to the study

Neonatal jaundice has been described as a "global disease burden" since it has been recognized as one of the leading causes of neonatal fatalities worldwide (Kahiya, Yacoubou, Mahaman & Maibouge, 2023). Newborn hospital admissions for this reason are among the most frequent ones. It is a symptom or expression of a condition that is typically characterized by the

yellowing of the lips, eyes, and skin rather than an illness in and of itself. During the first week of life, most cases of newborn hyperbilirubinemia can be corrected as the liver grows (Bolajoko, Michael & Thor, 2018). Nonetheless, it has been determined that the main cause of admissions and readmissions during the neonatal period is hyperbilirubinemia or elevated bilirubin. A common side effect of hyperbilirubinemia is kernicterus, a bilirubin-induced brain dysfunction that has negative medical, financial, and social effects on patients, families, and communities (Grosse, Prosser & Botkin, 2019). Numerous maternal and neonatal risk factors, such as ABO incompatibility, preeclampsia, G6PD deficiency, preterm birth, birth weight, metabolic disorders, neonates' birth weight, and nutrition, have been related to newborn jaundice. This condition, which affects 1/2500 live births worldwide, should be checked on all newborns who exhibit jaundice, light stools, and black urine.

Globally, (Sumangala & Vijaykumar, 2017)) found that 60% of term newborns exhibit clinical jaundice symptoms during the first week of life, with 80% of those babies being preterm. Exchange transfusions and intense phototherapy are typically used concurrently, with the babies' responses varying. Compared to other developed continents like America, Southeast Asia, Europe, and the Western Pacific, the prevalence of neonatal jaundice in Africa is higher at 667.8/100,000 live births (Assefa, et al., 2023). High neonatal mortality rates are caused by the effects of jaundice in low- and middle-income countries. According to research by Aagard, Chimhuya, Mbuwayesango & Nathoo (2018), 50% of the burden of neonatal jaundice is attributable to nations like Nigeria, China, India and the Democratic Republic of the Congo. According to earlier research, Zimbabwe has a high neonatal mortality rate of 24 per 1000 live births. Mpilo Central Hospital is one of the facilities in Bulawayo where expectant mothers receive care. There is a lack of information regarding the extent of the neonatal jaundice burden at Mpilo Central Hospital, which is why this study was necessary.

1.3 Problem statement

Table 1.1: Number of babies delivered at Mpilo Central Hospital who developed neonatal jaundice from 1 January 2022 to 31 December 2022

Period	Gender	Total number of babies born	Babies who developed neonatal jaundice	Percentage of babies who developed neonatal jaundice (%)
January 2022 to December 2022	Males	454	182	40.1
	Females	391	143	36.6
	Total	**845**	**325**	**38.5**

Source: Diagnostics Laboratory Services Laboratory Information Management System (DLS LIMS), Bulawayo, (2022).

From January 2022 to December 2022 a total of 845 babies were born at Mpilo Central Hospital and were tested for neonatal jaundice with 454 being males and 391 females. A substantive number of 182 (40.1%) males and 143 (36.6%) females developed neonatal jaundice. A total of 325 (38.5%) babies born at the hospital developed neonatal jaundice. The statistics reveal that a significant number of babies delivered at Mpilo Central Hospital develop neonatal jaundice. Jaundice can cause brain damage in a neonate if not treated. Hence the investigator was prompted to determine the prevalence of neonatal jaundice among babies delivered at Mpilo Central Hospital.

1.4 Justification of the study

Given that neonatal jaundice is a preventable and treatable condition with high global rates, improving patient management has become a top priority in the healthcare industry in an effort to monitor and lower the disease's morbidity, mortality, treatment costs, length of hospital stay and treatment regimens. Understanding the patterns of neonatal jaundice—whether they are centralized geographically or are due to other causes is essential. Many people are unaware of

the risks associated with neonatal jaundice and there are inadequate health facilities that provide little support to Zimbabwe's impoverished citizens in terms of medication and pre-pregnancy testing such as screening, high costs for TSB monitoring and other tests due to the fact that each test has a set cost, to name a few. Therefore, the primary goal of this research was to contribute to the understanding of the prevalence and risk factors of neonatal jaundice. In Zimbabwe, particularly in Bulawayo, the second capital city, there is a dearth of information regarding the prevalence and risk factors that are linked to neonatal jaundice. This research would help monitor the rate of newborn jaundice in Zimbabwe and increase public and medical personnel awareness of the need to treat it as seriously as other health concerns. The study results would also assist governments in creating budgets that help hospitalized mothers pay for TSB tests on time. Many mothers are compelled to stay in hospitals for an extended period of time because they lack the funds to pay for the tests that their babies require. The study results would either strengthen or improve the training curricula for Medical Laboratory scientists at all levels. Furthermore, the information from this study would enhance health education to mothers on the importance to have their babies with neonatal jaundice tested for TSB on time. The study results would also be used as a spring board for further researches related to neonatal jaundice.

1.5 Research objectives

1.5.1 Broad Objective

The purpose of the study was to determine the prevalence of neonatal jaundice for babies born at Mpilo Central Hospital in Bulawayo in the year 2022.

1.5.2 Specific Objective

1. To determine the prevalence of neonatal jaundice among babies born at Mpilo Central Hospital in the year 2022.

2. To determine the risk factors associated with neonatal jaundice among babies born at Mpilo Central Hospital in year 2022.
3. To find out the strategies that can be implemented to reduce the risk of neonatal jaundice among babies among babies born at Mpilo Central Hospital.

1.6 Research Questions

1. What was the prevalence of neonatal jaundice among babies born at Mpilo Central Hospital in the year 2022?
2. What were the risk factors associated with neonatal jaundice among babies born at Mpilo Central Hospital in the year 2022?
3. What are the strategies that can be implemented to reduce the risk of neonatal jaundice among babies born at Mpilo Central Hospital?

1.7 Delimitations of the study

This study was carried out at one location, Mpilo Central Provincial Hospital on Special Care Baby Unit (SCBU) on 364 hospital records of babies with neonatal jaundice and the results were extrapolated and generalized. This might not be a true representation of the prevalence of neonatal jaundice among newborns. The investigator was a novice in research who developed the data collection tool (checklist) and used it for the first time. The study results might not be accurate and detailed, which might have distorted the study results despite pretesting the instrument for reliability and validity. Convenience sampling method was used to select the records which were included in the study. This sampling method has an element of bias.

