

# **Evaluation of Knowledge and of effects of Haemolytic Disease of the Newborn amongst postnatal women in the public hospitals of the Umgungundlovu District**

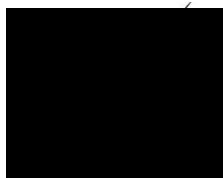
Submitted in fulfilment of the requirements of the degree of Master of Technology: Biomedical Technology in the Faculty of Health Sciences at the Durban University of Technology

By

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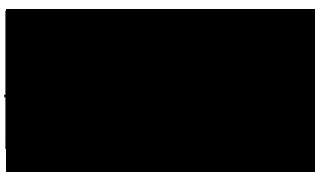
APRIL 2012

I Gugulethu Eve Khumalo hereby declare that the content of this project is my own unaided original work, except where specific indication is given to the contrary (by reference). This work has not been previously submitted to the Durban University of Technology or any other University.



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## **ABSTRACT**

The purpose of the study was to evaluate knowledge and effects of Haemolytic Disease of the Newborn (HDN) in postnatal women from the Umgungundlovu District. Although the prevalence of HDN has declined because of prophylaxis from 45 cases per 10,000 births to 10.2 cases per 10,000 births but it is still a cause of infant and neonatal morbidity and mortality. The effects of the disease range from jaundice, kernicterus and in severe cases death.

### **Methodology**

An interviewer-administered questionnaire was used to obtain information about the knowledge and effects of HDN amongst postnatal women. The incidence rate was calculated using the number of cases that were found divided by the total number of deliveries during the study period. A total of 300 women were interviewed. SPSS version 19.0 was used to analyse data.

### **Findings**

Fifteen (15) of the 300 women had babies with confirmed HDN and only four of the 15 (26%) women had knowledge of HDN. Two hundred and eighty five women had babies with jaundice but were not affected by HDN and, of these women, 12 (4.2%) of them knew what HDN was. Overall, only 16 (5.3%) knew what HDN was. All 15 women who had babies with HDN indicated financial and emotional effects because of HDN. The total incidence was 0.09% for the first 12 months of the study period.

### **Conclusion**

Postnatal women with jaundiced babies lack knowledge of HDN and HDN has financial and emotional effects on these women. Although the incidence rate of HDN was found to be even smaller than previously reported, it still exists and threatens the lives of infants and neonates.

## **DECLARATION**

The author hereby declares that the content of this project is the author's own unaided original work, except where specific indication is given to the contrary (by reference). This work has not been previously submitted to the Durban University of Technology or any other University.

**Signature:** \_\_\_\_\_

**Date:** \_\_\_\_\_

## **DEDICATION**

I would like to dedicate this work to:

- God my Father who helped me throughout this study, teaching me to trust Him more than I trust myself.
- My beloved family, especially my precious mother, Mrs Virginia Shezi, for all their words of love and encouragement.
- All the women that so willingly participated in the study.

## **ACKNOWLEDGEMENTS**

I am most thankful to the following people who participated in the study in which would never have been successful without their assistance:

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- Professor Henry Mwambi for assisting me with statistical methods and data analysis.
- The Unit Managers of the NICU and Nursery Wards at Greys, Edendale, Northdale and Appelsbosch Hospitals for allowing me access to the wards.
- The KwaZulu-Natal Department of Health for allowing me the opportunity and time to conduct the study.

## **RESEARCH DEFINITIONS**

1. Knowledge- the state of knowing by way of understanding or to be familiar with something. The study did not determine whether women had heard of the term HDN, but whether they understood the meaning of HDN.
2. Effects: The financial and emotional effects of HDN according to this study and the effects expected from these woman.
3. Health Care Worker (HCW) : In the context of this study, HCW refers to all qualified health workers that are involved in managing pregnant women and HDN, namely general doctors, midwives, nurses, staff-nurses, gynaecologists and obstetricians.

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# CHAPTER 1

## INTRODUCTION

### 1.1. Background to the study

Haemolytic Disease of the Newborn (HDN) is also called Erythroblastosis Fetalis (EF), the former being the condition in newborns and the latter the same condition in foetuses. The majority of HDN cases are from the Rhesus (Rh) and the ABO blood grouping systems. The pathology of the Rh factor caused HDN begins during pregnancy, where some of the mother's antibodies are transported across the placenta and enter the fetal circulation. This is necessary because, at the time of birth, newborns have under developed immune system which is assisted by the continual presence of maternal antibodies which ensures their survival while their immune system matures. A downside to this protection is that, by targeting fetal red blood cells (RBCs), maternal antibodies can also cause HDN. The severity of the disease is concomitant with the potency of the causative antibody in the maternal system. Rhesus D alloimmunisation remains a major problem despite the use of Anti-D prophylaxis and the disease can range in severity from being evident only in a laboratory test, to severe fetal anaemia, resulting in fetal hydrops, stillbirths or birth of babies with severe anaemia and jaundice (Govender & Moodley, 2005).

Pregnancies at risk of HDN are those in which an RhD negative mother becomes pregnant and has an RhD positive child. The mother then develops antibodies (Anti-D) against the baby's blood (RhD positive cells) as seen in Figure 1.

The other cause for HDN is the ABO antibodies that are naturally occurring in the maternal blood system (Anti-A and Anti-B) when a fetus has a different blood, type A, B, or AB (Drabik-Clary, Reddy, Benjamin & Boctor, 2006). In addition, in contrast to the Rh antigens, the ABO blood group antigens are

expressed by a variety of fetal (and adult) tissues (Drabik-Clary et al., 2006), reducing the chances of anti-A and anti-B binding their target antigens on the fetal RBCs.

HDN can also be less commonly caused by other antibodies from other blood group systems namely MNS, s, Duffy, Kidd and Kell.

All women attending the antenatal clinics in the public hospital facilities routinely submit blood samples to be tested for rhesus (Rh) and ABO blood grouping, in order to prevent HDN.

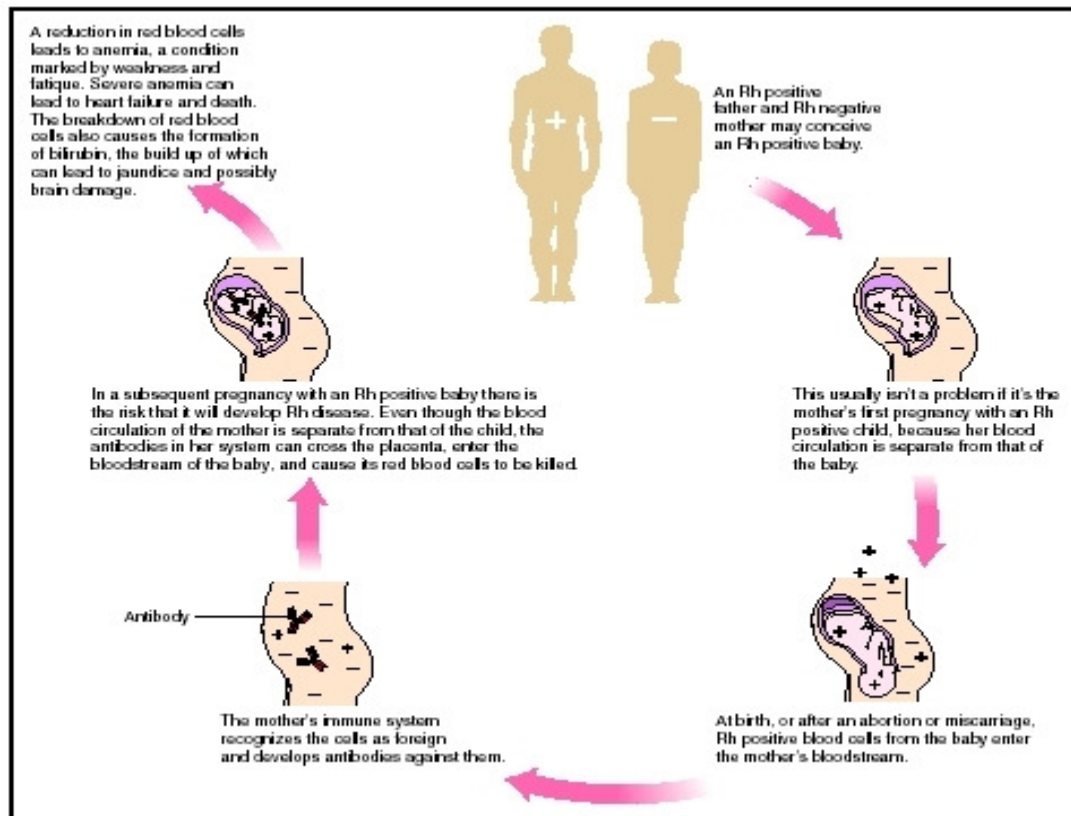
According to the Department of Health (2008), District Hospitals are supposed to refer patients that have complicated pregnancies (for example Rhesus negative woman who has potent antibodies prenatally and, therefore, baby at risk of HDN) to the Regional or Tertiary Hospitals. However, this does not always occur. Some women with complications have their babies delivered at the District Hospitals. This study was conducted at Northdale, Appelsbosch, Edendale and Greys Hospitals. Northdale and Appelsbosch Hospitals are District Hospitals, whilst Edendale is a Regional Hospital and Greys a Tertiary Hospital.

A patients' knowledge of the disease is more often attributed to the doctor-patient relationship, which ensures that the doctor passes on knowledge to the patient about any disease, its risks and medical procedures which has to be undertaken for that particular disease (Wagle, 2008). Besides the patient – doctor relationship, there is also a medical and legal pitfall of disclosing all the facts about the pathogenesis and prognosis of any disease that exists, which binds the doctors to explain in detail to every patient the risks and outcomes of a disease (Wagle, 2008). Costs of having a sick child in the family are underestimated (Gould, 2004). According to Langa (2004), both health services researchers and health care givers must recognise the often complex 'ripple effects' of an illness in the family.



The study will assume that postnatal women have a right to be informed by the relevant health care worker about the health of their babies and to be cautioned about what to expect at that point and in the future. The second assumption in this study is that the illness of the baby affects the mother financially and emotionally because of a possible extended length of stay in the hospital.

Data analysis was done in conjunction with a statistician. Given the nature of data accrued in the study, the data was summarized in the form of two-way contingency tables and graphs. Since the primary aim was to determine the association between individual and hospital specific variables and the knowledge of HDN and the effect of HDN on the mother, the chi-square statistic for association was used to test the association of explanatory variables (individually) to the response variables. Finally, estimation techniques were developed in order to estimate the incidence rate.



**Figure 1. Flow chart demonstrating how Rh disease is carried to fetus through mother** [source: <http://www.healthofchildren.com/E-F/Erythroblastosis-Fetalis.html>]

According to Harrison (2002:102), HDN still remains a cause of morbidity and mortality in neonates, particularly amongst Blacks.

The main aim of the study was therefore to evaluate knowledge and effects of HDN amongst postnatal women admitted in Public Hospitals in the Umgungundlovu district.

#### **The study objectives were:**

1. To determine the HDN incidence rate in the study hospitals.
2. To examine knowledge of HDN amongst postnatal women
3. To evaluate the effect of HDN (financial and emotional) on postnatal women. Financial and emotional effects are going to be evaluated.

The study's Null hypothesis ( $H_0$ ) is that most postnatal women have knowledge and understanding of HDN and that HDN does not have any financial and emotional effects on the affected women.  $H_0$  means the finding was found by chance.  $H_0$  is then assumed to be true until evidence is found to the contrary. If the evidence is just too unlikely given the null hypothesis, it is assumed that the alternative hypothesis ( $H_1$ ) is more likely to be correct.

Alternative hypothesis ( $H_1$ ) of the study is that postnatal women lack HDN knowledge and HDN has financial and emotional effects on the affected women.

## **1.2. Motivation for the study**

Very little is known about the extent of knowledge and the effects of HDN amongst postnatal women. There has been no study conducted in KwaZulu-Natal regarding the knowledge and effects of HDN amongst postnatal women affected and not affected by HDN.

Currently, there are limited HDN education protocols in KZN public hospitals for antenatal and postnatal women for example printed information in the form of booklets or information sheets and audio-visual presentations to improve patient knowledge about the disease. Such information would assist women in taking early precautions to seek medical assistance for possible early intervention. This can be initiated at the Family Planning Clinics and, thereafter, be followed up in the Antenatal Clinics.

The findings of the study are aimed to be used to raise awareness of the need for an appropriate policy that reflects best practice benchmarks in the education and management of HDN in public hospitals in the Umgungundlovu district, and hopefully will spread the awareness to other public health facilities.