1.8 Summary of the chapter

This chapter presented the introduction, background information to the study, problem statement, justification of the study, objectives and research questions. The delimitations and limitations of the study were also highlighted. The next chapter addresses the literature review.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

A literature review summarizes the state of the art in a particular subject matter by dissecting the body of extant literature in that discipline. By combining previous and current assessments, it is feasible to pinpoint areas that can benefit from more research. Paragraphs in the literature review should flow naturally into research hypotheses and methods for a believable conclusion. Because of this, the literature review must stay targeted and steer clear of the more thorough, textbook-style approach (Rowley & Slack, 2004). This chapter addresses literature related to prevalence of neonatal jaundice, risk factors associated with neonatal jaundice and strategies that can be implemented to reduce the risk of neonatal jaundice.

2.2 Prevalence of neonatal jaundice

The World Health Organisation (WHO) found neonatal jaundice to be part of the contributors of high neonatal morbidity rate. According to Sumangala & Vijaykumar (2017), 80% of preterm babies and 65% of term babies will exhibit clinical signs of jaundice during the first week of life. If a new-born's TSB is greater than the 95th centile (>190μmol/L or >2.147mg/dL) for their age within the first 24 hours they are considered to have neonatal hyperbilirubinemia and need to be treated and monitored closely. A report from UNICEF (2023), noted jaundice as a major contributing factor in the high number of new-born deaths in 2021, accounting for 2.3 million of the deaths in the first month of life, or roughly 6,400 per day.

In Zimbabwe, the neonatal mortality rate for 2021 was noted at 25 deaths per 1000 live births, with neonatal sepsis which is linked to hyperbilirubinemia causing 14% of these deaths (Knoema, n.d.). While mild jaundice in new-borns is considered normal, severe jaundice poses a serious risk of irreversible brain damage. With 20 of its countries having the highest risk of neonatal jaundice, Africa has emerged as the hotspot for the condition. Unless significant

changes are made regarding the way that obstetricians and paediatricians treat sick newborns, there may be a sudden rise in the frequency of the newborns experiencing significant jaundice.

Neonatal jaundice is a common paediatric problem in West Africa, which has become a condition associated with high morbidity and mortality worldwide. Nigeria, a country facing development discrepancies, faces challenges with the high neonatal jaundice prevalence and an increase in neonates with cerebral palsy (Aliyu, Masur, Nathan, Wasagu & Idowu, 2011).

2.3 Risk factors associated with neonatal jaundice

Several factors can increase the risk of developing severe neonatal jaundice. These risk factors can vary and may include the following: premature birth, birth weight, neonatal gender, ABO incompatibility, infections and delivery method. However, the common causes of neonatal hyperbilirubinemia include physiologic hyperbilirubinemia, breastfeeding and pathologic hyperbilirubinemia due to hemolytic disease of the newborn as well as liver dysfunction. According to research conducted in Nigeria by Aliyu, Masur, Nathan, Wasagu & Idowu (2011), the above risk factors have played a vital role in the manifestation of neonatal jaundice with the prevalence being extremely high. Premature birth puts the newly born babies at risk of developing jaundice as the liver which takes part in the breakdown of bilirubin would not have fully matured yet. Due to the immature liver, the newborn also has a higher rate of red blood cell breakdown.

When a mother's blood type differs from that of her child, this condition is known as blood type incompatibility, such as Rhesus (Rh) incompatibility or ABO incompatibility. Elevated bilirubin levels can occur when the baby's red blood cells are attacked by the mother's antibodies. Between 15 and 20 percent of pregnancies result in the mother and foetus' ABO blood groups not matching (Felc, 2001). This occurs when the mother has blood group O and the neonate has blood type A or B. After 72 hours following birth, neonates whose mothers

belong to the O blood group should be released from close observation. However, it is not advisable to routinely screen neonates whose mothers belong to the O blood group.

It has also been observed that there is a higher chance that a sibling may get severe jaundice in the future if a prior sibling did. An accelerated rate of red blood cell breakdown and raised levels of bilirubin might result from trauma or bruises sustained during delivery, including internal bleeding (Schneider, 1986). Unsatisfactory intake during exclusive breastfeeding may occasionally result in high bilirubin levels. Prolonged jaundice can also be caused by breast milk jaundice, a condition in which certain chemicals in breast milk prevent the body from eliminating bilirubin. Neonatal jaundice is a serious risk for newborns who are not breastfed because the β glucuronidase in breast milk accelerates the breakdown of conjugated bilirubin to unconjugated bilirubin in the intestine. Normal bilirubin metabolism may also be inhibited by lipoprotein lipase and non-esterified fatty acids found in breast milk. Dehydration and increased enterohepatic circulation caused by low breast milk supply, which could be the result of delayed milk production or formula intake, led to an increase in bilirubin concentration (Schneider, 1986).

Individuals with specific medical problems, such as hypothyroidism or glucose-6-phosphate dehydrogenase (G6PD) deficiency, may experience severe jaundice more frequently. G6PD deficiency should be looked at in infants with severe jaundice who come from a family with a history of significant jaundice or from an area where G6PD is connected. It's important to keep in mind that a newborn with one or more of these risk factors does not necessarily have severe jaundice (Hedayati, Rahman & Ullah, 2016).

A Kenyan study by Simiyo (2003) at a paediatric referral centre reported that a total of 306 neonates were admitted in the year 2000 and 106 (34.4%) of them were diagnosed with neonatal jaundice. Of the 106 neonates 22 of them died giving a case fatality rate (CFR) of

22.7%. Eight years later, another Kenyan study at a different hospital reported an incidence of 14.3%. These and many other studies have shown that neonatal jaundice will forever be there in other places. Geographical locations also contributed to the factors that led to the high incidence rate. Chiara, et al. (2016) showed how these geographical locations affect the incidence rates of neonatal jaundice even in the same country, Kenya. Zimbabwe, a developing country faces these challenges as 60% of the population resides in rural areas where less information on neonatal jaundice is available to mothers (Care, 2017). Awareness of neonatal jaundice to these people is either little or none. Lack of effective phototherapy units in some facilities especially those health institutions that are not capable of providing intensive radiance contributes to the incidence of severe neonatal jaundice. Although sunlight therapy is utilized in such incidences, it is most effective for those with mild to moderate hyperbilirubinemia. Lack of affordable medical facilities may force families to resort to improper medical practices or to travel long distances to get treatment and tests (World Bank Zimbabwe, 2016).

2.4 Strategies that can be implemented to reduce the risk of neonatal jaundice

Neonatal jaundice cannot be prevented from happening even if we do not want to. However, it can be treated in order for the baby to not get severe neonatal jaundice which is kernicterus leading to increased mortality rates. Neonatal jaundice treatment options include exchange transfusion, feeding, and phototherapy, which involves exposing the infant's skin to specific blue lights to help break down bilirubin into a form that can be easily excreted in the urine and stool (UNICEF, 2022).

When an infant's blood has excessive amounts of bilirubin and/or antibody-coated red blood cells, an exchange transfusion (ET) is performed to replace the blood with a new donor. It is recommended when hyperbilirubinemia persists at elevated levels even after rigorous phototherapy, and it is especially helpful in cases of severe hemolysis. While hemolysis is the primary cause of hyperbilirubinemia in infants requiring ET, inadequate feeding, delayed

hospital presentation, early maternity ward discharge without establishing appropriate breastfeeding, and under-recognition of jaundice by parents are also significant contributing factors (Atasay, et al., 2021).

When an infant's blood bilirubin level is five times higher than their body weight, jaundice becomes deadly. One of the safest and most efficient ways to treat new-born jaundice is phototherapy. Fluorescent lights, tungsten halogen bulbs, LEDs, optical cables, and other components are used in these devices. Our blood's bilirubin responds to blue and green light. In situations of severe new-born jaundice, treatment with blue light phototherapy is required to prevent morbidity and mortality. Because the blue light breaks down bilirubin in the blood, the excess bilirubin can be expelled by the baby before it builds up and causes irreversible brain damage or death (UNICEF, 2022).

Other strategies that can implemented in order to reduce the risks of neonatal are enforced neonatal guidelines in the communities. These will help both the physicians and the parents working together to minimize the severe risks that can babies can experience from neonatal jaundice. McCarthy (2022) highlighted certain guidelines that can be implemented to reduce the risks of neonatal jaundice such as ensuring that the mother’s blood type and antibodies have been tested. In case there is a worry, the newborn must also be thoroughly examined of all potential causes of jaundice, including the mother's blood type, gestational age, history of bleeding, bruising, the early onset of jaundice, and other variables. After 24 to 48 hours of life or sooner, if the baby appears jaundiced or is returning home earlier, the total serum bilirubin levels have to be checked (McCarthy, 2022).

Due to Zimbabwe's economic framework, it is impossible for parents especially those coming from the outskirts to finance such tests (World Bank Zimbabwe, 2016). Nonetheless, working in conjunction with pathology labs or nonprofit organizations that have operational equipment

and kits for the necessary tests needed by the baby may be useful. Since feeding is one of the causes contributing to newborn jaundice—babies are more likely to develop jaundice if they don't eat enough during their first three to five days of life, we can make sure that mothers receive appropriate assistance with feeding (Schneider, 1986). In addition to that, mothers can be taught the severity of neonatal jaundice before time to reduce panic.

2.5 Summary of the chapter

This chapter presented the introduction and the literature review in relation to the objectives that were presented in Chapter 1.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

Research methodology has been defined by Schwardt, (2007) as a theory guiding the conduct of an investigation. It entails dissecting the underlying presumptions, guidelines, and methods of a specific investigative methodology. This chapter provides an overview of the research approach that was employed to investigate the prevalence of newborn jaundice in neonates born at Mpilo Central Hospital in Bulawayo between January 1, 2022, and December 31, 2022. This chapter addresses the study population, research design, inclusion and exclusion criteria, sample size and sampling process, data processing and ethical considerations.

3.2 Research design

In this study the investigator used a retrospective descriptive research design. Retrospective research frequently necessitates the study of information that was initially gathered for purposes unrelated to research. In this study data were collected from the files of newborns admitted at Mpilo Central Hospital, Special Care Baby Unit (SCBU) at the Maternity ward for the year 2022. The design was ideal for this study as it described the prevalence of neonatal jaundice, risk factors associated with neonatal jaundice and strategies that can be implemented to reduce the risk of neonatal jaundice among babies among babies born at Mpilo Central Hospital. Keerthi & Mohit, (2020) pointed out certain drawbacks to this type of study design, therefore, the researcher was watchful and cognizant of them. For example, the investigator used data that had already been collected for clinical diagnosis purposes; some variables that could have an impact on the result might not have been recorded at all and be used for research purposes.

3.3 Study setting

The study was conducted at Diagnostics Laboratory Service (DLS) for patients referred by Mpilo Central Hospital, Special Baby Care Unit. The DLS is located in Bulawayo on the campus of Mater Dei Hospital.

3.4 Study population

The study population were records of babies with neonatal jaundice.

3.4.1 Target population

The target population were records of babies with neonatal jaundice who were attended at Mpilo Central Hospital Special Care Baby Unit (SCBU).

3.5 Exclusion criteria

The following were not included in the study:

- Records of newborn babies attended at Mpilo Central Hospital Special Care Baby Unit who tested positive for neonatal jaundice at Diagnostic Laboratory Services before 1 January 2022 and after 31 December 2022.
- Records of all newborn babies attended at other health facilities who tested positive for neonatal jaundice at Diagnostic Laboratory Services from 1 January 2022 to 31 December 2022.

3.6 Inclusion criteria

The following were included in the study:

Records of all newborn babies attended at Mpilo Central Hospital Special Care Baby Unit who tested for neonatal jaundice at Diagnostic Laboratory Services from 1 January 2022 to 31 December 2022.

3.7 Sampling procedure

The investigator used a convenience sampling procedure to select the records of the babies with neonatal jaundice at Mpilo Central Hospital referred to Diagnostics Laboratory services from 1 January – 31 December 2022 for neonatal jaundice tests. The investigator understood that the sampling procedure of choice had an element of bias.