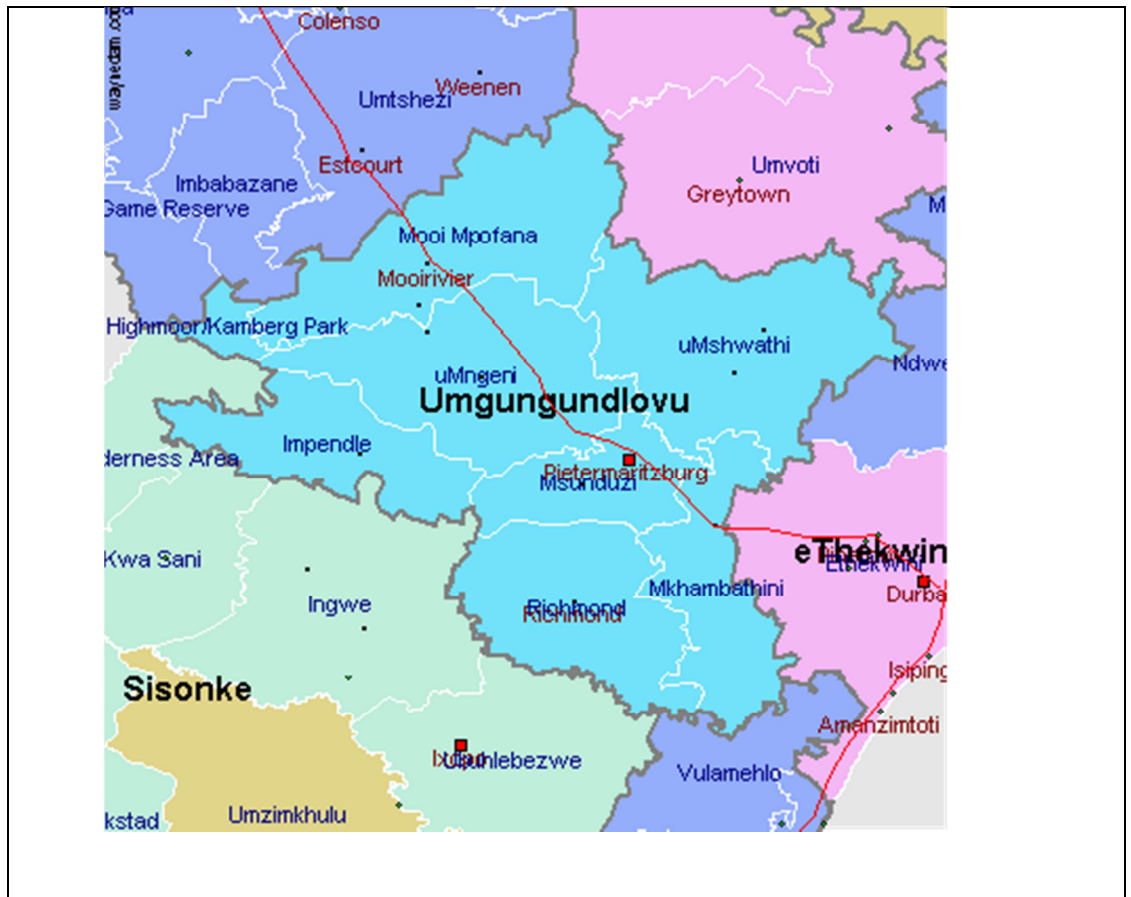
### 1.3. Glossary of terms

1. **Amniocentesis** —A procedure performed at 16-18 weeks of pregnancy in which a needle is inserted through a woman's abdomen into her uterus to draw out a small sample of the amniotic fluid from around the baby for laboratory analysis. .
2. **Amniotic fluid** —The liquid in the amniotic sac that cushions the fetus and regulates temperature in the placental environment. Amniotic fluid also contains fetal cells.
3. **Anaemia** —A condition in which there is an abnormally low number of red blood cells in the bloodstream, which may be due to loss of blood, an increase in red blood cell destruction, or a decrease in red blood cell production.
4. **Antibody** —A special protein produced by the body's immune system as a defence against foreign material (bacteria, viruses, etc.) that enters the body. It is uniquely designed to attack and neutralise the specific antigen that triggered the immune response.
5. **Antigen** —A substance (usually a protein) identified as foreign by the body's immune system, triggering the release of antibodies as part of the body's immune response.
6. **Bilirubin** —A reddish yellow pigment produced through the breakdown of red blood cells, and metabolised by the liver. When levels are abnormally high, it causes the yellowish tint to eyes and skin commonly known as jaundice. Levels of bilirubin in the blood increase in patients with liver disease, blockage of the bile ducts, and other conditions.
7. **Chorionic Villus Sampling (CVS)**: CVS is a prenatal test that detects chromosomal abnormalities such as Down syndrome, as well as a host of other genetic and immunological disorders. The doctor takes cells from tiny finger-like projections on the placenta called the chorionic villi and sends them to a laboratory for analysis. The main advantage of CVS over amniocentesis is that it can be done earlier, generally between 11 and 12

weeks of pregnancy, whereas amniocentesis can only be done at 16 weeks gestation period.

8. **Direct Antiglobulin Test (DAT)** – Also referred to as the Coombs test. A positive result of this laboratory test indicates the presence of immunoglobulin or complement (types of proteins) on the surface of the red blood cell. Th.
9. **Erythroblastosis** – When a mother is pregnant with a baby whose blood type is incompatible with hers, antibodies in the mother's blood may cross the placenta and attack the baby's red blood cells. This causes anaemia in the baby. If it is severe enough, it can cause the baby to die before birth.
10. **Haemolysis** -The process of breaking down of red blood cells. As the cells are destroyed, haemoglobin, the component of red blood cells that carries the oxygen, is liberated.
11. **Hydrops fetalis** —A condition in which a fetus or newborn baby accumulates fluids, causing swollen arms and legs and impaired breathing.
12. **Hyperbilirubinemia** —A condition characterized by a high level of bilirubin in the blood. Bilirubin is a natural by-product of the breakdown of red blood cells; however, a high level of bilirubin may indicate a problem with the liver.
13. **Jaundice** - Jaundice is a yellow discoloration of the skin, mucous membranes, and the whites of the eyes caused by increased amounts of bilirubin in the blood.
14. **Kernicterus**- It is a form of brain damage in newborns with jaundice because of excessive bilirubin in the blood. If bilirubin is excessive in the blood, it can move to the brain tissue causing kernicterus. The major symptom is that the newborn becomes too sleepy and difficult to wake up.
15. **Placenta** - The organ that provides oxygen and nutrition from the mother to the unborn baby during pregnancy. The placenta is attached to the wall of the uterus and leads to the unborn baby via the umbilical cord.

16. **Postnatal**- Of or occurring after birth, especially in the period immediately after birth extending to about 6 weeks.
17. **Red Blood Cells** – The blood cells that carry oxygen. They are made of haemoglobin, and are also known as erythrocytes.
18. **Rh factor** (RhD)—An antigen present in the red blood cells of 85% of humans. A person with Rh factor is RhD positive (Rh+); a person without it is Rh negative (Rh-). The Rh factor was first identified in the blood of a rhesus monkey and is also known as the rhesus factor.
19. **Rhesugam** (Ro) – Also called the Anti-D Immunoglobulin. Ro prevents the mother from producing anti-D antibodies by coating the red cells that enter the mother's circulation, and destroying them before they sensitise the mother's immune system. This must be done in the first pregnancy within 72 hours of the birth of the first baby.
20. **Sensitization** - The coating of cells with antibody as a preparatory step to some detectable reaction. In the case of HDN the reaction is haemolysis.
21. **Transplacental** - Passing through or occurring across the placenta.
22. **Umgungundlovu District** — The Umgungundlovu Health District is one of the 11 KwaZulu-Natal Department of Health Districts. It has a population of 995 303 (DHIS Estimate, July 2007) and comprises seven local authority areas. The District has 48 fixed clinics, 12 mobile clinics, 4 community health centres and 9 hospitals (Department of Health, 2012).



**Figure 2: Map showing Umgungundlovu** [source: <http://www.waynedam.com/southafrica/showdistrict.asp?district=DC22> by: Dam, W. 2012]

**23. Ultra Violet (UV) Light** - It is used in the treatment of physiological jaundice of the newborn, and in haemolytic disease of the newborn, the newborn is exposed to intense light (UV Light) in the blue-green part of the visible spectrum. Light of this particular frequency promotes the conversion of excessive and damaging bilirubin in the newborn's blood to water-soluble and harmless biliverdin.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1. Introduction**

This chapter is a review of the literature which is relevant to the current study. A literature review therefore entails more than a report of what you have read and understood. It requires a demonstration that one is knowledgeable about the field of study. The literature below details the incidence of HDN in KwaZulu-Natal (KZN) and other countries and what steps are carried out to manage the disease. This chapter also describes the effects of the disease. After an extensive search of previous studies conducted on HDN, no studies were found about the financial and emotional effects of HDN or about knowledge of HDN amongst postnatal women in KZN or in any other country.

HDN is now not as common and fatal like when it was first discovered more than 30 years ago because of improved disease management such as the introduction of Anti-D immunoglobulin in the UK in the 1970s which has reduced the incidents of HDN (Murray & Robert, 2007).

When a baby carrying an antigen inherited from its father and the mother has a corresponding antibody, the maternal antibodies can start attacking the fetal or infant cells causing HDN and the most common immunogenic antigens are of the Rhesus Blood Group System (Shamsi, Hossain & Paidas, 2010).



## **2.2. Incidence rates**

### **2.2.1. Rh HDN incidence rates**

After an extensive literature search, only one study mentioned the KwaZulu-Natal HDN incidence rate. This was a once off study conducted by Govender & Moodley (2005), at King Edward VIII (KEVIII) Hospital in KwaZulu-Natal. Out of the estimated 3 600 RhD negative pregnant women, 95 new cases of Rh sensitisation occurred (Govender & Moodley, 2005). This then estimates the HDN incidence rate to be 2.63 in 2005 for KEVIII hospital according to this study only. Govender and Moodley (2005) stated that it is estimated that only 16-17% of RhD negative women who deliver an Rh positive fetus will become alloimmunised if not administered with Anti-D immunoglobulin. According to them, the factors that affect the risk of alloimmunisation in a susceptible RhD negative woman include the volume of feta-maternal haemorrhage (FMH) and the degree of maternal immune response and the concurrent ABO incompatibility. This is also supported by the study done by Wagle (2008) that confirms that ABO incompatibility and compatibility will cause a 16% and 1-2% risk of and Rh alloimmunisation respectively.

Programmes like the HDN laboratory programme (tests for the presence of maternal significant antibodies) as mentioned in a South African study conducted by Hitzeroth and Brill (1996) from the South African Department of Health leads to better management of the disease and hence decrease incidence rate. In this study by Hitzeroth & Brill (1996) a number of pregnant women benefited from the programme and on average, about 0.77% of white women and 0.26-0.29% of those from all other groups were found to have clinically significant antibodies, the most important of which was anti-D (0.52% in whites; 0.11-0.16% in other groups). The mortality rate due to HDN in the non-black groups has dropped considerably (to about 50/100 000 live births for 1960-1965) to < 4 in 1990 (no data are available for blacks) (Hitzeroth & Brill, 1996)

In the United Kingdom (UK), 600–700 new cases of Rh sensitisation still occur each year. HDN occurs in about 9-10% of pregnancies in Canada, depending on race. The incidence in Canadians of Caucasian extraction is about 15%, 7% in Black Americans, and as low as 1% in North American Indians and Inuit (Beaulieu, 1993). According to Beaulieu (1993), HDN incidence depends on the number of women in a population who are RhD negative. In 2005 in the UK white population, 10% of the total births were at risk of HDN as they were RhD positive born to RhD negative mothers and out of the 10%, 1% would be sensitised that is, able to cause fetal or neonatal HDN (Beaulieu (1993).

Rh HDN has been reduced by Anti-D prophylaxis (Anti-D immunoglobulin) as also confirmed in the study by the Royal College of Obstetricians and Gynaecologists (2011) that it has fallen from 46/100 000 births before 1969, to 1.6/100 000 in 1990.

#### **2.2.2. ABO HDN incidence**

Also, no ABO incidence rate literature was found for KwaZulu-Natal or South Africa however the researcher found ABO HDN incidence rate on studies that were conducted in the United States of America. According to Drabik-Clary et al. (2006), HDN incidence ranges from 1:150 to 1:3000 births in the United States, ABO incompatibility affects 20% of pregnancies (Wagle, 2008) and, according to Harrison (2002:102), it is the commonest cause of haemolytic disease in the newborn, although very mild reactions result.

### **2.3. HDN Knowledge amongst postnatal women**

After an extensive literature search, the researcher found that there was no study conducted to evaluate knowledge of HDN amongst. In general patients' knowledge of any disease is attributed more to the doctor-patient relationship, thereby ensuring that the doctor passes on knowledge to the patient about any disease, its risks and medical procedures that are to be undertaken for that particular disease (Wagle, 2008).

## **2.4. Effects of diseases in general (emotional, financial)**

An extensive literature review revealed that there was no study conducted to assess the effects of HDN specifically although there are studies which have been conducted to assess or evaluate the effects or implications of other diseases. For example, a study conducted by Phillips, Stanton, Provan and Lew (1994) looked at the financial, social and psychological implications of leg ulcers on the quality of life. This study found that there were financial and psychological implications due to leg ulcers; which were all negative implications. A study by Devins, Binik, Hutchinson, Hollomby, Barne and Guttman (1984) looked at the emotional impact of end stage renal disease. The researchers' findings revealed that there were negative mood levels related to the disease. Williams, Skirton, Paulsen, Tripp-Reimer, Jarmon, Kenney, Birrer, Hennig and Honeyford (2009) conducted a study to evaluate the emotional experiences of family carers of Huntington disease and their findings indicated an association of emotional distress in caring for a sick family member. From the above studies, one can assume that the effects of a disease in a patient or on those that are carrying for the patient are mostly negative.

## **2.5. Management of HDN in public hospitals**

Like all other diseases, HDN in the public hospitals is managed by guidelines and if the guidelines are used effectively by the HCWs, the disease incidence and fatality will be minimal. The management of HDN in the public hospitals include Rh status testing, antibody testing, plasmapheresis and Anti-D immunoglobulin administration as also confirmed by the algorithm for HDN management (Govender & Moodley, 2005). Figure 3 below indicates the management of a woman who is already sensitised. Also coordination of medical experts is required as part of the disease management (Shamsi, Hossain & Paidas, 2010).

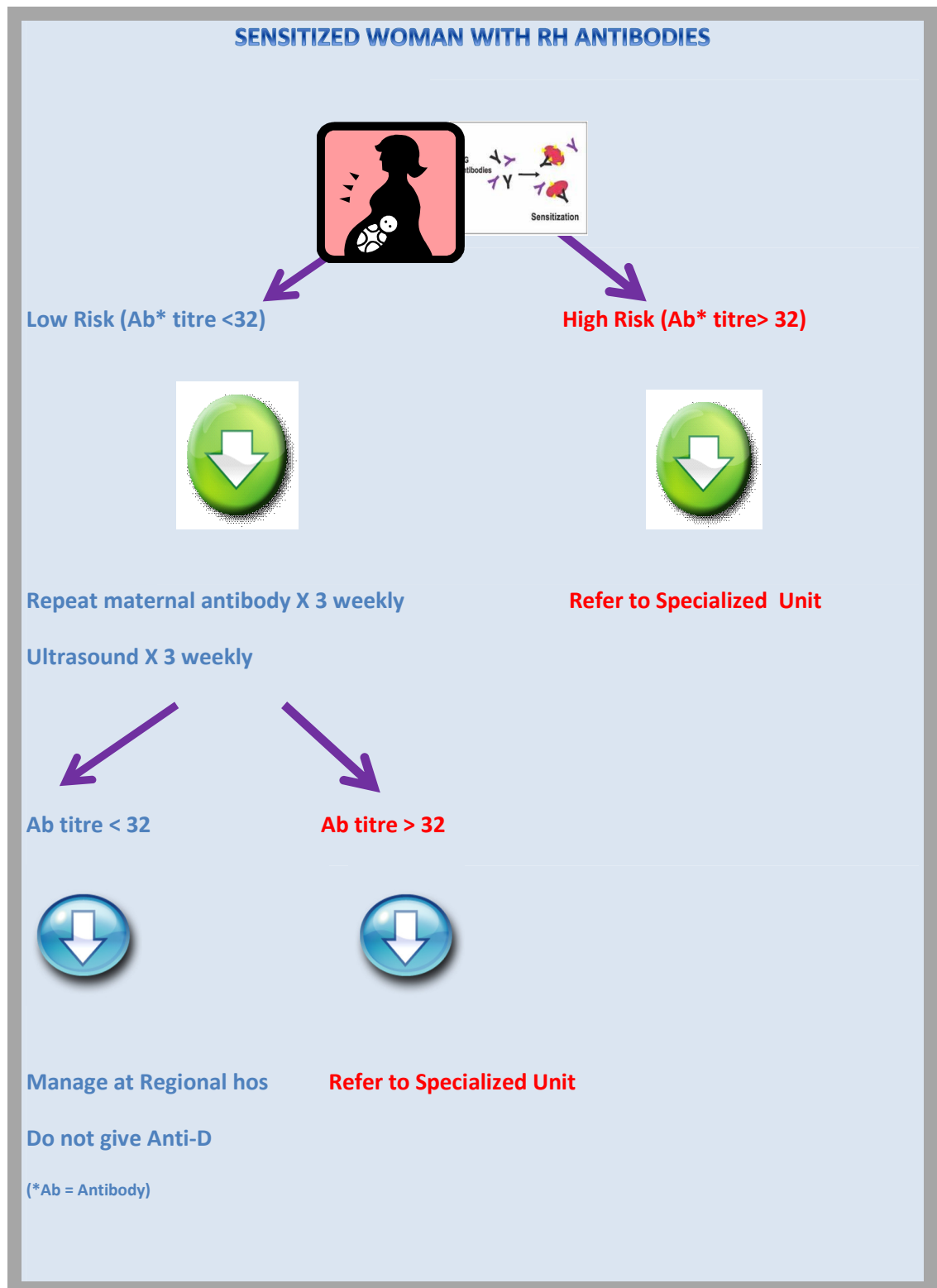


Figure 3. A diagram showing HDN management in a sensitized woman [with Rh Antibodies as shown in the Algorithm by Govender & Moodley (2005)]

According to the Department of Health Guidelines (2007) for management of Rh negative mothers, rapid rhesus (D) blood group testing is done on all pregnant women at the first antenatal visit, or at delivery in unbooked mothers. Rhesus-positive mothers need no further specific management. If a mother is rhesus-negative, blood is sent for antibody testing at 24, 32 and 36 weeks.

If the father of the baby is tested and also found to be rhesus-negative, no further management will be necessary, as the baby will then be rhesus-negative.

### **2.5.1 Laboratory tests**

Early detection of Rh negative blood type in pregnant women is of substantial benefit if the patient is not yet isoimmunised and the father is not known to be RhD negative. According to Dean (2005), the following tests must be conducted to detect and to prevent HDN.

The Coombs test (Richmond, 2006), the Direct Coombs test (DAT) and the Indirect Coombs test

A mother is also tested for potent antibodies and if no antibodies are found, Anti-D Ig is administered to the Rh negative mother at around 28 and 34 weeks gestation period and the last dose within 72 hours after birth (Dean, 2005; Department of Health Guidelines, 2007 & Govender & Moodley, 2005). Once the antibodies in the maternal blood have been confirmed, the baby's blood is tested to see if it is RhD positive which puts the baby at risk and if it is and is causing severe haemolysis, blood transfusion is done *in utero* to replace the haemolysed fetal RBCs

### **2.5.2 Phototherapy**

Kernicterus is one of the major concerns in an HDN affected infant because of the large amounts of bilirubin that have entered the brain tissue which can cause mortality so any increased amounts of bilirubin need to be decreased

before kernicterus start affecting the infant. Phototherapy, also known as UV Light Treatment is one of the treatments used to decrease bilirubin levels and according to Maurer, Kirkpatrick, McWilliams, Draper & Bryla (1985), is an effective treatment for affected infants with jaundice if treatment is continued for 96 hours or more. As effective as phototherapy can be, it cannot be used as a substitute for exchange transfusion especially for severe HDN cases because according to Maisels & McDonagh (2008), it gets rid of bilirubin very slowly which is not effective in severe cases of hyperbilirubinemia. This is why HCWs should monitor the infant who is undergoing phototherapy so that the need for exchange transfusion can be assessed and performed urgently should phototherapy proves to be ineffective (Maurer et al., 1985).

### **2.5.3 Exchange transfusion**

Exchange transfusion is when the infants blood is removed and replaced by washed Group O, Rh negative whole blood and manages HDN by removing the already sensitised infants RBCs hence preventing hyperbilirubinemia Exchange transfusion is more effective than phototherapy in decreasing bilirubin levels in the infant's blood (Maurer et al., 1985).

### **2.5.4 Intrauterine transfusion**

The difference between intrauterine transfusion and exchange transfusion is that the former is done *in utero* and the latter on a live infant.

Intrauterine transfusion is performed on a fetus by transfusing O-negative blood *in utero* when amniocentesis shows that the amniotic fluid analysis suggests that the fetus is severely affected by HDN and delivery is inappropriate because of fetal immaturity. It is not an effective procedure as it can only save 40% of affected fetuses (Health Family, 2010). The procedure may be repeated every two weeks until the fetus is mature enough for delivery (Health Family, 2010).

### **2.5.5 Plasmapheresis**

Plasmapheresis involves transfusing Group O blood plasma to the pregnant mother with significant antibodies to reduce the antibody quantity and potency.

According to a study conducted by Rock, Lafreniere, Chan & McCombie (1981), plasmapheresis is a widely used treatment for treating HDN and is useful in treating women with potent antibodies.

### **2.5.6 Rhesugam [Ro/Rho (D)]**

Rhesugam is Anti-D immunoglobulin used to manage Rh caused HDN. It is made from blood and hence recipients should be counselled and thereafter consent before its administration (Govender & Moodley, 2005). It was introduced in 1968 following its effectiveness in a series of controlled clinical trials which showed that isoimmunisation did not occur in any of the women who received a full dose of Ro postpartum and who were not sensitised at the time of administration in the early 1960s (Beaulieu, 1993).

According to Dean (2005), other blood group caused HDN do not have a routine immunoglobulin prophylaxis.

## **2.6. Role of health care workers**

The role of HCWs involves identifying, treating and educating patients who are at risk (Harrod, Hanson, VandeVusse & Haywood, 2003). HCWs and especially midwives have an unquestionable role to play when it comes to HDN management because patients go to the health facilities trusting them to receive the best care and treatment solutions but according to Moodley and Govender (2005), many sensitisations occur because of practitioner error. Lashley (2005) further interrogates the reasons behind practitioner error as a failure to recognise the need for prophylaxis, administering an inadequate dose, and late administration of the prophylaxis. It is expected that knowledge and management of HDN in the maternity wards is better and

high but that is not the case. This is supported by the guidelines from the National Institute for Health and Clinical Excellence (2008) where they concluded that there is still a challenge amongst healthcare professionals to give relevant information (management) to pregnant women. Of all the studies on healthcare practitioner awareness of Rh management conducted in Singapore by Wee and Kanagalingam (2009), only one reflected a high rate of awareness when they surveyed obstetricians' knowledge of guidelines on anti D prophylaxis and the average score of Rh management awareness was calculated at 75.9%. The other failure area identified by the researchers in the same study was that only 12.7% of the participants would routinely perform a Kleihauer test after delivery. A Kleihauer test is used to detect the volume of fetomaternal haemorrhage after an episode of bleeding in a pregnant woman. Where a Kleihauer test cannot be performed, the Royal College of Obstetricians and Gynaecologists (2011) guidelines suggest that a standard dose of 1500 IU of Rh immunoglobulin be given. HCWs need to know what to do and how to do it in managing HDN for the effectiveness of any treatment intervention.

## **2.7. Jaundice**

Jaundice is the first observable symptom that the health practitioner would look for when checking for the presence of HDN. This is because the excess bilirubin (caused by the breaking down of red blood cells) in the infant's blood system causes its eyes, urine and skin to be yellow, a condition called jaundice.

## **2.8. Conclusion**

HDN is not considered a big threat to the infant or neonatal life because of the introduction of Rhesugam in 1969 (Robson, Lee & Urbaniak, 1998; Beaulieu, 1993). In addition, the incidence rate of HDN has dramatically decreased since the first case of HDN was discovered in 1930. It cannot be



stressed enough though that one infant's death is one too many. HDN is still a cause of mortality and morbidity amongst infants and neonates and precautions must be taken.

## **CHAPTER 3**

### **METHODOLOGY**

#### **3.1. Introduction**

This chapter describes the study design, data collection, calculation of sample size, data analysis, reliability of data and ethical issues.

#### **3.2. Study design**

The study was a cross-sectional study using quantitative methods for data collection. A cross-sectional study is one that takes place at a single point in time that is, taking a 'slice' or cross-section of whatever we are observing or measuring (Trochim, 2006). This study was a cross-sectional study because the data was collected from the population of interest at one point in time from July 2010 to January 2012, and it was designed to measure certain phenomena or characteristics for example events, behaviour, attitudes etc. in the population of interest (Bowling, 2002).

#### **3.3. Study setting**

The study was conducted in four of the nine public hospitals of the Umgungundlovu District: one Tertiary Hospital, one Regional Hospital and two District Hospitals. The other five public hospitals are specialised hospitals for tuberculosis (TB) and psychiatry treatment. Umgungundlovu district is one of eleven districts in the KwaZulu-Natal Department of Health. Its neighbouring districts are eThekweni, Ilembe, Sisonke, Ugu, Umzinyathi and Uthukela. The total population of Umgungundlovu is 927 846. It is 53.7% urban and 46.3% rural, which makes this district semi-urban (Havemann & Kearney, 2006).

### **3.4. Criteria for selection of study sites**

In a study conducted by Hoque (2001), the highest estimation of Infant Mortality Rate (IMR) of 112 per 1000 live births was observed in district DC 28 (Uthungulu), which is a deep rural district, followed by DC 24 (Umzinyathi) with 111 and thirdly DC 22 (Umgungundlovu) with 107. Umgungundlovu was selected as the site for the study because it has the third highest infant mortality rate and because of ease of access.

The variation in IMR and Under 5 Mortality Rate (U5MR) between districts could be related to socio, demographic, cultural and economic factors. Therefore it is necessary to examine background information on the district (Hoque, 2001). The only public hospitals in the Umgungundlovu district that offer maternity services are Edendale, Greys, Northdale and Appelsbosch hospitals. The other public facilities are either Primary Health Clinics (PHCs) or Community Health Clinics (CHCs) which were not part of the study.

### **3.5. Study population**

The study population were postnatal women admitted to Edendale, Greys, Northdale and Appelsbosch public hospitals during the study period. Table 1 indicates the number of postnatal women from each hospital that were sampled according to the number of HDN tests done by the blood bank per month. HDN samples from all the four hospitals were submitted to the Pietermaritzburg Blood Bank for testing.

Below are the criteria used for selection of participants (study population):

#### Selection Criteria

Women who were in-patients, 18 years and older, and had babies with jaundice who were undergoing UV light treatment were included in the study. Those that were too ill were excluded from the study.

**Table 1: Hospital sampling based on average HDN tests done per month**

	Edendale	Greys	Northdale	Appelsbosch	TOTAL
<b>Average HDN tests done/month</b>	27	25	16	1	
<b>No of patients recruited</b>	117 (10/month)	108 (9/month)	69 (6/month)	6 (1/2 <sup>nd</sup> month)	<b>300</b>

### **3.6. Delimitations of the study**

The study was only conducted in the four public hospitals of the Umgungundlovu District so the results or findings from the study cannot be generalised to the whole population of KwaZulu-Natal.

### **3.7. Pilot study**

A pilot study was conducted at Edendale hospital on the 12<sup>th</sup> and 15<sup>th</sup> of July 2010 with five postnatal women who had babies with jaundice and undergoing UV light treatment. Permission was obtained from the hospital manager. The study was explained to each participant and Informed consent was obtained from each woman. One of the four women had a baby with HDN. Four of the patients spoke isiZulu and one woman spoke English.

The purpose of the pilot study was to test the questionnaire (Appendix 6 & 7) prior to data collection to check for ambiguity in the way the questions were phrased, and to make the necessary changes. The results obtained from the pilot study were not included in the main study results.

### **3.7.1 Observations and challenges observed during the pilot study.**

The main challenge in the pilot study was to interpret HDN in isiZulu because there is no one particular word that describes this disease in isiZulu. The researcher had to use lay terms to explain the actual pathology of the disease and corresponding symptoms of the disease. Some women understood the disease when the researcher explained in lay terms, but they did not know that it was HDN that the researcher was talking about. The researcher noted that during data collection for the main study she would need to use lay terms to explain the disease.

A further concern was that one of the maternal files lacked the presence of blood bank results. The healthcare worker who was on duty explained to the researcher that the reason for the absence of results was because the blood bank had not communicated the results telephonically. This was the second day after the baby's and mother's blood specimen had been taken and sent to the blood bank for HDN testing. According to the blood bank guidelines, specimens received must be tested and the results sent or telephoned through to the ward staff on the same day.

## **3.8. Evaluate knowledge of HDN amongst postnatal women**

### **3.8.1 Study population**

The study population was all postnatal in-patients that had babies with jaundice and undergoing Ultra Violet (UV) light treatment admitted in the public hospitals at the Umgungundlovu district during the period of study. The four hospitals used for sampling were the only public hospitals that provide postnatal care.

#### Selection Criteria

Women who were in-patients, 18 years and older, and had babies with jaundice who were undergoing UV light treatment were included in the study. Those that were too ill were excluded from the study.

### **3.8.2 Sampling**

A total of 300 postnatal women were recruited for the study. The sample size calculation was based on a null hypothesis of an HDN incidence rate of 1% and less ( $\leq 1$ ) and an alternative hypothesis of 4% using a level of significance of 5% and a 95% power of detecting a significance increase. The sample size was calculated to be 298 and was rounded to 300 to ensure the power is maintained at 95%. A total sample of 300 postnatal patients was recruited for the study.

### **3.8.3 Data collection**

Permission to access the hospitals and to access patient's files was sought from the hospital managers using Appendix 4 (Seeking Permission from Hospital Managers). To evaluate knowledge of HDN amongst, postnatal women admitted to the hospitals because of their babies being diagnosed with jaundice and undergoing UV light treatment, were interviewed using an interviewer-administered questionnaire with closed- ended questions. The women were interviewed in English or isiZulu, depending on the language that the patient preferred or was fluent with; hence the questionnaire was both in English (Appendix 6) and isiZulu (Appendix 7). The researcher is fluent in both English and isiZulu and was the one interviewing the women at all times. There was no research assistant. Before the woman was interviewed, the study was explained to her and a letter of Information and Consent form was given to her to read and sign once she agreed to participate in the study. Depending on the language they preferred, the women were either given a letter of Information and Consent form in English (Appendix 1) or isiZulu (Appendix 2). The Information letter and Consent form clearly informed the participants that, apart from the interview about HDN, their hospital files were going to be accessed by the researcher to verify the responses that they gave during the interview. There was a separate Patient Identification List (Appendix 3) that was used by the researcher in order to link the verbal interview with the corresponding mother's file.