3.8 Sample size

The investigator used Fisher's formula below to calculate the sample size

$$SS = \frac{Z^2 \times p \times (1-p)}{c^2}$$

Where SS = sample size

Z = statistic for the level of confidence usually set as 1.96 (corresponds to the 95% confidence interval)

P = expected prevalence for neonatal jaundice at Mpilo Central Hospital in the year 2022 which is estimated at 38.5%. P will be a proportion of 0.385.

C = standard error at 0.05 for a 95% confidence interval

The minimum sample size for babies with neonatal jaundice was:

$$SS = \frac{1.96^2 \times 0.385 \times (1-0.385)}{0.05^2}$$

$$=364$$

Therefore, a sample size of 364 records of babies with neonatal jaundice was used in the study.

3.9 Data collection tools

A structured checklist was used in the form of an excel sheet to collect information from the records of the babies with neonatal jaundice at the Diagnostics Laboratory services. The tool

comprised the date the test was done, patient identification number, patient's age, Bu = unconjugated bilirubin, Bc = conjugated bilirubin and Total Serum Bilirubin (See Appendix A).

3.9.1 Pretesting of the instrument

The aim of the pre-test was to investigate whether the important components of the study were feasible and to test for validity and reliability of the instrument. The pre-testing of the instrument brought to light weaknesses that had to be addressed. Pretesting of the checklist was done at the Diagnostic Laboratory Services on 10 records of babies with neonatal jaundice referred from Mpilo Central Hospital SBCU. The results of the pre-test were not included in the main study.

3.10 Data collection procedure

Using the developed checklist, data were extracted from the Diagnostic Laboratory Services database and presented in an excel sheet. To ensure confidentiality, laboratory ID coding system was used instead of the patient names. The investigator collected the data in a closed private room to ensure privacy. The data were collected within 10 working days. The collected data were kept in a locked cabinet and later transferred into the investigator's computer with a password.

3.11 Data analysis

Relevant data were extracted from the DLS database that is being used at Diagnostics Laboratory Services and then transferred to an Excel data sheet. The results were summarized using the SPSS statistical package to calculate the statistical variables such as categorical variables, means and percentiles. The analysed data were presented in form of frequency tables and bar graph followed by narratives.

3.12 Ethical considerations

Ethical approval was obtained from the Africa University Research, Ethics Committee (see appendix E). Permission was obtained from the Chief Medical Laboratory Scientist at Diagnostic Laboratory Services to conduct the study using the data from the DLS database archives (see appendix D). To ensure confidentiality, serial numbers were used instead of the patients' names. All the collected information was kept on the investigator's computer which has a password. Since the data used were secondary information, informed consent from the participants was not be applicable because the investigator reviewed patients' records.

3.13 Summary of the chapter

This chapter presented the research design, study population, study setting, inclusion and exclusion criteria. The sample size, sampling procedure, data collection tool, data collection procedure, data analysis, dissemination of the study results and ethical considerations of the study were also highlighted.

CHAPTER 4: DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter presents the results of the study. The collected data were analysed using SPSS and were presented in the form of tables and bar graph followed by brief descriptions of the particular set of information presented.

4.2 Prevalence of neonatal jaundice

Table 4.1: Prevalence of neonatal jaundice from 1 January 2022 to 31 December 2023

	Frequency (N=364)	Babies who developed neonatal jaundice	Non jaundiced babies	Percentage of babies who developed neonatal jaundice (%)
Gender				
Females	163	75	88	46.0
Males	201	99	102	49.2
Total	**364**	**174**	**190**	**47.8**

Table 4.1 shows that from 1 January 2022 to 31 December 2022 female babies constituted 46% while male babies accounted 49.2% who developed neonatal jaundice. The total prevalence of neonatal jaundice was 47.8%.

Table 4.2: Prevalence of neonatal jaundice by demographic and clinical characteristics of baby

	Frequency **(N=364)**	Number of jaundiced babies **(n=174)**	Number of babies without jaundice **(n=190)**	Percentage of babies with neonatal jaundice
Age				
>7 days	283	143	140	50.5
<7 days	81	31	50	38.2
Mode of delivery				
Natural	324	137	187	42.3
Caesarean surgery	40	18	22	45.0
Term				
Full-term	300	144	156	48.0
Pre-term	64	30	34	46.8
Infection				
Absent	360	171	189	47.5
Present	4	3	1	75.0

Table 4.2 displays the neonatal risk factors associated with jaundice in relation to the demographic and clinical presentation of the babies. For the mode of delivery that was used, babies delivered via caesarean surgery had the highest prevalence of neonatal jaundice of 45% and those who had natural birth had neonatal jaundice with prevalence of 42.3%. Full term babies with neonatal jaundice had a higher percentage of 48% as compared to the pre term babies (46.8%) diagnosed with neonatal jaundice. The new born babies who did not present with an infection had a low prevalence of 47.5% as compared to ones who presented with an infection.

Table 4.3: Prevalence of neonatal jaundice by demographic characteristics of mother

	Frequency **(N=364)**	Number of jaundiced babies **(n=174)**	Number of babies without jaundice **(n=190)**	Percentage of babies with neonatal jaundice
Age				
>20	104	70	34	67.3
21 - 30	124	52	72	41.9
31 – 40	97	34	63	35.0
<41	39	18	21	46.2
Race				
Black	360	173	187	48.0
White	0	0	0	00.0
Mixed	4	1	3	25.0
Location				
Urban	266	131	135	49.2
Rural	98	43	55	43.9

Table 4.3 shows the prevalence of neonatal jaundice by the demographic characteristics of the mother. From the observed distribution of neonatal jaundice amongst the different maternal demographics shows that babies born from the mothers who were 20 years old and younger have the highest prevalence of 67.3%. Most babies were born from mothers aged 21-30 years presented with the second lowest prevalence rate of 41.9% and the ones from aged 31–40-years had he least prevalence rate of 35%. According to race, 48% of the babies with neonatal jaundice were black Africans while 25% were of the mixed race. A total of 266 babies were born to mothers residing in the urban area and of these 131 (49.2%) developed neonatal jaundice while the babies born to mothers from the rural areas who developed neonatal jaundice contributed 43.9%.