The baby's and mother's ABO, Rh and Direct Antiglobulin Test (DAT) results were obtained from the mother's file and recorded in the Summary Sheet for Blood Bank Results (Appendix 5).

#### **3.8.4 Data collection tool**

The data collection tool was an interviewer-administered questionnaire (Appendix 6 [English] & 7 [isiZulu]) that was tested during the pilot study. It had closed-ended questions.

Section A of the questionnaire consisted of the mother's demographic information, that is, age, date of birth, marital status, education level and residence area. Section B asked about the current pregnancy, Section C asked about previous pregnancy/ies if the mother was not pregnant for the first time. Section D asked about counselling received during the previous pregnancy/ies, and Section E asked those women who had babies with HDN what the financial and emotional effects of HDN were.

#### **3.8.5 Data collection tool validity**

Validity means that correct procedures have been applied to seek answers to a question. The data was collected using a questionnaire that was validated during a pilot study. During the pilot study the researcher was careful to observe that the answers given by the respondents were the correct answers to the questions asked. All ambiguous questions were corrected and the sequencing of questions was optimised. The questionnaire was completed by the researcher.

#### **3.8.6 Postnatal women interviews**

Participants were asked about HDN in the language that they preferred. Before the interviews the study was explained to the woman and then an Information and Consent form (Appendix 1 [English] & Appendix 2 [isiZulu]) was given to the participant to read and sign. The interviews were done confidentially with curtains drawn around the bedside of the mother. If there

were no curtains, the researcher interviewed the patient at her bedside without the other mothers hearing the details of the interview.

### **3.8.7 Challenges with postnatal women interviews**

The first challenge encountered was that HDN, a biological term, its meaning was unknown to the participants. Insight gained during the pilot study, required the researcher to explain in lay terms which enabled the participant to understand the question clearly so that the meaning would not be lost and the desired response obtained.

The second challenge was the illiteracy of some participants. Even though they could understand the questions and produce appropriate answers, they were unable to read and sign the Information and Consent Form, hence they were initially excluded from the study. The study supervisors were informed about this challenge and they suggested that the researcher purchase an ink stamp, so that the participant's thumbprint could be used as proof of consent for participation in the study. After the ink stamp was purchased, this category of women were then included in the study. Prior to the participant's thumbprint, the researcher also had to read the Information and Consent Form in the language preferred by the participant.

The third challenge was that two women spoke neither isiZulu nor English, as they were foreigners. Fortunately there were women who understood their language and could also speak English, so they interpreted the interview. The women that provided assistance with interpretation signed as witnesses on the consent form.

The fourth challenge encountered was the emotional reaction of some women when questioned about their sick baby or the baby's father. The researcher had to then ask the participant whether she was able to continue with the interview given her emotional state. The interview proceeded once the participant indicated her willingness to continue with the interview. However none of the women had opted out of the interview. There was only



one woman who started crying during the interview and the researcher had to halt the interview, inform the Ward/Unit Manager who then sent a counsellor to her.

### **3.8.8 Data analysis**

Statistical Package for Social Science (SPSS) version 19.0 was used to analyse data. The closed-ended questions sought 'Yes' or 'No' responses, hence this fits well as a binary response from a statistical viewpoint. To analyse these responses frequencies and chi-square tests were used.

The chi-square statistic was used to test the association of explanatory variables (individually) to the response variables, in this case knowledge of HDN.

In order to assess the effect of all the variables on knowledge about HDN simultaneously, frequencies and chi-square tests were used since the data collected was quantitative.

### **3.8.9 Delimitations**

The study results only apply to the Umgungundlovu hospitals that formed part of this study. The results cannot be generalised to the KwaZulu-Natal (KZN) Province or any other KZN district.

## **3.9. Evaluate effects of HDN amongst postnatal women**

### **3.9.1 Study population**

The study population was all mothers of babies that had confirmed HDN during the study period.

#### Inclusion Criteria

Women who were in-patients, 18 years and older, and had babies with confirmed HDN were included in the study. Those that were too ill were excluded from the study.

### **3.9.2 Sampling**

All mothers who had babies with confirmed HDN were interviewed regarding the financial and emotional effects of HDN.

### **3.9.3 Data collection**

The objective was to examine the effects and impact of HDN on a mother with regard to various aspects of life, that is, economic (financial) and emotional. To evaluate the effects of HDN on postnatal women, an interviewer-administered questionnaire (Appendix 6 & 7) was used to obtain information about the effects of HDN on these women.

Section E of the questionnaire was designed for this objective. The questions asked by the interviewer (researcher) were also close-ended, but the interviewer prompted the mothers so that they did not deviate from the objectives of the questionnaire. Providing care to an ill member of the family does not only have a negative impact, but can also have beneficial effects for the caregiver for example the caregiver may learn to care more and be responsible (Brown, Nesse, Vinokur & Smith, 2003.) The researcher was interested to see if HDN had a positive or negative impact on the mothers who had to care for their sick babies. Mothers at the public hospitals bath and feed their own babies and also change their babies' beds using clean linen provided by the hospital.

### **3.9.4 Data collection tool**

The data collection tool was an interviewer-administered questionnaire (Appendix 6 [English] & 7 [isiZulu]) that was tested during the pilot study.

Section E of the questionnaire was used to obtain answers regarding the financial effects of HDN. Financial impact was demonstrated if the woman said she spent money buying food, airtime or toiletries because of the unplanned and extended hospital stay due to the baby's illness. Emotional

impact was demonstrated if the woman said she was stressed, anxious and sad because of the baby's unexpected illness.

### **3.9.5 Patient interviews**

Participants were asked about the effects of HDN in the language that they preferred. Before the interviews the study was explained to the woman and an Information and Consent Form (Appendix 1 [English] & Appendix 2 [isiZulu]) was given to participants to read and sign. The interviews were conducted confidentially with curtains drawn around the bedside of the mother. If there were no curtains, the researcher interviewed the patient at her bedside without the other mothers hearing the details of the interview.

### **3.9.6 Challenges with participants interviews**

The first challenge encountered was that HDN, a biological term, its meaning was unknown to the participants. Insights gained during the pilot study required the researcher to explain HDN in lay terms, which would then enable the participants to understand the question fully so that the meaning would not be lost and the desired response obtained.

The second challenge was the illiteracy of some participants. Even though they could understand the questions and produce appropriate answers, they were unable to sign the consent form, hence they were initially excluded from the study. The study supervisors were informed of this challenge and they suggested that the researcher purchase an ink stamp so that these participants' thumbprints could be used as proof of consent for participation in the study. After the ink stamp was purchased, this category of women was included in the study.

A third challenge was that one woman who had a baby with confirmed HDN could not speak either isiZulu or English. She could only speak Sesotho. The researcher was assisted by a nurse who could speak Sesotho and who agreed to translate. The nurse also signed as a witness on the consent form.

The fourth challenge encountered was that, in the third month of data collection, the researcher realised she was not obtaining confirmed HDN cases because of the absence of diagnosis in the babies' file at the time of data collection. The researcher discovered very few cases that were already confirmed as HDN upon checking the babies and mothers' files. This was due to the fact that blood test results had not returned from the blood bank or if the blood bank telephoned the results, the HCWs did not record them in the relevant file. The researcher continued the interviews with mothers before these mothers were discharged from the hospital since it would have been difficult, if not impossible, to trace the mother after discharge.

As a result, the researcher had to request permission on the 18<sup>th</sup> of July 2011 from the DUT Faculty Research Committee to interview all mothers who had jaundiced babies under UV light treatment, as opposed to just interviewing those mothers that had babies with confirmed HDN. The Faculty Research Committee approved the request.

### **3.9.7 Data analysis**

Statistical Package for Social Science, version 19.0 was used to analyse data. Quantitative data was collected with categorical variables. The answers given by the mothers were divided into possible options so that they are analysed as quantitative data (categorical variables). Descriptive statistics about such findings were presented by finding common responses (frequencies).

### **3.9.8 Delimitations**

Again, for this objective, the results obtained could not be generalised to the KwaZulu-Natal (KZN) Province or any other KZN district that is, they are limited to the Umgungundlovu public hospitals that formed part of this study.

### **3.10. HDN Incidence Rate**

#### **3.10.1 Study population**

The study population was all women who gave birth in each of the 4 public hospitals during the period of study (18 months).

#### **3.10.2 Sampling**

The researcher was able to derive a sample obtained from the hospital records of all women who gave birth in each of the hospitals during the period of study. HDN cases found during the period of study were used to calculate the incidence rate of HDN in each hospital and then a total combined incidence rate for all the hospitals was calculated.

#### **3.10.3 Data collection**

To estimate the disease incidence rate, Appendix 8 (Hospital Incidence Rate) was used to record the number of HDN cases obtained from the hospital records. This number was divided by the total number of babies delivered in the hospitals (population at risk) using hospital records for the period of the study. Incidence, according to Dawson & Trapp (2004), is defined as the number of new cases that have occurred during a given interval of time multiplied by 100 to get the percentage rate. The incidence rate should always be expressed in terms of a unit of time (Dawson & Trapp, 2004).

The following formula was used to calculate the incidence rate:

$$\frac{\text{NUMBER OF HDN CASES DURING THE PERIOD OF STUDY} \times 100}{\text{TOTAL NUMBER OF DELIVERIES DURING THE PERIOD OF STUDY}}$$

#### **3.10.4 Data collection tool**

Appendix 8 was used to enter the number of HDN cases obtained during the period of the study and the number of total deliveries during the study.

### **3.10.5 Challenges with data collection**

Hospital records were missing or unclear (some pages torn), so the researcher had to use the District Health Information System (DHIS) data to obtain the number of deliveries per hospital during the study period. The DHIS is a computer-based programme used by the National Department of Health for collection, capturing, storage, analysis and reporting of routine data. All levels of service (clinics, hospitals and districts) collect and submit data which is stored on DHIS (Department of Health, 2011).

### **3.10.6 Data analysis**

Records for the first 12 months of the study period were used to estimate the incidence rate. The incidence rate was calculated for each hospital and then combined for all hospitals and the following formula was used to calculate the incidence rate:

$$\frac{a}{(a + b)} \times 100\%$$
 over the period of study where a is the total number of HDN cases in the 4 hospitals and b is the total number of non-HDN cases that is,  $(a + b) =$  total number of babies delivered in the 4 hospitals.

Since the data collected was for new cases of HDN for the study period, an appropriate measure of HDN here is incidence and not prevalence which is a measure of the total number of existing cases in a population. The number of HDN cases and total number of deliveries for each hospital was recorded on Appendix 8.

### **3.10.7 Limitations**

The DHIS data is not always accurate. The researcher would have preferred to obtain birth data from the hospital records

### **3.10.8 Delimitations**

The incidence rate of HDN was very low and hence it would have been appropriate to use a bigger sample of women that is, bigger than 300. This can be considered in any future studies with the assistance of a statistician.

### **3.11. Ethical considerations**

The Information and Consent form, Appendix 1 (English) and 2 (IsiZulu), were utilised to inform the participants about the study and to obtain consent to participate. The participants gave signed consent to participate in the study before they were interviewed. The researcher made sure that the participants understood what the study entailed using lay terms in isiZulu and English where applicable.

If the participants were illiterate, the researcher read the Information and Consent form to them in a language that they preferred. An ink pad was used for the participant to make a thumbprint on the consent form as proof that they willingly participated in the study.

Ethical clearance was obtained from the Durban University of Technology (DUT) Faculty Research Ethics Committee (Appendix 10). The Higher Degrees Committee at DUT also approved the study (Appendix 11). Gatekeeper permission to access the hospitals was obtained from the KZN Provincial Health Research Committee (KZN-PHRC) (Appendix 9)

#### ***Ethical principles***

The researcher was guided by ethics principles whilst conducting the study, as detailed Polit & Beck (2006)

#### **Principle of beneficence**

Since researchers have to avoid doing what they think is best for the patient or participant, the patients' wishes must always prevail and not be overridden without consultation. In this study, this principle was observed by making

sure that the participants were being interviewed voluntarily and the researcher displayed courtesy by asking for a convenient time for them to be interviewed.

#### Principle of respect for autonomy

This principle concerns the freedom of expression by the participant to act according to his/her own will that is, voluntarily. This principle is basically the basis of the informed consent. During the study the researcher explained the details of the study in a language that the participant could understand and then asked the participant if she was willing to participate in the study. The participants were given an Information and Consent Form to read and then signed it or put an ink thumbprint only if she was willing to participate in the study. None of the participants were ever coerced into being interviewed.

#### Principle of non-maleficence

This principle requires that the researcher does not intentionally cause heedless harm or injury to the participant, either through acts of commission or omission. The researcher being aware that the interview was a sensitive one, was careful at all times not to prod the participant and cause emotional harm. If the patient was too emotional, the researcher halted the interview and the participant was referred to the Ward or Unit manager.

#### Principle of respect for human dignity

Every human being should be acknowledged as an inherently valuable member of the human community, and as a unique expression of life with an integrated bodily and spiritual nature. All participants were respected and given the freedom to be themselves according to what they believe they should be or say during the interview. No participant was coerced to phrase her responses according to the beliefs of the researcher.

A human being must be treated with respect in such a way that ensures her or his human dignity is recognised. All individual human beings are



presumably to be free and responsible persons hence they should be treated as such in proportion to their ability in the circumstances. During this study, all the mothers interviewed were respected for their views and their responses and at no time were these views undermined by the researcher.

#### Principle of justice

The principle of justice speaks to the fairness or equal distribution of goods, especially if goods are in short supply. In this study, there were no goods or service rendered to the participants, except that all participants were given a fair opportunity to respond at their own pace and time.

### **3.12. Conclusion**

The difference between research and non-research activity lies in the way that answers are found. The methodology used to answer the research questions must be a method that will produce the best answers that have been posed by the research questions or objectives. In this study, the cross-sectional and quantitative method was the best method to obtain data. The researcher was able to obtain results that were well suited as the best answer for the objectives of the study. Statistically 300 participants were required to make the data significant. The researcher did interview 300 participants.

## **CHAPTER 4**

### **RESULTS AND DISCUSSION**

#### **4.1 Introduction**

This chapter details the results obtained from this study on knowledge and effects of HDN amongst postnatal women.

Three-hundred women whose babies were undergoing UV light treatment were interviewed to determine their knowledge of HDN. Amongst the 300 women, 15 had babies with confirmed HDN and only these 15 women were interviewed regarding the effects of HDN. The same questionnaire (Appendix 6 & 7) was used to interview all women. If HDN was not confirmed, the participant did not answer Section E, which asked about the effects of HDN. Only when HDN was confirmed were women interviewed regarding the effects of HDN (Section E of the questionnaire). Frequencies and variable relationships were used to answer the research objectives.

In this study health care worker (HCW) in the questionnaire referred to all categories of HCWs that tend to pregnant mothers and their babies with jaundice or HDN, unless the question specified the category of HCW.

#### **4.2 Objective 1: Evaluating HDN knowledge amongst postnatal women**

Participants were interviewed using an interviewer-administered questionnaire; 300 women were interviewed.

#### **4.2.1 Demographics**

##### **Age**

**Table 2: Age distribution**

<i>Age Categories</i>	<i>Frequency</i>	<i>Percent (%)</i>	<i>Valid Percent</i>	<i>Cumulative Percent</i>
1 = 18 – 20yrs	105	35.0	35.0	35.0
2 = 21- 26 yrs.	83	27.7	27.7	62.7
3 = 27-32 yrs.	81	27.0	27.0	89.7
4 = 33-38 yrs.	25	8.3	8.3	98.0
5 = 39-44 yrs.	6	2.0	2.0	100.0
Total	<b>300</b>	<b>100.0</b>	<b>100.0</b>	

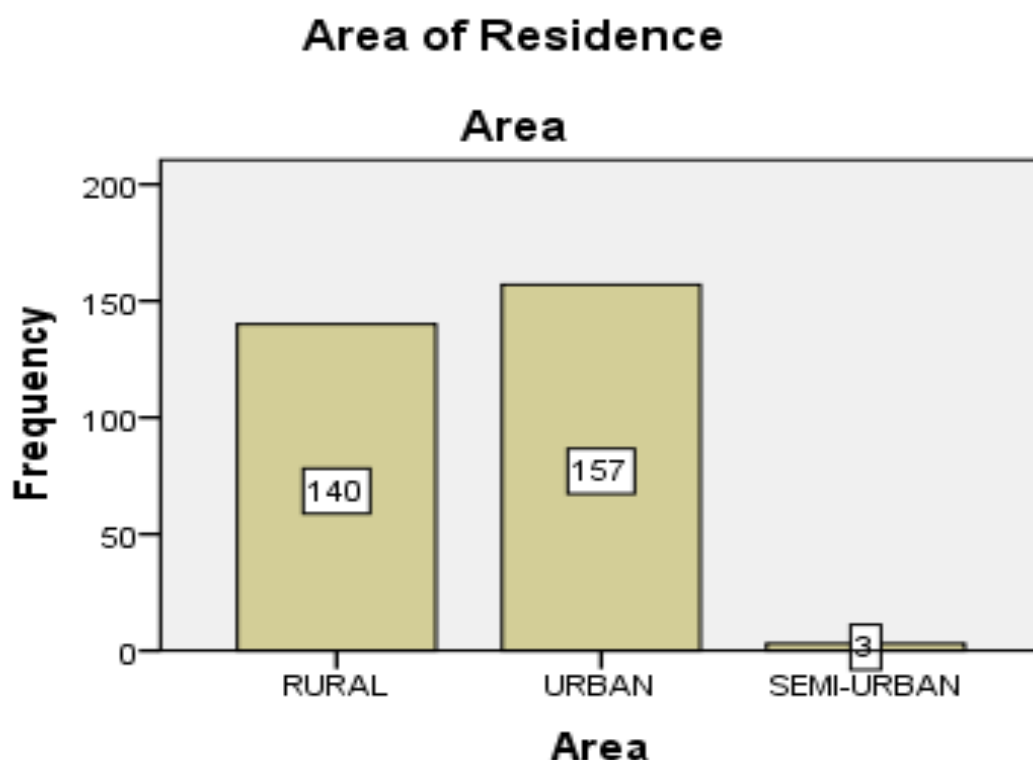
The ages of the mothers were put into categories as indicated in Table 2. A large number of patients (35%) fell into the 18 to 20 years age category and 27.7% of them were in the 21-26 years category. A small number (6%) of the total sample were women of 39-44 years. This was expected, as it is a known fact that fertility in women declines with age, so it was expected that most participants would fall into the younger age groups.

##### **Area of residence**

Several longitudinal studies have investigated the relationship between neighbourhood characteristics and mortality or incidence of disease (Haan, Kaplan & Camacho, 1987; Anderson, Sorlie, Backlund & Johnson 1997; Smith, Hart, Watt, Hole & Hawthorne, 1998).

Roux (2001) suggested that investigation of what and how people are affected by neighbourhood factors can lead to implementation of health strategies that are effective. In this study, participants were asked if they live

in a rural, urban or semi-urban residential area and the following results were obtained.



**Figure 4: Area of residence**

As seen in Figure 4, most mothers (157), were from an urban area (52.3%), 140 (46.7%) from a rural area and only 3 (1%) from a semi-urban area. These figures are not much different to the overall Umgungundlovu residential distribution, which is 53.7% urban and 46.3% rural (Havemann & Kearney, 2006).

## **Education**

Maternal education has a statistically significant impact on infant mortality (Desai & Alva, 1998). There is a strong correlation in maternal education and markers of child health (infant mortality, children's height-for-age and immunization status) although a causal relationship is far from established

and education acts as proxy for the socioeconomic status of the family and geographic area of residence (Desai & Alva, 1998).

The table below shows the education level of the 300 women that were interviewed

**Table 3: Education Level**

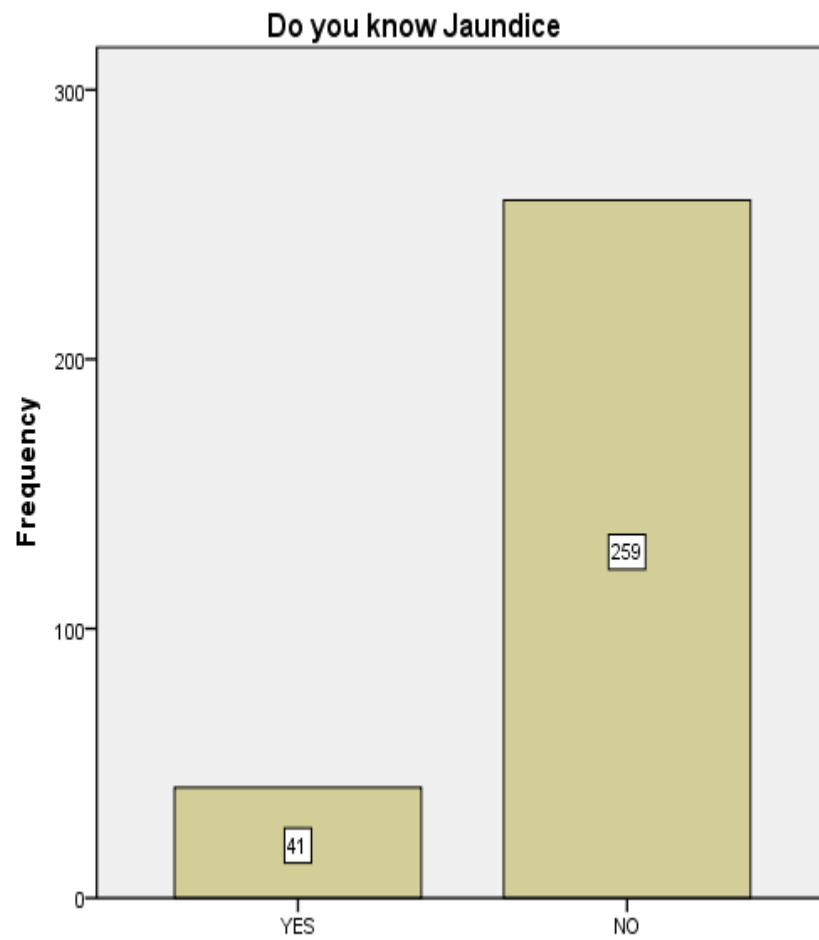
Education Levels	Frequency	Percent (%)	Valid Percent	Cumulative Percent
1 = Primary	6	2.0	2.0	2.0
2 = Higher Primary	8	2.7	2.7	4.7
3 = High School	267	89.0	89.0	93.7
4 = Post Matric	19	6.3	6.3	100.0
Total	300	100.0	100.0	

Table 3 above shows that most women, 267 (89%), had only high school education (Grade 8–Grade 12), followed by 19 (6.3%) who had post matric education, then 8 (2.7%) and 6 (2%) who had higher primary and primary education respectively. This clearly indicates that most women in the study could understand the purpose of the study by reading the information letter and could also understand the lay terms used by the researcher to ask the questions.

#### **4.2.2. Evaluation of knowledge amongst postnatal women**

Three questions were asked by the researcher to determine knowledge of HDN or of jaundice. The analyses of the responses to the three questions are presented in the graph and tables below.

When asked whether they knew what jaundice is, 41/300 (13.7%) women said they knew what jaundice is and 259/300 (86.3%) said they did not know.



**Figure 5: Jaundice knowledge**

**Table 4: Knowledge of HDN amongst confirmed & non-confirmed cases of HDN**

	Know HDN		Total
	Yes	No	
Confirmed HDN: Yes	4 (26%)	11	15
No	12 (4.2%)	273	285
Total	16	284	300

**Table 5: Knowledge of HDN amongst all postnatal women**

	Frequency	Percent (%)	Valid Percent	Cumulative Percent
Yes I know	16	5.3	5.3	5.3
No I do not know	284	94.7	94.7	100.0
TOTAL	300	100.0	100.0	100.0

Table 4 shows that out of 15 women who had babies with confirmed HDN, 4 (26%) knew what HDN was. Amongst those that had babies not affected by HDN (285), 12 (4.2%) knew what HDN is. Pearson's chi-square was used to test if there was any significance in HDN knowledge when comparing women that had babies affected by HDN and those whose babies were not affected by HDN. The test, at a probability (p) value of >0.05 (0.133) confirmed that

having a child with HDN did not necessarily mean that a woman will have more knowledge about HDN.

Table 5 shows the overall results of HDN knowledge amongst women that is, 16/300 (5.3%) of the total sample knew about HDN.

**Table 6: Age categories vs. HDN knowledge**

Age	HDN Knowledge		Total
	Yes	No	
1 = 18 – 20yrs	3	102	105
2 = 21- 26 yrs.	5	78	83
3 = 27-32 yrs.	6	75	81
4 = 33-38 yrs.	1	24	25
5 = 39-44 yrs.	1	5	6
<b>Total</b>	<b>16</b>	<b>284</b>	<b>300</b>

When using the Pearson Chi-square to test the significance of age in having HDN knowledge, the p value was 0.454 which is > than 0.05 and shows that age and HDN knowledge are not significantly related. It was interesting though to note that the age categories 21-26 years and 27 – 32 years had the most women who said they know what HDN is. This may be because they made up the majority of the sample. However, the age category of 18-20 years was the largest age category and only three participants knew about HDN.

### **Education Level vs. HDN knowledge**

The women were asked to select their highest level of education, the options being primary, higher primary, high school or post matric.

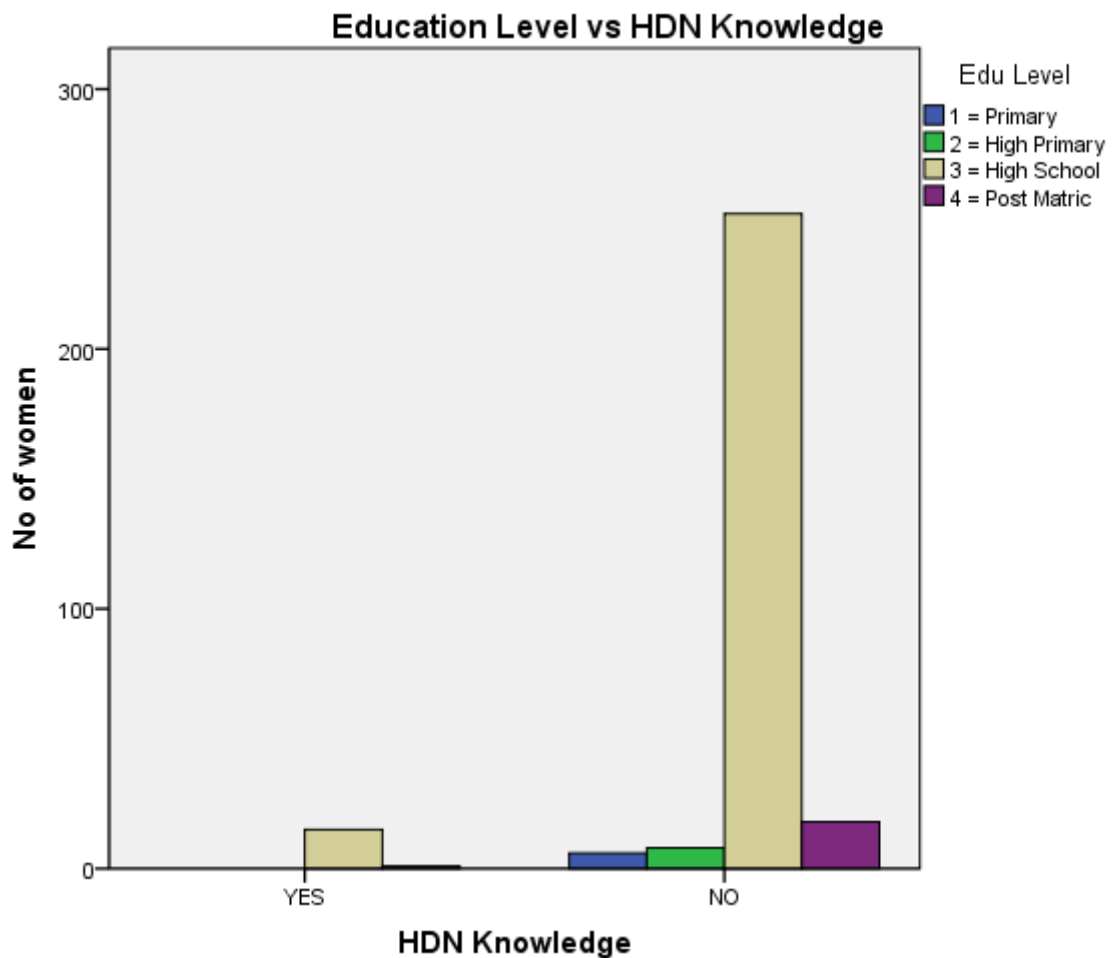


**Table 7: Education Level vs. HDN knowledge**

Education Level	HDN Knowledge		Total
	Yes	No	
1 = Primary	0	6	6
2 = Higher Primary	0	8	8
3 = High School	15	252	267
4 = Post Matric	1	18	19
<b>Total</b>	<b>16</b>	<b>284</b>	<b>300</b>

To test if HDN knowledge and education level variables are dependent of each other, that is, whether there is a relationship between them or not, a 2 x 2 contingency table (Table 7) was produced from SPSS by using cross-tabulation of the two variables. Of the 16 women who knew about HDN, 15 (93.7%) had high school education, and 1 (6.3%) had post matric education. None of the women who had primary and higher primary education knew about HDN.