4.3 Risk factor associated with neonatal jaundice

Table 4.4: Chi square test for risk factors associated with neonatal jaundice (N=364)

	Number of babies with jaundice	Number of babies without jaundice	P-value Two sides	Pearson correlation
Gender				
Male	99(27.2%)	102(28.0%)	0.003	0.954
Female	75(20.6%)	88(24.2%0		
Age				
>7 days	143(39.3%)	140(38.5%)	0.233	<0.001
<7 days	31(8.5%)	50(13.7%)		
Mode of delivery				
Natural	137(37.6%)	187(51.4%)	0.37	0.477
C-section	18(4.9%)	22(6%)		
Term				
Full-term	144(39.5%)	156(42.8)	0.13	0.810
Pre-term	30(8.2%)	34(9.3%)		
Infection				
Absent	171(46.9%)	189(51.9%)	0.178	<0.001
Present	3(0.8%)	1(0.3%)		

Table 4.4 displays the association between the maternal and neonatal risk factors with neonatal jaundice. The demographic characteristics of the babies had a significant association between gender and neonatal jaundice ($p=0.003$). The age risk and infection had a high correlation significance of $p<0.001$.

4.4 Strategies to reduce neonatal jaundice

Neonatal jaundice is primarily controlled through phototherapy and breast feeding. Hospitals quarantine babies who come with newborn jaundice on their premises until the jaundice has been cleared from the system. The table below shows the prevalence of neonatal jaundice in relation to the test trials that were done.

Table 4.5: Strategies implemented to reduce severe neonatal jaundice

N=364

Gender	TSBT1(n=364)	TSBT2(n=98)	TSBT3(n=69)	TSBT4(n=34)
Male	99	55	29	11
Female	75	38	12	4
Total(N=364)	174(47.8%)	93(25.5%)	41(11.3%)	15(4.1%)

Table 4.5 shows that from the initial 364 babies, 174 babies presented with neonatal jaundice with a prevalence of 47.8%. From the first test trial there was a gradual decrease in the prevalence of neonatal jaundice. The second test trial was done after intense phototherapy and breast feeding and 93 babies were found to be jaundiced giving a prevalence of 25.5%. Forty-one babies then tested the third time and had a prevalence of 11.3% of neonatal jaundice. The fourth test trial had 34 babies tested with 15 presenting with neonatal jaundice giving a prevalence of 4.1%.

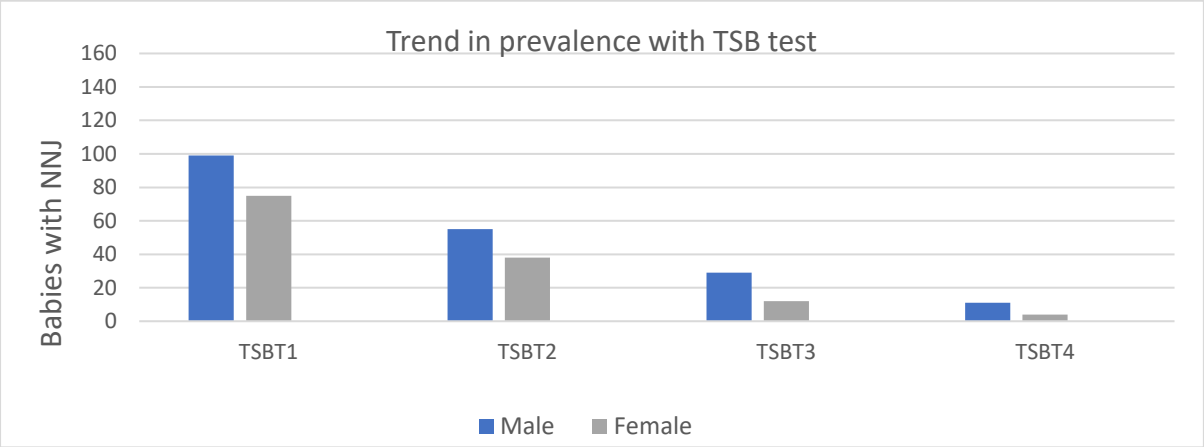


Figure 4.1*:* Trend in prevalence with TSB test N=364

Figure 4.1 shows the trend in the gradual decrease of the prevalence of neonatal jaundice with phototherapy treatment. Both female and male babies are showing a positive response to the phototherapy treatment with the number decreasing from the initial 174(47.8%) to 15(4.1%) babies with neonatal jaundice. However, the number did not drop to 0 as the babies had other medical conditions contributing to the slow responsiveness to phototherapy.

4.5 Summary of the chapter

This chapter presented the data that was presented in relation to the research questions in Chapter 1. The results revealed the prevalence of neonatal jaundice and the risks associated with neonatal jaundice as well as the strategies that can be implemented to prevent severe neonatal jaundice. The next chapter presents the discussion, summary, conclusions and recommendations that emanated from the study.

CHAPTER 5: DISCUSSION, SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the discusses the results presented in Chapter 4, summary, conclusions and recommendations of the study. It is supported by literature from past studies linked to the research problem.

5.2 Discussion

5.2.1 Prevalence of neonatal jaundice

In this study the prevalence of neonatal jaundice was as high as 47.8%, which is slightly less than what was revealed from the results of a study conducted in Nigeria by Aliyu, Masur, Nathan, Wasagu, & Idowu (2011), which reflected an estimated prevalence rate of 48% of neonatal jaundice among newly born neonates. Furthermore, a study from Bloemfontein, which supports this high prevalence number of neonatal jaundice illustrated that more than half, (55%) of the newborns developed neonatal jaundice. A research done in Kenya at a pediatric referral center, found that out of 306 newborns hospitalized in 2000, 106 (34.4%) had neonatal jaundice. The study findings confirm that neonatal jaundice will always exist in different settings, as demonstrated by these and several other studies, which is cause of concern.

5.2.2 Risk factors associated with neonatal jaundice

Chironda, Murekatete, Muteteli, & Nsengiyumva (2020) and Sumangala & Vijaykumar (2017) linked the risk factors to the demographic characteristics of both mothers and newborns to variations in neonatal jaundice throughout time. These included the neonate's race, gender, term at birth, mode of delivery, infection, and geographic location. In this study, a significant number (46%) neonates were female babies who developed jaundice compared to almost half (49.2%) male babies who had neonatal jaundice. This finding is consistent with Sumangala & Vijaykumar (2017) and Chironda, Murekatete, Muteteli, & Nsengiyumva (2020) who cited that

there is greater prevalence of neonatal jaundice among male babies than female babies.in males is consistent with. However, no research has been conducted yet to address any mechanism linking gender to neonatal jaundice.

Prematurity or preterm has contributed to neonatal jaundice as the baby would not have fully developed its liver to be able to conjugate the bilirubin in the body (Bolajoko, Michael, & Thor, 2018). Preterm babies have low activity of the bilirubin conjugating enzyme leading to excessive load of bilirubin in liver that it can conjugate due to its immaturity at birth as a result of hemolysis that could have occurred. This study's results showed that a big number (48%) of full-term babies developed neonatal jaundice with the preterm babies having neonatal jaundice constituting 46.8%. However, the close difference does not disprove the possible risk of preterm babies developing neonatal jaundice. A study conducted in India confirmed prematurity as a risk factor as most (60%) of the preterm babies developed neonatal jaundice (Sumangala & Vijaykumar, 2017). Assefa, et al. (2023) from Northern Ethiopia and Sumangala & Vijaykumar, (2017) from India linked neonatal infection/septicemia as a probable cause for the development of neonatal jaundice. However, for this study, only (0.8%) neonates developed septicemia. Therefore, this study cannot have a probable conclusion basing on these results.

This study showed that high prevalence (45%) of neonatal jaundice was common in babies born by caesarean surgery. Therefore, caesarean surgery can be implicated to neonatal jaundice. However, natural birth contributed to a high chance of neonates having a high prevalence of neonatal jaundice as evidenced by majority (89%) neonates who developed neonatal jaundice when they were born naturally. Although previous literature by Kahiya, Yacoubou, Mahaman & Maibouge (2023) revealed race being part of the risk factors associated with neonatal jaundice with the black race said to be protective against neonatal jaundice. This study found out that study population was predominately of black race with only 1% being of

the mixed race. This study finding suggests that being of the black race does not prevent babies from getting neonatal jaundice.

5.2.3 Strategies to reduce neonatal jaundice

The prevalence of neonatal n jaundice in this study was 47.8%, and all the infants who met the eligibility criteria for phototherapy treatment were unable to return for follow-up visits after discharge from the hospital. The study results (figure 4.1) demonstrated a progressive decline in the prevalence of neonatal jaundice from 47.8% down to 4.1% among babies following phototherapy. However, the number of infants admitted for phototherapy after the first test trial was notably smaller (25.5%), perhaps because they were not diagnosed or did not require additional testing before phototherapy owing to financial constraints. Breastfeeding was associated with neonatal jaundice by Grosse, Prosser & Botkin (2019), linking it with low calorie intake and dehydration. However, for this study, findings relating to breasting feeding was not reported because it was beyond the scope of this study.

5.3 Summary of the study

Neonatal jaundice is a common condition in babies and its symptoms usually show up a few days after delivery and include pale-colored stool, dark urine, and yellow colour of the eyes and the skin that starts on the face and spreads down to the chest, belly, and extremities. If left untreated, jaundice in neonates can harm their brains.

In the year 2022 a total of 845 babies were born at Mpilo Central Hospital and were tested for neonatal jaundice. A significant number (38.5%) babies born at the hospital developed neonatal jaundice, which prompted the investigator to conduct this study.

The purpose of this study was to determine the prevalence of neonatal jaundice among babies born at Mpilo Central Hospital in Bulawayo. The study objectives were to, determine the risk

factors associated with neonatal jaundice and to find out the strategies implemented to reduce the risk of neonatal jaundice among babies among babies born at Mpilo Central Hospital.

This study employed a retrospective descriptive research methodology and used data from Diagnostic Laboratory Services archives of babies admitted to the maternity ward at Mpilo Central Hospital's Special Care Baby Unit (SCBU) for the year 2022. Convenience sampling technique was used to 364 records of babies with neonatal jaundice.

Data from the selected records of the babies were collected using a checklist in the form of an Excel data sheet with columns for the date the test was done, patient identification number, patient's age, Bu = unconjugated bilirubin, Bc = conjugated bilirubin and Total Serum Bilirubin. The statistical software SPSS was then used to determine the frequencies, percentiles, and categorical variables, and chi square to summarize the results. The analysed data were presented in form of frequency tables followed by narratives.

The study results showed that the total prevalence of neonatal jaundice among babies born at Mpilo Central Hospital was 47.8%. The development of neonatal jaundice was significantly correlated with risk variables such as race (blacks, 48%) and birth technique (caesarean section, 45%). Although there was not enough data to draw a judgment, there may be an association between other risk factors, such as infection, and newborn jaundice. This observation demonstrated how little the laboratory was informed in terms of the clinical presentation of the babies, which made it challenging to thoroughly evaluate the findings.

The study results revealed a marked decline in the prevalence of neonatal jaundice from 47.8% down to 4.1% among babies following phototherapy. This finding confirms that phototherapy is effective in reducing neonatal jaundice. However, the number of infants admitted for phototherapy after the first test trial was notably small because they were either not diagnosed or did not have additional testing done before phototherapy owing to financial constraints.

Breastfeeding is reported to be associated with neonatal jaundice resulting from low calorie intake and dehydration by Grosse, Prosser & Botkin (2019). However, for this study, the finding related to breasting feeding was not reported because it was beyond the scope of this study.

In order to speed up the treatment preprocess and have babies discharged from hospitals, medical scientists can come up with new treatments and preventive measures that have no side effects and conduct further scientific research to try and link some of the risk factors with neonatal jaundice such as how gender is related to neonatal jaundice with the male gender being mostly affected than the females. It is imperative that the Government offers free blood investigations to the neonates in particular those with neonatal jaundice.

5.4 Recommendations

1. Government and public health organizations should arrange workshops and trainings for mothers regarding neonatal jaundice especially the ones from rural areas. The Government can further give financial assistance to mothers with newly born babies that need clinical tests and treatment as regards to neonatal jaundice.
2. Medical scientists need to conduct researches to find effective preventive measures and new treatments to manage babies with neonatal jaundice.
3. In addition, medical laboratory scientists should conduct further research to determine more risk factors associated with neonatal jaundice as evidence is scarce regardless of the statistical evidence being presented in studies.

5.5 Limitations of the study

The investigator was a student and was controlled by the University academic calendar, which might have influenced the study to be conducted hurriedly within the stipulated short duration. This might have distorted the study results.