From the contingency table (Table 7) it appears women are more likely to know about HDN if they have a high school or post matric education. However, considering the fact that 89% of the participants had a high school education, and overall knowledge of HDN was very low, this does not hold true.



**Figure 6: Education Level vs. HDN knowledge.**

In Figure 6 above, the YES bar on the histogram is only clearly seen for the women that had high school education.

A study was conducted to investigate the relationship between patients' knowledge of chronic disease and their health literacy. The literate patients were found to have more knowledge about a disease compared to the health illiterate patients (Gazmararian, Williams, Peel & Baker, 2003), so health literacy plays a role in enabling the patient to understand and have knowledge of a disease (Gazmararian, Williams, Peel, Baker, 2003).

### Area of residence vs. HDN knowledge

As seen above in Figure 4, the sample was made up of 52.3% of women that live in an urban area, 46.7% in a rural area and 1% in a semi-urban area. The results below show the relationship, if any, between the area of residence of a woman and her HDN knowledge. Looking at Table 8 below, one can conclude that living in a rural area contributes to higher HDN knowledge in a woman, since 11/16 (68.75%) women who said they knew about HDN came from rural areas; 5/16 (31.25%) came from urban areas. None of the three women who live in semi-urban areas knew about HDN.

**Table 8: Area of Residence vs. HDN Knowledge**

Area of Residence	HDN Knowledge		Total
	Yes	No	
1 = Rural	11	129	140
2 = Urban	5	152	157
3 = Semi-Urban	0	3	3
Total	16	284	300

However, Pearson's Chi-square test showed that there is no relationship between area of residence and HDN knowledge at a p value of  $>0.05$  (0.185); therefore, the results obtained were obtained by chance.

## Passing on of HDN knowledge by HCWs

### Recent pregnancy

The passing on of knowledge about HDN to affected mothers was seen as one of the contributing factors for patients' knowledge about the disease. The mothers were asked if any HCW had told them about HDN or explained HDN to them in the recent pregnancy or in their previous pregnancies if it was not their first pregnancy. Doctors tend to underestimate patients' desire for information and to misperceive the process of information giving (Waitzkin, 1984).

Table 9 and Table 10 show the responses to the questions about HCWs passing on HDN information to mothers.

**Table 9: Explanation of jaundice by HCW**

	Frequency	Percent (%)	Valid Percent	Cumulative Percent
Yes	63	21.0	21.0	21.0
No	237	79.0	79.0	100.0
Total	300	100.0	100.0	

63/300 (21%) of women said the HCW explained HDN to them. The study did not seek reasons for the HCW not explaining the baby's jaundice, which could be varied. One of the reasons could be the language barrier between the HCW and the patient.

**Table 10: Did the HCW tell you why the baby is admitted?**

	Frequency	Percent (%)	Valid Percent	Cumulative Percent
1=Yes	172	57.3	57.3	57.3
2 = No	128	42.7	42.7	100.0
Total	300	100.0	100.0	

172/300 (57.3%) women were told by the HCW why their baby was admitted, but that did not necessarily mean that they understood the condition. All the women should be told by the HCW why their baby is ill such that it needs an extended hospital stay. 42.7% (128/300) indicated that the HCW did not tell them why the baby was admitted.

**Table 11: Did the HCW explain HDN to you?**

	HDN explained by HCW		Total
	Yes	No	
Confirmed HDN Cases	2	13	15
TOTAL	2	13	15

This question was only applicable to women who had babies with HDN. As seen in Table 11 above, of the 15 women who had babies with confirmed HDN, only 2 (13.33%) received an explanation of HDN from the HCW.

### Previous Pregnancies

There were 161 women (53.7%) who had previous pregnancies as seen in Table 12 below. The null hypothesis (Ho) to be tested was that there was no difference in knowledge between first-time pregnant women and those that have been pregnant more than once.

**Table 12: Number of Pregnancies**

Pregnancies	Frequency	Percent (%)	Valid Percent	Cumulative Percent
1 <sup>st</sup> pregnancy	139	46.3	46.3	46.3
>1 pregnancy	161	53.7	53.7	100.0
Total	300	100.0	100.0	

**Table 13: HDN knowledge in women with 1 pregnancy vs. with >1 pregnancy**

	Do you know HDN		Total
	Yes	No	
1 <sup>st</sup> Pregnancy	7 (5.30%)	132	139
>1 Pregnancy	9 (5.92%)	152	161
Total	16	284	300

Using Fisher's Exact Test, a statistical test used to determine if there are non-random associations between two categorical variables, a value of 1 was obtained which proves that there is no association between the HDN knowledge that a woman has and the number of pregnancies that she had. The results obtained were obtained by chance. In our study, 5.30% first-time mothers knew about HDN and 5.92% mothers who had more than one pregnancy knew about HDN. There is no significant difference between the two groups when using the Chi-square test since a p value of 0.8 ( $>0.05$ ) was obtained. The null hypothesis is therefore accepted that is, there is no difference in knowledge between first-time pregnant women and those than have been pregnant more than once.

### 4.3 Objective 2: Evaluating the effects of HDN amongst postnatal women

#### 4.3.1 Financial effects

**Table 14: Financial Implications on confirmed HDN cases**

	Financial Implications		Total
	Yes	No	
Confirmed HDN Cases	7 (46.6%)	8 (53.3%)	15
Total	7	8	15

Of the 15 women who were affected by HDN, 46.6% of them were affected financially because of the extended hospital stay. The expense was caused by the mother having to buy airtime, cosmetics, extra food and having to provide the family with money to visit her and her baby at the hospital.

**Table 15: Hospital fees payment due to HDN**

	Hosp Fees Paid		Total
	Yes	No	
Confirmed HDN Cases	0	15	15
<b>TOTAL</b>	0	15	15

No mother had to pay any hospital fees because all maternal costs are free in all South African public hospitals. Children from birth until they are 5 years old also receive free services from these hospitals.

#### 4.3.2 Emotional effects

**Table 16: Emotionally affected because of HDN**

	Emotionally affected		Total
	Yes	No	
Confirmed HDN Cases	15	0	15
<b>TOTAL</b>	15	0	15



**Table 17: Anxious to go home**

	Anxious to go home		Total
	Yes	No	
Confirmed HDN Cases	15	0	15
Total	15	0	15

**Table 18: Not sure about the outcome of my baby's illness**

	Do not Know Outcome		Total
	Yes	No	
Confirmed HDN Cases	15	0	15
Total	15	0	15

**Table 19: Stressed because of sick baby**

	Stressed		Total
	Yes	No	
Confirmed HDN Cases	15	0	15
Total	15	0	15

Looking at Tables 18, 19, 20 and 21 above, it is evident that HDN has emotional effects on the mother. All affected mothers stated that they were stressed because of conflicting emotions such as their baby being ill, anxious to go home because they did not like to stay at the hospital. All the mothers said they were stressed because they did not know the outcome of their baby's illness.

#### **4.4 Objective 3: HDN incidence rate**

The table below (Table 20) indicates the number of confirmed HDN cases in each hospital. The most cases were found in Greys Hospital (7), followed by Edendale (5) and lastly Northdale with only three cases. There were no HDN cases at Appelsbosch hospital during the study period. Greys hospital is a Tertiary Hospital, the highest level of care hospital, and it can therefore be deduced that severely affected infants and neonatal cases are treated at this hospital. Edendale is the Regional Hospital that most of the Umgungundlovu primary health care clinics, community health centres and district hospitals refer patients to. Northdale Hospital is a district hospital and hence it services a specific population catchment area. Appelsbosch is a rural district hospital that services a minimal number of severe infant and neonate illnesses. Very ill infants and neonates are referred to Northdale, Edendale or Greys Hospital.

Of the 15 HDN cases, 5 (33.33%) were caused by ABO blood group system and 10 (66.66%) were caused by Rh blood group system as shown on Table 21 below.

**Table 20: HDN distribution in hospitals**

Hospital	Confirmed HDN		Total
	Yes	No	
1 = Appelsbosch	0	6	6
2 = Edendale	5 (33.3%)	112	117
3 = Greys	7 (46.6%)	101	108
4 = Northdale	3 (20%)	66	69
Total	15	285	300

**Table 21: HDN Type**

HDN type	Frequency	Percent (%)	Valid Percent	Cumulative Percent
1= ABO	5	1.7	33.3	33.3
2 =Rh	10	3.3	66.7	100.0
<b>Total</b>	<b>15</b>	<b>5.0</b>	<b>100.0</b>	

#### 4.4.1 Edendale Hospital

NUMBER OF HDN CASES DURING THE PERIOD OF STUDY X 100

TOTAL NUMBER OF DELIVERIES DURING THE PERIOD OF STUDY

$$5/7252 \times 100 = 0.07\% \text{ per 12 months}$$

#### **4.4.2 Greys Hospital**

NUMBER OF HDN CASES DURING THE PERIOD OF STUDY X 100

TOTAL NUMBER OF DELIVERIES DURING THE PERIOD OF STUDY

$$= 7/2080 \times 100 = 0.33\% \text{ per 12 months}$$

#### **4.4.3 Northdale Hospital**

NUMBER OF HDN CASES DURING THE PERIOD OF STUDY X 100

TOTAL NUMBER OF DELIVERIES DURING THE PERIOD OF STUDY

$$= 3/6120 \times 100 = 0.05\% \text{ per 12 months}$$

#### **4.4.4 Appelsbosch Hospital**

NUMBER OF HDN CASES DURING THE PERIOD OF STUDY X 100

TOTAL NUMBER OF DELIVERIES DURING THE PERIOD OF STUDY

There were no new HDN cases at Appelsbosch hospital during the study period.

#### **4.4.5 Total HDN incidence rate**

NUMBER OF HDN CASES DURING THE PERIOD OF STUDY X 100

TOTAL NUMBER OF DELIVERIES DURING THE PERIOD OF STUDY

$$15/16453 \times 100 = 0.09\% \text{ per 12 months}$$

## **CHAPTER 5**

### **CONCLUSION**

#### **5.1 Introduction**

The results above indicate that most postnatal women in the public hospitals of the Umgungundlovu District are ignorant about HDN as well as those that are affected by the disease. The affected women that is, those that had babies with confirmed HDN tend to spend money by attending to personal needs because of the extended hospital stay. The incidence rate was found to be much lower than mentioned in the local study conducted by Govender & Moodley (2005) and also lower than the incidence rates mentioned on the studies conducted by international authors. According to the statistician, this could have been caused by the small sample size (300 participants) employed in the current study. Future studies should make use of a larger sample to match the very low HDN incidence rate.

#### **5.2 Evaluation of knowledge of HDN amongst postnatal women**

Women from Umgungundlovu District are not knowledgeable about HDN even though this disease is still a cause of death amongst infants and neonates. Only 13.3% of the total affected population were told by the HCW about HDN. This small percentage raises a cause for concern. Therefore HCWs have an important role in ensuring that the affected parents receive proper knowledge about the disease affecting their babies, and this in turn will reflect on the mother's reaction in future, should she come across the same situation. For example, in her next pregnancy, she will then be aware of the possibility of her child developing HDN and can be proactive by discussing ways to manage it. Patients (although mothers are not patients in this case, but their babies) need to understand their illness if the focus of

control is to move from doctor to patient. If the patient has good knowledge about a disease, it also impacts positively on their lives (Conway, Pond, Watson & Hamnett, 1996).

Giving information to patients remains problematic (Waitzkin, 1984). The transmission of information is related to patient characteristics (sex, education, social class, and prognosis), doctor characteristics (social-class background, income, and perception of patient's desire for information), and the clinical situation (number of patients seen). Doctors' nonverbal communication abilities are associated with outcomes of medical care, such as satisfaction and compliance. Regarding the sociolinguistic structure of communication, doctors often maintain a style of high control, which involves many doctor-initiated questions, interruptions, and neglect of the patients' life world (Waitzkin, 1984).

### **5.3 Evaluation of effects of HDN amongst postnatal women**

#### **5.3.1 Financial effects**

Financial effects could only be evaluated by interviewing the women that had babies confirmed as having HDN. South African public hospitals offer free services to pregnant women and children under-5 years, so there is no financial effect with regard to medical expenses due to HDN amongst these women. Mothers who are at the hospital because their babies have HDN do, however, have to stay longer at the hospital and find themselves having to purchase airtime, toiletries and extra food. The removal of user fees in any setting must be accompanied by wider measures to ensure smooth implementation and secure intended access gains (Goudge, Gilson, Russell, Gumede & Mills, 2009).

#### **5.3.2 Emotional effects**

The determination of the emotional effects of HDN was also done by interviewing only those mothers whose babies were confirmed as having HDN. All the women that were interviewed were anxious about their baby

being ill and as a result felt sad. HDN has an emotional effect on postnatal women, who are already not feeling well as they have just given birth. Counselling should be offered to those mothers who are not coping with the fact that their baby is sick. The case of the mother that was constantly crying and not talking should have been a sign to the HCWs that psychological intervention or counselling was required.

#### **5.4 Incidence rate**

The total incidence of HDN in the current study was 0.09% per year. This incidence is very small compared to the HDN incidence rate that was obtained through the literature search. The introduction of Rhesugam (Ro) has evidently reduced HDN incidence tremendously. One death, however, remains one death too many and, if HDN is still a cause of death amongst infants and neonates, it should be considered as serious.

The Null ( $\leq 1\%$ ) and Alternative hypothesis (4%) rates of HDN incidence assumed in the design stage were much higher than the actual incidence rate found in the study population. If the study were to be redone, a much larger sample size would have to be used to take into consideration a more appropriate null and alternative hypothesis (0.09%). In effect, a study based on a 0.09% incidence rate of HDN would require a huge sample of 6245 women (calculated using Gen Stat, version 14.1).

## CHAPTER 6

### RECOMMENDATIONS

- HCWs need to find simpler methods (lay terms) to explain HDN to all women that are affected by the disease or who have jaundiced babies. Utilising a language that the mother can understand so that they know what to expect in their future pregnancies. If the mother knows the pathogenesis and prognosis of their baby's illness it will reduce their anxiety.
- It is recommended that HCWs strictly follow the guidelines for HDN management by the South African Department of Health (2007). The guidelines also call for HCWs to encourage pregnant women to attend antenatal clinic early and have the necessary tests performed on them.
- In an attempt to improve health literacy, a pamphlet/leaflet in simple terms or diagrams should be developed for distribution at the antenatal clinic (ANC) level. These pamphlets should be in a language that the patients can understand. Antenatal clinics could also have user-friendly, computer-based health information helpdesk to provide mothers with HDN information.
- In some of the interviews that were conducted, it was clear that the women never received Anti-D even if they were Rh negative, pregnant for the first time, and having delivered an Rh positive baby. Rhesugam prophylaxis has proved to be effective when administered at the appropriate time, so denying women the opportunity of receiving this treatment increases infant and neonatal mortality, and even morbidity, unnecessarily. HCW should ensure that Ro is administered and at the appropriate time.
- A campaign must be conducted to encourage pregnant women to attend ANC early. Road shows can also be organised to educate the



women about the importance of attending ANC early. Encouraging early antenatal clinic attendance can also be implemented at the Reproductive Health Clinic (Family Planning Level). In some cases there were no maternal Rh type test results available. Such testing should have been done at the ANC. This led to the assumption that women are not attending ANC as they should. Rh typing is initiated at ANC so that early intervention is initiated to prevent HDN. Further research should be conducted to examine the relationship between ANC attendance and late HDN diagnosis.

- Training programmes and standards of clinical practice should emphasise that doctor-patient communication is both desirable and possible (Waitzkin, 1984). The training should also include communication skills and an emphasis of the importance of communicating with patients.
- It is recommended that a study using a larger sample size be conducted which will indicate the true incidence rate of HDN.

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## **APPENDIX 1: LETTER OF INFORMATION AND CONSENT** **(ENGLISH)**

**Title of the Research Study:** Evaluation of knowledge and of effects of Haemolytic Disease of the Newborn amongst postnatal women in public hospitals in the Umgungundlovu district.

**Principle Investigator/s:** Mrs Gugulethu E Khumalo

**Co-Investigator/s:** N/A

**Brief Introduction and Purpose of the Study:** Haemolytic Disease of the Newborn (HDN), a disease that destroys a newborn's red blood cells, is still a cause of neonatal mortality and morbidity in KwaZulu-Natal. Knowledge of this disease by mothers who intend to have children manages the disease better. The purpose of this study is to evaluate knowledge of and effects of HDN among postnatal women who are admitted to public hospitals in the Umgungundlovu District because their babies have HDN. The HDN incidence rate is going to be estimated using records obtained from the selected hospitals.

**Outline of the Procedures:** Postnatal women who are inpatients in the public hospitals at Umgungundlovu District are going to be interviewed using an interviewer-administered questionnaire to evaluate their knowledge of HDN and effects of HDN. The patient's file will also be accessed to obtain more information relevant to HDN and to verify the responses from the interview. The interview will not take more than 45 minutes.

**Risks or Discomforts to the Subject:** There will be no risks or discomfort expected to occur because of the study. Patients who are too ill will be excluded from the study.

**Benefits:** There will be no tangible benefits to the participants except that the participants will be more aware of the disease and have at least some knowledge about it.

**Reason/s why the Subject May Be Withdrawn from the Study:**

Participants who have consented to participate in the study will remain in the study until the end unless they withdraw at any stage of the study which they can do at any time. Participants will not be withdrawn because of any reason.

**Remuneration:** There will be no incentives paid to the participants. Participants will voluntarily consent to be part of the study.

**Costs of the Study:** Estimated at R16520.00.

**Confidentiality:** The participant will be asked to **not** fill their names in on the questionnaire. To link patients' interviews with files, a patient identification list will be used that will **only** be accessed by the researcher. All questionnaires and the Patient Identification List will be kept in a locked cabinet **at all times** when not in use.

**Research-related Injury: No injuries** related to this study are anticipated. Participants who are going to be part of the study will be patients and hence under the care of health care workers.

**Persons to Contact in the Event of Any Problems or Queries:**

- Mrs Gugulethu Khumalo (033-3953189 / 0836020105)
- Dr M J Titus (033-8973293 / 0824924785)
- Mrs N J Mtshali (031-3735280/ 0724816024)
- Dr C Blanchard (079-4979125)

**Statement of Agreement to Participate in the Research Study:**

I,.....(subject's full name), ID number....., have read this document in its entirety and understand its contents. Where I had any questions or queries, these have been explained to me by .....to my satisfaction. Furthermore, I fully understand that I may withdraw from this study at any stage without any adverse consequences and my future health care will not be compromised. I, therefore, voluntarily agree to participate in this study.

Subject's name (print) .....

Subject's signature:..... Date:.....

Researcher's name (print): .....

Researcher's signature:..... Date:.....

Witness name (print) ..... .....

Witness signature: ..... Date:.....

Supervisor's name (print):.....

Supervisor's signature: ..... Date:.....

## **APPENDIX 2: LETTER OF INFORMATION AND CONSENT** **(ISIZULU)**

**Isihloko Socwaningo:** Ukuhlola ulwazi nemiphumela ye-Haemolytic Disease of the Newborn (HDN) komama abasebebelethile abalaliswe ezibhedlela zikahulumeni esifundeni saseMgungundlovu.

**Umcwaningi Omkhulu:** Mrs Gugulethu E Khumalo

**Abasizi Bomcwaningi:** Abekho

**Isingeniso esifingqiwe nenjongo yalolucwaningo:** i-HDN, isifo esibulala igazi lengane, isayimbangela yokugula nokufa kwezingane ezisanda kuzalwa KwaZulu-Natali. Ulwazi ngalesisifo ngomama, kungenza lesisifo siphathwe kangcono. Ngakhoke injongo yalolucwaningo ukuhlola ulwazi lwe HDN komama abasanda kubeletha abalaliswe ezibhedlela zikahulumeni esifundeni saseMgungundlovu ngenxa yokuthi izingane zabo zine HDN. Izinga lokuvelela kwe HDN lizocatshangelwa kusetshenziswa amalekhodi ezibhedlela ezikhethiwe.

**Uhlelo lwenqubo:** Omama abalaliswe esibhedlela abaqeda ukubeletha abalaliswe ezibhedlela zikahulumeni esifundeni saseMgungundlovu bazofakwa imibuzo kusetshenziswa indlela lapho umbuzi ebuza bese ebhala izimpendulo phansi ukuhlola ulwazi lwe-HDN nemiphumela yayo. Kuzovulwa namafayela eziguli ukuthola olunye futhi ulwazi kuhlaziywe nesiqiniseko sezimpendulo ezinikwe ngomama ngesikhathi bebuzwa imibuzo. Ukufakwa imibuzo komama ngeke kuthathe imizuzu engaphezu kwa-45.

**Ubungozi noma ukungaphatheki kahle kwakho:** Abukho ubungozi obungakuvelela noma ukungaphatheki kahle ongabuzwa ngenxa yalolucwaningo. Iziguli ezigula kakhulu ngeke zibe yingxenye yocwaningo.

**Inzuzo:** Ayikho inzuzo ephathekayo ozoyithola ngaphandle kokuthi abazibandakanya nalulucwaningo bazokwazi ngalesisifo kangcono.

**Isizathu sokuthi uhoxiswe kulolucwaningo:** Abavumile ukuzibandakanya nalolucwaningo ngokusayina bazobakhona kulolucwaningo luze luphele. Abazibandakanyile nalolucwaningo bangashiya noma kunini. Ngeke baze bahoxiswe nangayinoma isiphi isizathu.

**Inkokhelo:** Ayikho inkokhelo abazofumbathiswa yona abazibandakanyayo. Abazibandakanyile bazobe bezivumele bona ngokusayina ukuba yingxeny yalolucwaningo.

**Izindleko Zemali zalolucwaningo.** Zibalelwa ku R16520.00

**Ukugcina Imfihlo:** Wonke amaphepha okuphendula imibuzo azobe **engenalo igama lomuntu** ozibandakanyile futhi nabo bazocelwa ukuthi uma bephenula imibuzo bangawabhali amagama abo ephepheni lokuphendula imibuzo. Ukuxhumanisa amaphepha ezimpendulo zemibuzo, namafayela eziguli kuzobanohlu lokwazisa oluzosetshenziswa umcwaningi **kuphela**. Wonke amaphepha ezimpendulo zemibuzo nohlu lokwazisa kuzohlala ekhabetheni elikhiwayo uma kungasetshenziswa **ngaso sonke isikhathi**.

**Ingozi Evela Ngenxa Yocwaningo:** **Azikho izingozi** ezilindelekile ngenxa yalolucwaningo. Abazibandakanyayo ukuba yingenxe yalolucwaningo bazobe beyiziguli ngakho ke bengaphansi kweso lezisebenzi zezempilo. Uma kungavela ingozi ngenxa yocwaningo, ingozi izophathwa yizisebenzi zezempilo.

**Umuntu eningamthinta uma kunenkinga noma imibuzo**

- Mrs Gugulethu Khumalo (033-3953189 / 0836020105)
- Dr M J Titus (033-8973293 / 0824924785)
- Mrs N J Mtshali (031-3735280/ 0724816024)
- Dr C Blanchard (079-4979125)

**Isitatimende sokuvuma ukuzibandakanya nalolucwaningo:**

Mina,.....(igama lakho eligcwele),  
Inombolo kamazisi....., ngiyifundile  
lencwadi ngokugcwele nagqonda nokuqukethwe yiyo. Lapho bekunemibuzo  
nokungaqondi, lokho kuchaziwe kimina  
ngu.....ngokunganelisayo. Phezu  
kwalokho, Ngियाqonda ngokuphelele ukuthi ngingahoxa kulolucwaningo  
noma kusiphi isigaba ngaphandle kwemiphumela emibi kimi futhi ikusasa  
lokuphathwa kwempilo yami ngeke libe sengcupheni. Mina, ngakhoke  
ngizivumela mina ukuzibandakanya nalolucwaningo.

Igama lozibandakanyayo (shicilela) .....

Isiginesha yozibandakanyayo:..... Usuku:.....

Igama Lomcwaningi (shicilela): ..... I

siginesha omcwaningi:..... Usuku:.....

Igama Likafakazi (shicilela) .....

Isiginesha Kafakazi: .....Usuku:.....

Igama Lomphathi (shicilela):.....

Isiginesha Yomphathi: .....Usuku:.....



### **APPENDIX 3: PATIENT IDENTIFICATION LIST FOR MOTHERS**

**(Access limited to the Researcher only)**

**Hospital: .....**

**Date:.....**

Record Number	Patients Surname	Patients Full Name	Patients Hospital No.

## **APPENDIX 4- SEEKING PERMISSION FROM THE HOSPITAL MANAGER**

10-102 South Tower

Natalia Building

Department of Health

330 Langalibalele Street

PIETERMARITZBURG

3200

Date

Dear .....

### **REQUEST FOR PERMISSION TO USE ..... HOSPITAL TO CONDUCT MASTERS DEGREE RESEARCH STUDY (Masters in Biomedical Technology- MTech)**

I kindly request permission to use ..... Hospital to conduct my research study as part of my Masters degree requirement. I am studying part time at the Durban University of Technology (DUT) and my student number is 20055314. The title of my research study is **“Evaluation of knowledge and of effects of Haemolytic Disease of the Newborn (HDN) amongst postnatal women in the Public Hospitals of the Umgungundlovu District.”**

HDN is still a cause of neonatal mortality and morbidity in KwaZulu-Natal and hence it is important that knowledge about this disease is passed on to

patients by doctors and midwives so that early treatment interventions can be initiated.

The study will involve interviewing relevant patients and accessing their medical records.

The study is significant as it will bring to light the level of HDN understanding among women in the participating hospitals and the extent of HDN management by the doctors in these hospitals.

The standards of Ethics will be upheld at all times during the study, especially confidentiality. The study has been granted Ethical Approval by DUT.

Please find enclosed research proposal and Ethical Approval from DUT.

I look forward to your positive response soon.

Yours sincerely

Mrs. Gugulethu Khumalo

## **APPENDIX 5: SUMMARY SHEET FOR BLOOD BANKS TEST RESULTS**

Record No		LABORATORY RESULTS			Conclusion
		ABO Type	Rh Type	DAT	
	Ba				
	Ma				
	Ba				
	Ma				
	Ba				
	Ma				
	Ba				
	Ma				
	Ma				
	Ma				

## **APPENDIX 6: QUESTIONNAIRE FOR POSTNATAL WOMEN**

### **Appendix 6: QUESTIONNAIRE FOR POSTNATAL WOMEN**

#### ***FOR OFFICIAL USE ONLY***

Date:  D D / M M / Y Y Y Y

Hospital: \_\_\_\_\_

RECORD Number: \_\_\_\_\_

YES = 1

NO = 2

#### **SECTION A: BACKGROUND INFORMATION**

1. Age : \_\_\_\_\_ yrs

2. Date of Birth:  D D / M M / Y Y Y Y

3. Marital status: Single  1

Married  2

Divorced  3

Living with a partner  4

Widow  5

4. What is your highest education level? 1 = Primary School

2 = Higher Primary

3 = High School

4 = Post Matric

5. How can you describe the area where you come from?

1 = Rural

2 = Urban

3 = Semi-Urban

6. How long have you and your baby been admitted in the hospital? -----

**SECTION B : RECENT PREGNANCY**

- a. Were any blood tests done on the baby's father because of this pregnancy?
- b. Is this your first pregnancy? \_\_\_\_\_
- c. Do you know what jaundice is? \_\_\_\_\_
- d. Was your baby born with jaundice? \_\_\_\_\_
- e. Was the cause of jaundice explained to you? \_\_\_\_\_
- f. Do you know the meaning of HDN? \_\_\_\_\_
- g. Do you know the cause of your baby's admission?
- h. If yes, was it the health care worker that told you?
- i. With this recent pregnancy, did the health care worker (hcw) explain HDN to you?

**SECTION C: PREGNANCY HISTORY**

SKIP IF FIRST  
PREGNANCY

- a. How many times have you been pregnant?.....
- b. Were all your children born alive? \_\_\_\_\_
- c. If you say No, above, how many stillborns did you have?.....
- d. What was the cause of stillborn/s?
- e. Have you ever lost a child before it turned 1 month old?
- f. If you say Yes, what was the cause of your child/ren's death?
- g. Have you ever had a child born with jaundice? \_\_\_\_\_

- a. If yes, was the cause of jaundice explained to you by the hcw?
- b. What was the cause of jaundice?
- c. Have you ever had premature labour/ induced labour because of HDN?
- d. Were all your previous pregnancies normal?
- e. If No, The cause was:

#### **SECTION D: COUNCELLING DURING PREVIOUS PREGNANCY/IES**

SKIP IF FIRST PREGNANCY

- a. Did any hcw tell you of any tests that were going to be done because of HDN?
- b. Did any hcw inform you about HDN?
- c. Did any doctor ever request the father of the baby to come and do blood tests because of HDN?