5.6 Dissemination of the study results

The study report was given to the Diagnostics Laboratory Services Medical laboratory scientists. Another report was also provided as soft and hard copies to the Department of Biomedical and Laboratory Sciences in the College of Health, Agriculture and Natural Sciences (CHANS). A soft copy report was sent to the Africa University library.

5.7 Conclusions

The prevalence of neonatal jaundice is high and this study revealed it to be 47.8%. The study showed that neonatal jaundice had a significant relationship with factors such as gender, birth method, neonatal term, infection, race, and geographical location. Although newborns who presented with an infection and were of a black race had a higher risk of neonatal jaundice, the small sample size of this study hindered drawing valid conclusions. This study revealed that the birth method strongly related to the neonatal risk factors of jaundice was caesarean surgery having a high prevalence rate (45%) as compared to natural birth (42.3%). It is important to note that phototherapy strongly has a role in reducing neonatal jaundice.

References

Aagard, E. M., Chimhuya, S., Mbuwayesango, B., & Nathoo, K. J. (2018). Development of a neonatal curriculum for medical students in Zimbabwe - A cross sectional survey. *BMC Medical Education, 18*(90).

Aliyu, M., Masur, L., Nathan, H., Wasagu, R. U., & Idowu, A. A. (2011). Clinical investigation of neonatal jaundice. *Journal of clinical medicine and reaserch.*, 120-122.

Ansong-Assoku, B., Shah, S. D., & Adnan, M. (2023). *Neonatal Jaundice.* Treasure Island: StatPearls Publishing LLC.

Assefa, A. G., Berhe, M. K., Getchew, Z. R., Girmatsion, F., Haftamu, E., Hayat, M. M., . . . Zenawi, H. G. (2023). Neonatal Jaundice: Its Determinats Among Neonates Admitted to Neonatal Intensive Care Units Of Tigray Region General Hospitals, Northern Ethiopia. *Global Pediatric Health*. doi:10.1177/2333794X231190518

Atasay, B., Ciftdemir, N. A., Erdeve, O., Ertugrul, S., Okulu, E., Ozdemir, H., . . . Zenciroglu, A. (2021). Exchange Tranfusion for neonatal hyperbilirunemia: A multicenter, prospective study of Turkish Neonatal Society. *Turkish Archive of Pediatrics*, 121-126.

Bolajoko, O. O., Michael, K., & Thor, W. H. (2018, August 2). Neonatal hyperbilirubinemia: a global perspective. *Lancet Child Adolesc Health*, 610-620.

Care, M. O. (2017). *Zimbambwe Reproductive, Maternal, Nweborn, Child, Adolescent Health and Nutritional Strategy (2017-2021).*

Chiara, G., Gaston, A., Nem-Yum, B., Iman, F. I., Angelo, O. A., Rinawati, R., . . . Richard, W. P. (2016). Neonatal Jaundice in Low and middle Income Countries: Lesson and

Future Directions from the 2015 DOn Ostrow Triete Yellow Retreat. *Neonatology*, 172-180.

Chowdhury, J. R., & Chowdhury, N. R. (1983). *Conjugatin and excretion of bilirubin.* New York: Thieme Madical Publishers Inc.

Felc, Z. (2001). Haemolytic disease of the new born caused by rhesus isoimmunization (anti-c). *Eastern Maditerranean health journal.*, 1065-1069.

Grosse, S. D., Prosser, L. A., & Botkin, J. R. (2019, July 1). *Jama Peddiatr.* Retrieved from Sreening of Neonatal Hyperbilirubinemia: JAMA Pediatr. 2019 July 01; 173(7): 617–618. doi:10.1001/jamapediatrics.2019.1194

Hedayati, M., Rahman, K., & Ullah, S. (2016). Hyperbilirubinemia in neonates: Types, causes, clinical examinations, preventive measures and treatments: A narrative review article. *Iranian journal of public health*, 558-568.

Hedayati, M., Rahman, K., & Ullah, S. (2016, May). Hyperbilirubinemia in Neonates: Types, Causes, Clinical Examinations, Preventive Measures and Treatments: A Narrative Review Article. *Iran J Public Health, 45*(5), 558-658.

Jardine, L. A., & Woodgate, P. (2012). Neonatal Jaundice. *American Family Physician*, 824-825.

Kahiya, C. M., Yacoubou Mahaman, A. R., & Maibouge, S. M. (2023, April 20). *Prevalence of Neonatal Jaundice and its Associated risk factore in babies born at Westend Hospital in Harare, Zimbabwe.* Retrieved from socialmedicine.info.

Kainat, J. (2023). High Bilirubin Levels (Hyperbilirubinemia). *Health*. Retrieved from https://www.health.com/high-bilirubin-levels-6931060

Keerthi, T., & Mohit, G. (2020). Retrospective studies - utility and caveats. *J R Cioli Physicians*, 398-402.

Knoema. (n.d.). Retrieved from Worl Data Atlas: Neonatal mortality rate: https://knoema.com/atlas/Zimbabwe/Neonatal-mortality-rate

McCarthy, C. (2022). New guidlines on newborn jaundice: What Parents need to know. *Child & Teen Health*.

Paul, M., Lehman, E. B., Hollenbeak, C. S., & Maisels, M. J. (2006). Preventable newborns readmissions since passage of the Newborns and Mother's health. doi:https://doi.org/10.1542/peds.2006-2043

Rowley, J., & Slack, F. (2004). Conducting a literature review. *Management research news, 27*(6), 31-39.

Sana, U., Khaista, R., & Mehdi, H. (2016). Hyperbilirubinemia in Neonates: Types, causes, clinical examination, preventive measures and treatments: a narrative review article. *Iran J Public Health*, 558-568.

Schneider, A. P. (1986). Breast mill Jaundice in the newborn: A real entity. *JAMA*, 3270-3274.

Schwardt, A. T. (2007). *The SAGE Dictionary of Qualitative Inqury* (3rd ed.). University of Illinois Urbana-Champaign.

Sumangala, D. D., & Vijaykumar, B. (2017, January 6). Risk factors for neonatal hyperbilirubinemia: a case control study. *International Journal of Reproduction, Conception, Obstetrics and Gynnecology*, 198-201. doi:http://dx.doi.org/10.18203/2320-1770.ijrcog20164657

UNICEF. (2022). *Target Product Profile: Phototherapy Light- Jaundice management.* NEST360.