#### **SECTION E: IMPLICATIONS OF HDN**

- a. Does HDN have any financial implications on you so far?
- If Yes, what implications?  
TICK THE MATCHING MOTHER'S RESPONSE
- i. I am using more money in the hospital on myself (toiletries, food) whilst waiting for my baby to get better. ☐ ☐
- ii. The hospital staff told me that I will have to pay more hospitals fees as the baby is going to stay longer than usual because of HDN. ☐ Yes ☐ No
- b. Does HDN have any emotional implications so far?
- If Yes, what implications?  
TICK THE MOTHER'S MATCHING RESPONSE
- i. I am stressed as I didn't expect my baby to be sick. ☐ Yes ☐ No
- i. I am so anxious to go home. ☐ Yes ☐ No
- ii. I am stressed as I don't know the outcome of my baby's illness. ☐ Yes ☐ No
- iii. I am not stressed. ☐ Yes ☐ No

**FOR OFFICIAL USE ONLY:**

**SECTION F (Information obtained from the patient's file)**

**Presence of HDN/EF: Yes = 1                      No = 2**

**Causative Blood Group System : ABO= 1                      Rhesus = 2**

**Complications (perinatal /postnatal):**

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**APPENDIX 7: QUESTIONNAIRE FOR POSTNATAL WOMEN**  
**(ISIZULU)**

***OKWE OFISI KUPHELA***

Usuku: D D/ M M/ YYYY

Isibhedlela: \_\_\_\_\_

Inombolo Yelekhodi: \_\_\_\_\_

YEBO= 1                      CHA = 2

**ISIGABA A : IMIBUZO MAYELANA NAWU**

1. Iminyaka yakho yokuzalwa: \_\_\_\_\_

2. Usuku Lokuzalwa: D D/M M / Y Y Y Y

3. Ubudlelwane: Uwedwa

Ushadile

Udivosile

3

Uhlala nesoka

4

Umgumfelokazi

5

4. Wagcina kuliphi ibanga lokufunda 1=Amazinga aphansi

2 = Amazinga aphakathi

3 = Esikoleni esikhulu

4 = Ngale kukamatikuletsheni

5. Ungayichaza kanjani indawo ohlala kuyo?

1 = Amafamu

2 = Idolobha

3 = Ifamu-dolopha

6. Usulaliswe isikhathi esingakanani nengane yakho lapha esibhedlela?.....

**ISIGABA B : UKUKHULELWA OKUSANDA KUDLULA**

- a. Wake wahlolwa igazi ubaba wengane ngenxa  
yalokukukhulelwa? \_\_\_\_\_  

Yebo	Cha
------	-----
- b. Ukukhulelwa kwakho kokuqala lokhu? \_\_\_\_\_  

Yebo	Cha
------	-----
- c. Uyazi ukuthi yini i-jondisi? \_\_\_\_\_  

Yebo	Cha
------	-----
- d. Ingane yakho izalwe inejondisi? \_\_\_\_\_  

Yebo	Cha
------	-----
- e. Ngabe wachazelwa imbangela ye-jondisi? \_\_\_\_\_  

Yebo	Cha
------	-----
- f. Uyazi ukuthi yini i-HDN? \_\_\_\_\_  

Yebo	Cha
------	-----
- g. Uyazi ukuthi ingane yakho ilaliswe leni esibhedlela? \_\_\_\_\_  

Yebo	Cha
------	-----
- h. Uma uthi yebo, utshelwe umhlengikazi? \_\_\_\_\_  

Yebo	Cha
------	-----
- i. Kulokhukukukhulelwa kwamanje, umsebenzi wezempilo uke  
wakuchazela nge HDN? \_\_\_\_\_  

Yebo	Cha
------	-----

**ISIGABA C: UMLANDO WOKUKHULELWA**

SKIP IF FIRST

a. Usume wakhulelwa kangaki?:.....

b. Wazizala ziphila zonke izingane?

Yebo

Cha

N/A

c. Uma uthi Cha ngenhla, zingaki ezazalwa sezidlulile emhlabeni?.....

d. Kwabayini imbangela yokufa kwe(zi)ngane?

1 HDN

2 Okunye

3 Angazi

4 N/A

e. Ikhona ingane/izingane eyashona kungakapheli inyanga isizaliwe?

f. Uma uthi Yebo, yini eyaba imbangela yokudlula kwayo/zo emhlabeni?

1 HDN

2 Okunye

3 Angazi

4 N/A

g. Wake wazala ingane ene-jondisi? \_\_\_\_\_

Yebo

Cha

N/A

h. Uma uthi yebo, wachazelwa ngayo umhlengikazi?

i. Kwakuyini imbangela yejondisi?

j. Wake wabeletha /wabelethiswa singakafiki isikhathi?

k. Ngabe ukukhulelwa okwedlule kwakujwayelekile?

l. Uma uthi Cha, imbangela:

SKIP IF FIRST  
PREGNANCY

**ISIGABA D: UKULULEKWA NGESIKHATHI UKHULELWE NGESIKATHI  
ESEDLULE**

a. Ukhona owezempilo owake wakutshela ngokuhlolwa okwakuzokwenziwa ngenxa ye-HDN?

b. Ukhona owezempilo owake wakutshela nge-HDN?

c. Ukhona udokotela owake wacela ubaba wengane ukuthi azohlola igazi ngenxa ye-HDN?

Yebo

Cha

N/A

**ISIGABA E: UKUTHINTEKA NGENXA YE-HDN**

**a. Kukhona okubengumthelela we HDN ngokwezimali?**

Yebo

Cha

Uma uthi Yebo, kuyini

*THIKHA IMPENDULO KAMAMA EHAMBISANAYO:*

i. Ngisebenzisa imali kakhulu ezidingweni zami (okokugeza, ukudla) ngesikhathi ngisalinde ingane yami ukuthi ibe ngcono. Yebo ☐ Cha ☐

ii. Abasebenzi besibhedlela bangitshele ukuthi ngizokhokha imali ethe xaxa ngoba ingane yami izolaliswa ngaphezu kwesikhathi esijwayelekile ngenxa ye HDN. Yebo ☐ Cha ☐

**b. Kukhona okube ngumthelela we HDN emphefumulweni wakho?**

Yebo

Cha

Uma uthi Yebo, kuyini?

*THIKHA IMPENDULO KAMAMA EHAMBISANAYO:*

- i. Anginakho ukuphumula emphefumulweni ngoba bengingalindele ukuthi ingane yami igule. Yebo ☐ Cha ☐
- ii. Ngijahe ukuya ekhaya. Yebo ☐ Cha ☐
- iii. Anginakho ukuphumula ngoba angazi ukuthi izogcina injani ingane yami. Yebo ☐ Cha ☐
- iv. Anginakho ukukhathazeka Yebo ☐ Cha ☐

**FOR OFFICIAL USE ONLY:**

**SECTION F (Information obtained from the patient's file)**

**Presence of HDN/EF: Yebo = 1      Cha = 2**

**Causative Blood Group System : ABO= 1      Rhesus = 2**

**Complications (perinatal /postnatal):**

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## **APPENDIX 8: HOSPITAL INCIDENCE RATE WORKSHEET**

<b>Hospital</b>	<b>No. of HDN Cases</b>	<b>Total No. of deliveries</b>	<b>Incidence Rate</b>
Edendale			
Greys			
Northdale			
Appelsbosch			

**Incidence Rate =**

***No of HDN cases in x period of study***

***x 100%***

***\_\_\_\_\_***  
***Total population at risk (no of deliveries) in the x period of study***

*Where 'x' is the specific period of study*



## Appendix 9: Department of Health Approval



**HEALTH**  
KwaZulu-Natal

### Health Research & Knowledge Management sub-component

10 – 102 Natalia Building, 330 Langalibalele Street

Private Bag x9051

Pietermaritzburg, 3200

Tel.: 033 – 395 2805

Fax.: 033 – 394 3782

Email: [hrkm@kznhealth.gov.za](mailto:hrkm@kznhealth.gov.za)

[www.kznhealth.gov.za](http://www.kznhealth.gov.za)

**Reference: HRKM092-10**

**Enquiries: Mr X. Xaba**

**Telephone: 033-395 2805**

Dear Mrs G.E. Khumalo

### Subject: Approval of Research

1. The research proposal titled “**Evaluation of knowledge and implications of haemolytic disease of the newborn (HDN) amongst postnatal women in the public hospitals of the uMgungundlovu District**” was reviewed by the KwaZulu-Natal Department of Health. The proposal is hereby **approved** for research to be undertaken at the Appelsbosch, Edendale, Grey's and Northdale hospitals.
2. You are requested to undertake the following:
  - a. Make the necessary arrangement with identified facility before commencing with your research project.
  - b. Provide an interim progress reports and final report (electronic and hard copies) when your research is complete.
3. Your final report must be posted to **HEALTH RESEARCH AND KNOWLEDGE MANAGEMENT, 10-102, PRIVATE BAG X9051, PIETERMARITZBURG, 3200** and e-mail an electronic copy to [hrkm@kznhealth.gov.za](mailto:hrkm@kznhealth.gov.za).

For any additional information please contact Mr X. Xaba on 033-395 2805.

Yours Sincerely

  
Dr. S.S.S. Buthelezi

Date: 22/06/2010

Chairperson: Provincial Health Research Committee  
KwaZulu-Natal Department of Health

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uMnyango Wezempilo . Departement van Gesondheid

*Fighting Disease, Fighting Poverty, Giving Hope*

## Appendix 10: DUT Ethics Clearance Letter



Faculty of Health Sciences

### ETHICS CLEARANCE CERTIFICATE

Student Name	Mrs Gugulethu Eve Khumalo	Student No	20055314
Ethics Reference Number	FHSEC 00044/09	Date of FRC Approval	07 September 2009
Qualification	MTech-Biomedical & Clinical Technology		
Research Title:	Evaluation of knowledge and implications of haemolytic disease of the newborn amongst postnatal women in the public hospitals of the Umgungundlovu district.		

In terms of the ethical considerations for the conduct of research in the Faculty of Health Sciences, Durban University of Technology, this proposal meets with Institutional requirements and confirms the following ethical obligations:

1. The researcher has read and understood the research ethics policy and procedures as endorsed by the Durban University of Technology, has sufficiently answered all questions pertaining to ethics in the DUT 186 and agrees to comply with them.
2. The researcher will report any serious adverse events pertaining to the research to the Faculty of Health Sciences Research Ethics Committee.
3. The researcher will submit any major additions or changes to the research proposal after approval has been granted to the Faculty of Health Sciences Research Committee for consideration.
4. The researcher, with the supervisor and co-researchers will take full responsibility in ensuring that the protocol is adhered to.
5. The following section must be completed if the research involves human participants:

	YES	NO	N/A
❖ Provision has been made to obtain informed consent of the participants	✓		
❖ Potential psychological and physical risks have been considered and minimised	✓		
❖ Provision has been made to avoid undue intrusion with regard to participants and community	✓		
❖ Rights of participants will be safe-guarded in relation to:	✓		
- Measures for the protection of anonymity and the maintenance of Confidentiality.			
- Access to research information and findings.	✓		
- Termination of involvement without compromise	✓		
- Misleading promises regarding benefits of the research	✓		

SIGNATURE OF STUDENT/RESEARCHER

23/10/2009  
DATE

SIGNATURE OF SUPERVISOR/S

25/10/2009  
DATE

SIGNATURE OF HEAD OF DEPARTMENT

26/10/09  
DATE

SIGNATURE OF CHAIRPERSON OF RESEARCH ETHICS COMMITTEE

4/11/2009  
DATE

## Appendix 11: DUT Postgraduate Committee Approval Letter



20 January 2010

**Reference: Proposal Ratification: GE KHUMALO, Student number 20055314**

Dear Mrs Khumalo

### **MASTERS DEGREE IN TECHNOLOGY: BIOMEDICAL TECHNOLOGY**

This serves to confirm the ratification of your research proposal by the Higher Degrees Committee, at its meeting on 17 December 2009, as follows:

1. Research proposal and provisional dissertation title:

**EVALUATION OF KNOWLEDGE AND IMPLICATIONS OF HAEMOLYTIC DISEASE OF THE NEWBORN AMONGST POSTNATAL WOMEN IN THE PUBLIC HOSPITALS OF THE UMGUNGUNDLOVU DISTRICT**

Supervisor: Mrs JN Mtshali

Co-supervisor: Dr MJ Titus

Please note that any proposed changes in the dissertation title require the approval of your supervisor/s, the Faculty Research Committee, as well as ratification thereof by the Higher Degrees Committee

The Committee recommended that a supervisor with a Doctorate qualification should be appointed.

2. Research budget to the amount of R15 000.00

Please note that this funding is not paid directly to you but is controlled by your supervisor. Any proposed changes to this funding allocation require the approval of your supervisor and the Faculty Research Committee.

The institutional Research Committee has stipulated that:

- (a) Ownership of any patent registered in respect of the results of your Masters/Doctors Degree in Technology studies be retained by you as the initiator of the project;
- (b) Should you make any profit from the results of your Masters/Doctors Degree in Technology, you will be required to repay, *pro rata*, the funding investment which the University has made in approving your request for funding;

- (c) If the University provided the equipment/materials for the creation of artefacts, this cost must be refunded to the University if such artefacts are sold;
- (d) The University must be given first refusal in respect of any possible future sale by you of any patent that may be registered in respect of your said project. May we remind you that in terms of Rule G24(2)(b), if you fail to obtain the Masters/Doctors degree within the maximum time period allowed after first registering for the qualification, the Senate may refuse to renew your registration or may impose any conditions it deems fit. You may apply to the Faculty Research Committee for an extension.

Please note that you are required to re-register each year.

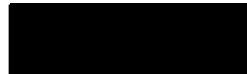
You are invited to apply for a Postgraduate Award from the Postgraduate Development and Support Directorate. The forms are available on the DUT website at [www.dut.ac.za](http://www.dut.ac.za); please note that conditions apply. You are further invited to contact the PGDS office to enquire about further support for your research studies.

Should you experience any problems relating to your research, your supervisor must be informed of the matter as soon as possible. If the difficulties persist, you should then approach your Head of Department and thereafter the Executive Dean of the Faculty.

Please refer to the 2009 General Rule Book concerning the rules relating to postgraduate studies, which include *inter alia* acceptable minimum and maximum timeframes, submission of thesis/dissertations, etc. You are also advised to read the Postgraduate Students' Guide which is available on the DUT website.

Please do not hesitate to contact this office for any assistance. We wish you success in your studies.

Kind regards,



Ms N Muller

Manager: Postgraduate Development and Support Directorate (Acting)

Cc     Faculty officer: Mr V Singh  
         TIP Research Finance: Ms R Govender  
         Head of Department: Mrs P Pillay  
         Supervisor: Mrs JN Mtshali