UNICEF. (2023, January). *Neonatal mortality*. Retrieved from UNICEF Data: data.unicef.org

WBZ. (2016). *Zimbabwe Economic Update: Results-based Financing of Health Clinics Helps Zimbabwe to Improve Service Delivery and Weather Economic Headwinds.* Harare: World Bank Zimbabwe.

Appendix A: Excel sheet for data collection

	A	B	C	D	E	F
1	**DATE**	**PATIENT ID**	**AGE(DAYS) WHEN TEST WAS DONE**	**Bu**	**Bc**	**TSB**
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						

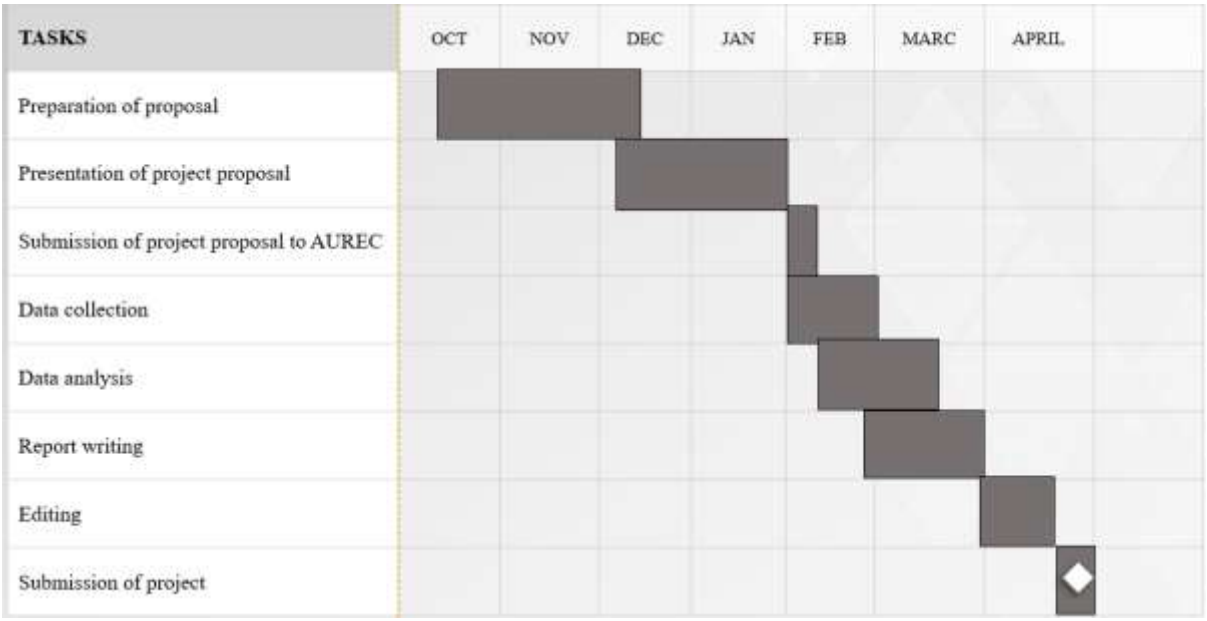
Patient ID = Laboratory number

Bu = unconjugated bilirubin (normal range ≤ 180µmol/L)

Bc = conjugated bilirubin (normal range ≤ 10µmol/L)

TSB = Total Serum Bilirubin (normal range ≤ 180µmol/L

Appendix B: Time frame



Appendix C: Budget

ITEMS	BUDGET
Stationary	$ 10.00
Transport fare	$ 70.00
Bond paper	$ 5.00
Airtime	$ 20.00
Printing	$ 5.00
Total	**$ 110.00**

Appendix D: Approval letter from Diagnostic Laboratory Services

DLS Diagnostics Laboratory Services
Commitment to Quality

Mater Dei Hospital
Burns Drive, Malindela
P.O.Box 2133
Bulawayo
Tel: +263 292 2411 32
+263 292 2411791

No 2 Fairbridge Avenue
Belgravia
Harare
Tel: +263 782500558

www.dls.co.zw

Date: 16 Nov 2023

From: DLS Lab Manager Nohlanhla Nyoni

REF: Approval to conduct Research study at DLS

Dear Sandile Ngwenya

This letter serves to grant you permission to conduct your research; **The Prevalence of Neonatal Jaundice and Associated Risk factors at Diagnostics Laboratory Services for the year 2022.** We permit you to collect the data from our system for the purposes of analysis of this information only.

Yours sincerely

Nohlanhla Nyoni (Laboratory Manager) Signature

Appendix E: Approval letter from AUREC

AFRICA UNIVERSITY
Investing in Africa's future

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320 Mutare, Zimbabwe, Off Nyanga Road, Old Mutare-Tel (+263-20) 60075/60026/61611 Fax: (+263 20) 61785 Website: www.africau.edu

Ref: AU3168/24

11 March, 2024

SANDILE NGWENYA
C/O Africa University
Box 1320
MUTARE

RE: **THE PREVALENCE OF NEONATAL JAUNDICE AMONG BABIES BORN AT MPILO CENTRAL HOSPITAL, BULAWAYO FROM 1 JANUARY 2022 TO 31 DECEMBER 2022**

Thank you for the above-titled proposal that you submitted to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following.

a) Research proposal

- **APPROVAL NUMBER** AUREC3168/24
  This number should be used on all correspondences, consent forms, and appropriate documents.
- **AUREC MEETING DATE** NA
- **APPROVAL DATE** March 11, 2024
- **EXPIRATION DATE** March 11, 2025
- **TYPE OF MEETING**: Expedited
  After the expiration date, this research may only continue upon renewal. A progress report on a standard AUREC form should be submitted a month before the expiration date for renewal purposes.
- **SERIOUS ADVERSE EVENTS** All serious problems concerning subject safety must be reported to AUREC within 3 working days on the standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.

AFRICA UNIVERSITY
RESEARCH ETHICS COMMITTEE (AUREC)
APPROVED
P.O. BOX 1320, MUTARE, ZIMBABWE

Yours Faithfully

MARY CHINZOU
ASSISTANT RESEARCH OFFICER: FOR CHAIRPERSON
AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE