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Feeding practices within neonatal intensive care units in tertiary public hospitals in Gauteng.

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A Masters Research Dissertation
Submitted to the Department of Speech Pathology and Audiology,
School of Human and Community Development
Faculty of Humanities
University of Witwatersrand
Johannesburg

Supervised by Dr Kim Coutts and Dr Joanne Neille

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Plagiarism Declaration

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

SCHOOL OF HUMAN AND COMMUNITY DEVELOPMENT
SPEECH PATHOLOGY AND AUDIOLOGY

30 June 2021

Plagiarism Declaration

I, Nicole Louw, with student number 2259764 hereby declare that this Research Report is my own work and that no plagiarism was committed by correctly referencing and citing all work used from other sources.

This Research Report is being submitted in the fulfilment of a MA (Speech-Language Pathology) degree, at the University of the Witwatersrand, in Johannesburg. This report has not been submitted before for any degree at any other University.

Signature of Research Student

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Abstract

Background: Before discharge from the Neonatal Intensive Care Unit (NICU), it should be a prerequisite for the infant to achieve safe oral feeding (Lau, 2014). Some infants experience difficulty with oral feeding post-discharge and many return to the hospital with complications (Lubbe, 2018). These complications and feeding difficulties could be attributed to the troublesome transition to oral feeds within the NICU or the lack of support in NICUs during feeding times. Which could have been further influenced due to the novel COVID-19 global pandemic.

Aim: The aim of this study was to describe the feeding practices and the role of the healthcare workers involved in feeding in the Neonatal Intensive Care Units in two tertiary hospitals in Gauteng.

Design: Structured observations were done over a period of 17 days and 22 semi-structured interviews with healthcare workers working within the NICU were conducted. Interviews were analysed qualitatively using a deductive thematic analysis approach.

Findings: Most infants admitted to the Neonatal Intensive Care Units are initially fed by enteral and alternative feeding methods. Public NICUs have a shortage of healthcare workers to assist the infants who are admitted to successfully transition to oral feeds before discharge. Furthermore, COVID-19 seems to have influenced the overall workload of healthcare workers and therefore possibly limited the quality of service provided in terms of feeding development of the infants.

Conclusion: With more healthcare workers and dedicated developmental team members within the NICU who understand their primary or secondary role within feeding, the feeding development of infants can be supported optimally and guided safely in order to discharge infants successfully and ultimately decrease neonatal deaths.

Keywords: neonatal intensive care unit, feeding practices, healthcare workers, speech-language therapist, COVID-19

Glossary of Terms

Anaemia "Anaemia in a new born is a condition where the baby's body has a lower red blood cell count than normal. This can happen for several reasons, including If the baby is premature." (*Anemia in Newborns*, 2020).

Aspiration "Aspiration is when something enters the airway or lungs by accident. It may be food, liquid, or some other material. This can cause serious health problems, such as pneumonia." (Cedars Sinai, n.d.).

Breastfeeding "Exclusive breastfeeding means that the infant receives only breast milk. No other liquids or solids are given – not even water – with the exception of oral rehydration solution, or drops/syrups of vitamins, minerals or medicines." (The World Health Organization, 2019)

Complementary food "Authorities have suggested that the term complementary food should be applied to foods or liquids other than breast milk or infants formulas" but "complementary foods are defined by the WHO as any food or liquid other than breast milk; This definition means that infant formulas are regarded as complementary foods." (Koletzko et al., 2015)

Cephalohematoma "Cephalohematoma is a collection of blood between a baby's scalp and the skull. Damaged blood vessels release the blood, and the blood pools into a mass under the skin of the scalp. The blood vessels are often damaged during labour and delivery." (Holland & Han, 2017).

Enteral feeds "Enteral feeding refers to intake of food via the gastrointestinal (GI) tract. In the medical setting, the term enteral feeding is most often used to mean tube feeding." (Marengo, 2018).

Feeding Feeding is the "act of giving food to a person" or "to supply with nourishment" (Collins English Dictionary - Complete and Unabridged, 2014).

Gastroschisis "Gastroschisis is when a baby is born with the intestines sticking out through a hole in the belly wall near the umbilical cord. Sometimes other organs also stick out." (Berman, 2019).

Hypoglycemia "Neonatal hypoglycemia, defined as a plasma glucose level of less than 30 mg/dL (1.65 mmol/L) in the first 24 hours of life and less than 45 mg/dL (2.5 mmol/L) thereafter, is the most common metabolic problem in newborns." (Cranmer, 2020).

Hypothemia "If your baby's rectal temperature drops below 95°F (35°C), they're considered to have hypothermia, or low body temperature. A low body temperature in babies can be dangerous." (Christiano, 2020)

Low birth weight "A baby weighing less than 2500 g at birth is low birth weight (LBW). A baby less than 1500 g is very low birth weight (VLBW)." (The World Health Organization, 2009).

Meconium Aspiration Syndrome (or MSL Meconium Strained Liquor) "Meconium Aspiration Syndrome (MAS) happens when a new born has trouble breathing because meconium got into the lungs." (Greenspan, 2020).

Neonatal Intensive Care Units (NICU) "When babies are born early, have health problems, or a difficult birth they go to the hospital's NICU. There, babies get around-the-clock care from a team of experts." (Gavin, 2019).

Orogastric Tube (OGT) and Nasogastric Tube (NGT) "Often babies can't breastfeed or take a bottle yet. These babies get nutrition (formula or breast milk) through a feeding tube. Tubes enter through the mouth or nose and go into a baby's stomach." (Gavin, 2019).

Parenteral feeds (or Intravenous feeding) "Parenteral nutrition, or intravenous feeding, is a method of getting nutrition into your body through your veins." (Stubblefield, 2017).

Pneumonia "Neonatal pneumonia is lung infection in a neonate. Onset may be within hours of birth" and "Pneumonia is one of the leading causes of neonatal respiratory distress". (Tesini, 2020; Tori Rodriquez, 2019).

Preterm birth "Preterm birth is when babies are born before 37 weeks of pregnancy are completed. There are subcategories of preterm birth, based on gestational age; extremely preterm (less than 28 weeks), very preterm (28 to 32 weeks) and moderate to late preterm (32 to 37 weeks)." (The World Health Organization, 2018).

List of Abbreviations

ASHA	American Speech-Language-Hearing Association
BFI	Baby-Friendly Initiative
COVID-19	Coronavirus disease 19
CPAP	Continuous Positive Airway Pressure
DBM	Donated breast milk
EBM	Expressed breast milk
EHM	Exclusive Human Milk
ELBW	Extremely Low Birth Weight
g	gram
HIE	Hypoxic Ischaemic Encephalopathy
HPCSA	Health Professionals Council of South Africa
IUGR	Intrauterine growth retardation
KMC	Kangaroo Mother Care
LBW	Low Birth Weight
MSL	Meconium Strained Liquor
NNJ	Neonatal Juandice
NNE	Neonatal Necrotizing Enterocolitis OR
NEC	Necrotising Enterocolitis
NICU	Neonatal Intensive Care Unit
OT	Occupation Therapist
PICU	Paediatric Intensive Care Unit
PPE	Personal Protective Equipment
RDS	Respiratory Distress Syndrome
RVD	Retro Viral Disease
SASLHA	South African Speech-Hearing-Language Association
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
SLT	Speech Language therapist
TAGA	Term Appropriate for Gestational Age
VLBW	Very Low Birth Weight
UNICEF	United Nations Children's Fund
WHO	World Health Organisation

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CHAPTER ONE

INTRODUCTION AND RATIONALE

Chapter one serves as an introduction based on the literature found within this field of research in order to serve as a focused orientation at the beginning the study conducted. The introduction is then followed by the rationale for the study.

Global health policies highlight the importance of the first 1000 days of an infant's life due to this period being an highly developmental stage laying the foundations of brain development, feeding and overall health more than any other time in their lives (World Health Organization, 2002, 2007; UNICEF, 2018). It is therefore important to ensure appropriate feeding practices are established during this developmental stage in an infant's life (Arumugam et al., 2016; Yin et al., 2015).

Neonatal Intensive Care Units (NICUs) are the working environments for doctors, nurses and other developmental healthcare workers who provide care to infants in need of specialised medical attention after birth (Naylor et al., 2020). It is far removed from a normal environment, as it prioritises the vital medical care needed by the infant (Barbosa, 2013; Medeiros, Santos, Santos, Barreto & Alves, 2017; Pinelli et al., 2001; Rossetti, 2001). The variety of diagnoses that the infants are admitted for could have an initial effect on their feeding abilities and overall development (D'Agata et al., 2016; Kritzinger & Mosca, 2017; Rossetti, 2001). Moreover, medication administered to treat conditions within the NICU may affect the infant's behaviour and ultimately, their progress in feeding (Greene et al., 2016).

Within South Africa, infants continue to experience difficulties with oral feeding post-discharge; as many as 20–80% are discharged with some degree of dysphagia and many return to hospital with complications such as being underweight, aspiration and other problems linked to feeding difficulties (Caretto et al., 2000; Da Costa et al., 2019; Lau, 2014; Lubbe, 2018)

South Africa currently has an overall neonatal mortality rate of 21 per 1000 live births, with most of these being deaths of early neonatal phase and avoidable causes (Hardy et al., 2021; Department of Health, 2015). Some of these deaths could have been prevented by ensuring that feeding guidelines (especially breastfeeding guidelines) as well as simple intervention strategies, including safe feeding methods and clean feeding environments at home, are

explained to the parents (MDG Monitor, 2016; Motsa et al., 2016; Rhoda et al., 2018; Visser & Nel, 2016). Globally, most neonatal deaths are caused by pneumonia, diarrhoea and malnutrition as a contributing factor which could be due to unsafe feeding practices, unclean feeding environments as well as a caregiver's limited knowledge on optimal feeding practices (Department of Health, 2013; World Health Organisation, 2019; Visser & Nel, 2016).

The majority (83%) of South Africans make use of public healthcare facilities due to the inability to access or afford private healthcare, particularly so in the rural areas (StatsSA, 2017). Tertiary hospitals in South Africa provide intensive care services that include NICU settings (Department of Health, 2012). In a study investigating a public sector hospital in Tshwane, Lloyd and de Witt (2013) reported that limited staff, delays in the referral processes, the inadequate number of NICU beds for infants and hospital-acquired infections accounted for numerous deaths in the hospital. These challenges undermine the effective provision of services to the public in a tertiary public hospital, particularly during the critical time after an infant is born (Mahwasane et al., 2020). As UNICEF confirms, South Africa, together with many countries worldwide, have a shortage of healthcare workers to provide critical information and support for optimal practices, including within the Neonatal Intensive Care Units (Department of Health, 2013; UNICEF/WHO, 2016).

Furthermore, the COVID-19, caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was declared a global pandemic by the World Healthcare Organization in March 2020 (Dashraath et al., 2020; de Miranda et al., 2020; Gale et al., 2020; Sumarni et al., 2020; Department of Health, 2020). Owing to COVID-19 being a novel infection, limited research is available to understand the repercussions of this virus, the influence on the NICU and feeding practices, as well as the effect on healthcare workers during this time (Calil et al., 2020; Gunes et al., 2021; Pramana et al., 2020).

RATIONALE

This research study initially aimed to describe the feeding practices and healthcare workers involved in the feeding development of neonates in the NICUs of two tertiary hospitals. This study was conceived prior to the novel COVID-19 pandemic, however owing to the global pandemic, the researcher added an additional objective to identify the possible influence of the novel global pandemic on the NICU settings with regard to the feeding practices and therefore the findings framed the overall results as explained in each section.

A better understanding of the current feeding practices compared to local and international guidelines, as well as identify the challenges faced within the NICUs may shed light on the high proportion of infants who experience feeding difficulties post-discharge. The difficulties following discharge may be due to the severity of the individual case of each infant or possibly due to the shortage of healthcare workers to care for the number of infants admitted.

It is important to establish whether there is a shortage of staff within the units to provide adequate care to the infants and to clarify the roles of the different team members involved in the feeding development during the infants' admission to the NICUs. By providing information on the team involved within the feeding development, the healthcare workers are enabled to understand their role and shared responsibility within the setting better. In particular, clarifying and describing the valuable role of speech-language therapists in the NICU setting could give other healthcare workers a clear indication of how to benefit from their services.

As mentioned, COVID-19 was declared a novel global pandemic, and therefore timeous information was gathered to provide an understanding of the influence it had on the feeding practices, recommendations made with regard to feeding as well as the impact COVID-19 had on the healthcare workers providing services during the time of limited knowledge within literature. More information can be found in Chapter 2 providing a literature review of this specific field of research. Chapter 3 provides the methodology of this specific study and the result can be found in Chapter 4. The discussion section, found in Chapter 5, describes the current feeding practices, a family centred approach, the healthcare workers who have a role within the feeding development and the influence COVID-19 has had and continues to have within these settings. The results can recommend future service delivery and future studies within this field of research, as explained in Chapter 6 which provides the limitations and recommendations, as well as the conclusion of this study.

CHAPTER TWO

LITERATURE REVIEW

This section provides the background information pertinent to this study. The aim of the literature review is to provide an understanding of the research problem identified and based upon the findings of the research problem, questions and aims were formulated.

2.1 International feeding policies

Global health policies highlight the importance of the first 1000 days of an infant's life due to this period being a highly developmental stage laying the foundations of brain development, feeding and overall health more than at any other time in the infant's life (The World Health Organization, 2002, 2007; UNICEF, 2018). It is therefore important to ensure that appropriate feeding practices are established during this critical developmental stage (Arumugam et al., 2016; Yin et al., 2015). International policies all mention the:

- significance of breastfeeding within one hour of birth
- benefits of exclusive breastfeeding up to six months of age
- importance of maternal support
- evidence-based education for healthcare workers and the maintenance of their knowledge
- implementation of feeding policies within healthcare systems

(du Plessis, 2013; Department of Health, 2013; World Health Organization, 2002, 2007; UNICEF, 2018; van der Merwe, du Plessis, Jooste & Nel, 2015).

The Baby-Friendly initiative (BFI) is a programme designed by the World Health Organisation (WHO) and United Nations Children's Fund (UNICEF) to aid all new born and maternal services. Entitled *The 10 steps to successful breastfeeding*, the programme includes the most common principles of feeding policies worldwide and specifically advocates breastfeeding practices. The implementation of these ten steps promotes successful breastfeeding, which ultimately assists optimum infant feeding (UNICEF/WHO, 2006). The programme recommends that the following should be in place at an institution:

1. Having a written infant feeding policy that is routinely communicated to staff and parents. This includes ongoing monitoring and data management systems.
2. Ensuring that staff has sufficient knowledge, competence and skills to support breastfeeding.
3. Discussing the importance of the management of breastfeeding with pregnant women and their families.

4. Facilitating immediate and uninterrupted skin-to-skin contact to help mothers initiate breastfeeding as soon as possible after birth.
5. Supporting mothers to maintain breastfeeding and manage common difficulties.
6. Refraining from providing breastfed new-borns with any food or fluids other than breast milk, unless medically indicated.
7. Enabling mothers and their infants to remain together and to practice rooming-in 24 hours a day.
8. Supporting mothers to recognise and respond to their infants' cues for feeding.
9. Counselling mothers on the use and risks of using feeding bottles, teats and pacifiers, and to rather to make use of cup feeding when breastfeeding is an inappropriate option.
10. Coordinating discharge so that parents and their infants have timely access to on-going support and care.

Each hospital providing maternal and infant services should aim to implement all ten steps recommended by the WHO and UNICEF (2006). However, they must also ensure that they implement the national policies on infant feeding improvement (du Plessis, 2013; Department of Health, 2013; UNICEF/WHO, 2006). *The Global Strategy for Infant and Young Child Feeding* explains the importance of national infant and child feeding policies and guidance (Department of Health, 2013; World Health Organisation, 2002).

According to Motsa et al. (2016), Southern Africa is one of the contexts that are often non-compliant with the recommendations made in the WHO/UNICEF guidelines. For example, it is recommended for children to be exclusively breastfed up to six months but that they receive complementary feeding before six months of age if a mother is reporting insufficient milk supply or is returning to work/school. This could also be attributed to lack of knowledge or support regarding feeding recommendations (Motadi, Malise & Mushaphi, 2019; Motsa et al., 2016). A potential reason for this non-compliance was found in a study where most mothers decided not to initiate or maintain breastfeeding in South Africa due to their HIV status (Siziba et al., 2015). As HIV/AIDS is one of the quadruple burdens of disease within SA (South African Medical Research Council, 2016), this is a pertinent issue that needs to be explored and guided appropriately.

2.1.1 The impact of HIV/AIDS on feeding – specifically in South Africa

The amount of HIV infected mothers may have uncertainties about feeding their infants and worries about affecting their new born infants especially when they are not educated regarding the recommendations made by literature (West et al., 2019). Research proves that exclusive breastfeeding of an infant born to an HIV positive mother could prevent mother-to-child transmission and neonatal death caused by the infections which they are at risk for, including diarrhoea and pneumonia (DOH, 2013; Doherty, Sanders, Goga, & Jackson, 2011; Visser & Nel, 2016). However one study explained the history of not promoting breastfeeding within South Africa due to the high frequency of HIV patients, and the additional concern that infants received complementary feeds before 6 months of age which goes against all recommendations made with regard to feeding infants, as well as infants exposed to HIV positive mothers (Rossouw et al., 2016). Research also further elaborate on the additional and general risks of feeding infants with formula feeds or mixed feeds; which also includes diarrhoea and pneumonia which are amongst the leading causes of neonatal deaths (Department of Health, 2013; World Health Organisation, 2019; Visser & Nel, 2016).

The World Health Organization revised their HIV and infant feeding guidelines in 2010 stating that all nations should decide on one feeding strategy for the HIV population and that they recommend that mothers taking their antiretroviral medication should practice exclusive breastfeeding (WHO, 2002; Vitalis et al., 2021). Ideally, it is recommended that South Africa should strive even more so for exclusive breastfeeding as a feeding strategy as it is more affordable, especially given the social-economic status of the majority of the population and that most South Africans do not meet the WHO "Acceptable, Feasible, Affordable, Sustainable and Safe" (AFASS) criteria necessary to attain the recommended formula feeding to the population (Rossouw et al., 2016; Siziba et al., 2015; Department of Health, 2013; Van der Merwe et al., 2015).

In an attempt to prevent mother-to-child transmission (PMTCT) and ultimately avoid neonatal deaths, the South African Department of Health revised their feeding policy confirming that all mothers should receive antiretroviral medication, breastfeed exclusively and that no free formula milk should be provided at public facilities (Department of Health, 2013; Doherty et al., 2011; Du Plessis, 2013; Pillay et al., 2018; UNICEF/WHO, 2016). In spite of the policies and recommendations made, mothers prove to have limited knowledge of the benefits of breastfeeding and the policies within South Africa; this could be due to not being supported and

educated optimally or to personal limitations such as the responsibility of returning to work or cultural beliefs (Rossouw et al., 2016; Siziba et al., 2015; West et al., 2019).

2.2 South Africa's public healthcare systems and NICU services

With the ever increasing population in South Africa and increasing levels of poverty, the vast majority of the population is dependent on the public healthcare, including the Neonatal Intensive Care Units (NICUs) facilities (Pieper & Hesseling, 2007). From the 1 051 311 live births within South Africa as per 2019 statistics, it is estimated that 10-15% will require inpatient services for any health issues and in prevention of neonatal death (Department Statistics South Africa, 2020; LINC, 2013). Around 83% of South Africans make use of public healthcare facilities due to their inability to afford private healthcare, particularly in the rural areas (StatsSA, 2017).

The South African government stated in 2013 that the goal of the National Health Insurance System will be to provide healthcare, including maternal, new born and child health services, with the aim of decreasing neonatal mortalities (Department of Health, 2013). This was done in line with the Millennium Developmental Goal 4 which was to reduce the mortality of children under five by two-thirds by the end of 2015 (Hardy et al., 2021; MDG Monitor, 2016). In 2017, the Department of Health reaffirmed its commitment to education, awareness and promotion campaigns to encourage women to access antenatal services at any public health clinic to ensure safe and healthy pregnancies and to reduce mortality rates (Department of Health, 2012, 2015). Maternal healthcare is freely accessible at all healthcare clinics countrywide in South Africa and can ultimately lower all risks of an infant ending up in NICU (Department of Health, 2015; World Health Organisation, 2012).

The South African healthcare system includes four levels of service delivery where level one consists of community health clinics and district hospitals, level two being regional hospitals, level three being tertiary hospitals and level four including specialised hospitals (Lloyd & de Witt, 2018; Department of Health, 2012). Should mothers and their infants need more specialised care because of the severity of a problem, they are referred to the regional and tertiary hospitals (Department of Health, 2012).

Tertiary hospitals in South Africa provide intensive care services which include NICU settings (Department of Health, 2012). This level of care should provide evidence-based

information and services to all patients making use of the higher levels of care (Department of Health, 2013), but numerous reasons interfere with the ideal care necessary from the public healthcare setting.

In their study on a public sector hospital in Tshwane, Lloyd and de Witt (2013) reported that limited staff, delays in the referral processes, the inadequate number of NICU beds for infants, poor resuscitation management and hospital-acquired infections accounted for numerous deaths in the hospital. These challenges undermine the effective provision of services to the public in a regional or tertiary public hospital, particularly so during the critical time after a baby is born (Mahwasane et al., 2020). As UNICEF confirms, one reason is that many countries worldwide, including South Africa, have a shortage of healthcare workers to provide critical information and support for optimal practices, including within NICUs (Department of Health, 2013; UNICEF/WHO, 2016).

2.3 NICU settings

NICUs are the working environments for doctors, nurses and other developmental healthcare workers who provide care to infants in need of specialised medical attention after birth (Naylor et al., 2020). The population within the NICU is mainly infants born prematurely with low birth weight (LBW), those who experienced complications during birth, infants with disorders, congenital abnormalities and/or other medical complications such as cleft palates, respiratory difficulties, and heart defects that will have an initial effect on the infants feeding and on their overall development (D'Agata *et al.*, 2016; Kritzinger & Mosca, 2017; Rossetti, 2001). The NICU setting is far removed from a normal environment, as it prioritises the vital medical care needed by the infant, thus initially delaying the focus on oral feeding of the infant (Barbosa, 2013; Medeiros, Santos, Santos, Barreto & Alves, 2017; Pinelli et al., 2001; Rossetti, 2001).

It is vital to consider all characteristics of the NICU environment, as it has been proven that reducing environmental factors, such as light and noise levels, may reduce the stress experienced by the infant (Bertoncelli et al., 2012; D'Agata et al., 2016; Hardy et al., 2021; Lau, 2014; Rossetti, 2001). The medical needs of the infants, the emotions experienced by parents, medical monitoring and treatments, feeding challenges and lack of interaction between a mother and her infant add to the stress levels experienced in this setting (Bertoncelli et al., 2012; Rossetti, 2001).

The challenges imposed by the NICU setting not only inhibits the mothers' opportunities to provide care to their infant but could also influence their confidence in caring for their infants during the NICU admission. This includes the vital new born care activity of feeding an infant (Arvedson et al., 2020). Research shows that the NICU environment, with the separation, stress and pain experienced, may be a contributing factor for infants developing lifelong difficulties post-discharge which includes attachment and bonding, feeding and educational development (D'Agata et al., 2016; Madhoun & Dempster, 2019). These factors can contribute to the stress experienced by both the mother and infant and can make the establishing of attachment and safe feeding practices more challenging, influence the milk production of the mother and possibly also lead to additional developmental difficulties when discharged (Bertoncelli et al., 2012; D'Agata et al., 2016; Fouché, 2018; Fróes et al., 2020; Lau, 2001).

2.3.1 Length of stay

The medical care needed and length of stay in the NICU depends on the severity of the medical diagnosis and/or other difficulties faced by the infant (D'Agata et al., 2016). As most infants are placed in this environment to heal, develop and most importantly, fight to stay alive, oral feeding practices are not the healthcare practitioners' main priority until the infants are medically stable (D'Agata et al., 2016; Lau, 2014). Before discharge, it is usually a prerequisite that the infant gains sufficient weight and achieves safe oral feeding skills (Lau, 2016; Madhoun & Dempster, 2019; Pike et al., 2016). This is important, as within a NICU when infants are fed via tubes upon admission, it would lead to a longer NICU stay until oral feeding skills were mastered (Bertoncelli *et al.*, 2012; Lau, 2014; Younesian, Yadegari & Soleimani, 2015). Safe feeding practices therefore need to be established as soon as possible to ensure optimal development, a successful discharge and avoid neonatal deaths (Matus et al., 2018).

2.4 Impact of prematurity and LBW on the public healthcare system

Some of the main reasons for neonatal and infant death in South Africa is pre-term birth (before 36 weeks' gestation) and low birth weight (LBW) (Rhoda et al., 2018). LBW can be defined as a baby being born at 2500g or less, very low birth weight (VLBW) being under 1500g and extremely low birth weight (ELBW) less than 1000g at birth (Arumugam et al., 2016; World Health Organization, 2003). Children born with LBW are at risk of infant death due to their medical needs and can have various other difficulties later in life, including diabetes, cardiovascular difficulties, problematic psychosocial development and school progress to name a few (Altenhöner et al., 2015; Demitto et al., 2017).

In 2012, the WHO established that the incidence of prematurity worldwide was 5–18%, and that 60% of pre-term births occurred in Africa and South Asia (World Health Organisation, 2012). In South Africa, 8 out of every 100 babies are expected to be born prematurely and prematurity accounts for 46% of neonatal deaths in the country (Mahwasane et al., 2020; Mongale, 2012). Owing to the novel COVID-19 pandemic, infants are also at risk of premature birth to a COVID-19 positive mother (Tran et al., 2020).

Other risk factors that could lead to LBW include the demographic status (age and marital status), any pregnancy complications (multiple pregnancy, anaemia, rupture of membranes, foetal anomalies and prematurity) as well as behavioural and environmental risks (smoking, alcohol, toxic exposure, inadequate care and high levels of stress) (Altenhöner, Köhler & Philippi, 2015; Fouché, 2018; Rossetti, 2001). As for infants who are born prematurely, it could be due to poor prenatal care, never seeking medical attention or attaining medical advice too late, toxins or substance abuse, multiple births and lower socio-economic factors (Mahwasane et al., 2020; Rossetti, 2001).

As mentioned previously, South Africa presents with some of the highest rates of pre-term birth and LBW infants, with most of these infants being born in lower socio-economic communities. The birth weight of infants may be negatively influenced by the socio-economic characteristics as well as the educational status of their mothers (Demitto et al., 2017; Nayeri et al., 2013). It has been shown that mothers of a lower socio-economic status, with low education and income levels, are more likely to give birth to infants weighing 2500g or less (Altenhöner *et al.*, 2015). This results in more of these infants being admitted into the public healthcare system, as most families from a lower socio-economic status rely on these services (StatsSA, 2017).

When an infant is born pre-term or with LBW, they become part of a high-risk group who are at risk of neonatal death (Ahmed, 2008; Bonet, Forcella, Blondel, Draper, Agostino, Cuttini & Zeitlin, 2015; da Silva & de Almeida, 2015; Rossetti, 2001; Siziba *et al.*, 2015; World Health Organisation, 2015; Underwood, 2013). As with LBW, when a baby is born prematurely and taken away from the natural environment of a mother's womb where nutrition was provided through the placenta and where development still needs to take place, the infant is at risk for multiple medical, feeding and developmental difficulties (Arumugam et al., 2016; D'Agata et al., 2016; Gulati & Jadcherla, 2019; Mahwasane et al., 2020; Rossetti, 2001).

These infants are usually admitted for a lengthy time depending on their needs and development that includes the long-term goal of establishing safe oral feeding practices as a prerequisite before discharge (Pike et al., 2016; Rossetti, 2001). In turn, the length of stay will influence the number of beds available for other infants and thus lead to overpopulated NICU environments with limited staff and resources available (Da Costa et al., 2019; Lloyd & de Witt, 2018). It is therefore vital to establish safe feeding practices to ensure that the infants consume proper nutrition to help their development, decrease the risk of prolonged hospitalization and lower the possibility of other risk factors, including sepsis which could lead to death amongst other risk factors (Assad et al., 2016; Dutta et al., 2015; Freitas et al., 2019; Nayeri et al., 2013). Particularly within this high risk population, it is recommended that infants be fed their mother's breast milk or alternatively, donors' milk, and then only is infant formula recommended (Dutta et al., 2015; World Health Organization, 2011).

2.5 Type of feeding practices recommended in evidence-based research

As stated earlier, the manner in which infants are fed is not the main priority when infants are first admitted to the NICU with severe medical needs that must be attend to first (D'Agata et al., 2016; Lau, 2014). This may be due to the nature and severity of their primary medical condition or other comorbidity factors, such as congenital malformations, respiratory distress syndrome (RDS), neonatal necrotizing enter-colitis (NNE), hypoxic ischaemic encephalopathy (HIE), anaemia or infantile apnoea, which calls for invasive medical treatments such as continuous positive airway pressure (CPAP) and any additional treatments that may be necessary (Da Costa et al., 2019; Demitto et al., 2017). Comorbidity factors can also further disrupt the sensory and motor experiences linked to the oral structures. Moreover, medication administered to treat conditions within the NICU may affect the infant's behaviour and ultimately, their progress in feeding (Greene *et al.*, 2016). Consequently, infants may face numerous difficulties daily including overall weakness, alertness, behavioural disturbances, motor and/or physiological functioning that will directly affect their initial feeds and overall feeding development (Mahmoodi et al., 2019).

2.5.1 Intravenous fluids (IV) and total parenteral nutrition (TPN)

Because of the majority of infants inability to initiate oral feeds upon admission, they are provided with the nutrition they need through IV fluids and/or TPN (Arumugam et al., 2016; Bonet et al., 2015; Fairview, 2020; MedlinePlus, 2019; Rhoda et al., 2018; World Health Organization, 2011). IV fluids and TPN will be provided to infants born prematurely, unable to

suck and swallow appropriately, unable to digest feeds due to immature digestive systems, being too medically ill, or simply needing additional nutrition (Arumugam et al., 2016; MedlinePlus, 2019).

TPN will provide the essential nutrition to infants via a central or peripheral vein, since their digestive systems might not be developed appropriately and able to absorb the nutrition from feeds given into their stomachs (Arumugam et al., 2016; Fairview, 2020). Research indicates that infants provided with TPN showed an improved birth weight and height due to the administration of the needed nutrition (Arumugam et al., 2016). As providing infants with TPN for an extensive amount of time has possible risks such as acquiring sepsis or infections (Arumugam et al., 2016; MedlinePlus, 2019; Yin et al., 2015), healthcare workers need to monitor the TPN timelines and its safe provision.

It is recommended that infants admitted due to prematurity, low birth weight or other medical complications, should be provided with parenteral nutrition (via IV or TPN) which could be gradually replaced by enteral feeding methods of milk feeds (Arumugam et al., 2016; Rhoda et al., 2018; Rossetti, 2001; World Health Organisation, 2015; 2011).

2.5.2 Breastfeeding

The initiation of breastfeeding can be a challenge due to medical conditions or complications at birth; position variations during feeding; latching difficulties; bonding limitations; environmental stressors; personal difficulties; the mother's support system; her education; her own health, beliefs and attitude; as well as the mother's doubt of her own capabilities (Boucher, Brazal, Certosini, Sherrard & Feeley, 2011; Pinelli, Atkinson & Saigal, 2001; Siziba, Jerling, Hanekom & Wentzel-Viljoen, 2015; van der Merwe et al., 2015). These challenges are even more pronounced when an infant's first days are spent in a NICU, being born prematurely with LBW or for various other reasons for being a high risk infant ultimately needing more monitoring, which could also possibly include the mother's inability to provide the infant with her own breast milk (Lester et al., 2014; Zanganeh et al., 2021).

2.5.3 Donor Breast Milk (DBM)

Literature recommends the provision of DBM alternatively to an infant's own mother's breast milk and an increase in the advocacy of DBM has been noted in South Africa (Dutta et al., 2015; Sparks et al., 2018; World Health Organization, 2011; Yin et al., 2015). Research

explains the benefits of DBM being equally beneficial as a mother's own breast milk, as it can decrease the risk of feeding tolerances and acquiring NEC, as well as shorten the time to attain full oral feeds and overall time spent in NICU (Assad et al., 2016; Yin et al., 2015; Zanganeh et al., 2021). Recent studies also established that an Exclusive Human Milk (EHM) diet can reduce the possibility of BPD, ROP and sepsis (Assad et al., 2016; Zanganeh et al., 2021). The possible reason for inadequate accessibility of DMB might include the cost surrounding attaining and processing DBM, or the limited availability within the country (Zanganeh et al., 2021). Providing DBM might carry additional costs to hospitals, however, when taking into consideration the health benefits provided by an EHM diet, providing infants with DBM is cost effective in the long run (Assad et al., 2016; Yin et al., 2015; Zanganeh et al., 2021). Owing to the possible scarcity within South Africa, it is found that DBM is first provided to infants born prematurely or infants with feeding intolerance and/or metabolic disorders (Yin et al., 2015).

2.5.4 Formula feeds and/or Mixed Feeds

Formula feeds should only be the option of feed provided to an infant when a mother is ill herself or unable to provide breast milk, and the infant cannot receive donor breast milk as a feeding option (Assad et al., 2016; Dutta et al., 2015; Koletzko et al., 2015; World Health Organization, 2011; UNICEF/WHO, 2006; Yin et al., 2015). One study confirmed that infants have longer hospitalization periods when fed formula or mixed feeds with an increased risk of feeding intolerances (Assad et al., 2016). Other studies explain the risk of providing infants with formula instead of breast milk which includes feeding and digestion difficulties, increased risk of NEC due to immature digestive systems, possibility of diarrhoea and pneumonia later on in life which increases the risk of neonatal mortality (Department of Health, 2013; World Health Organization, 2019; Yin et al., 2015).

2.6 Feeding development, methods and establishing oral feeding in the NICU

2.6.1 Transitioning to oral feeds

When infants are medically stable and ready for feeds they can be fed via enteral feeding methods comprising of oral- or nasogastric tubes (Bonet *et al.*, 2015; Maastrup *et al.*, 2014; Rhoda *et al.*, 2018; Rossetti, 2001; World Health Organisation, 2011; 2015). The guidelines for the South African healthcare system include, as research recommends, establishing an IV line with fluids upon admission to the NICU settings to ensure provision of nutrients needed by the infants admitted, and initially feeding through tubes alternatively known as ‘gavage feeds’ every

two to three hours if the infants are able to tolerate feeds (Dutta *et al.*, 2015; Department of Health, 2014).

Prolonged gavage feeding can influence and complicate the transition to oral feeds and therefore healthcare workers need to ensure the initiation of appropriate initiation of oral feeds when the infant is ready and assist mothers during the transition period (Greene et al., 2016; Pike et al., 2016; Yin et al., 2015; Younesian et al., 2015). The transition to feeds given orally will be different for each infant depending on their personal factors including their age, weight, oral reflexes, sucking abilities, coordination of feeding abilities and sources mention that it can take up to 6 weeks or more (Greene et al., 2016; Mahmoodi et al., 2019; Yin et al., 2015). Starting trophic feeds, meaning small amounts (10-30ml) of milk a day, in the recommended time frame no later than 24 hours of life and following additional intervention measures thereafter, for example including oral motor intervention plans, can assist the infant in attaining full oral feeds earlier (Dutta et al., 2015; Mahmoodi et al., 2019). However, this is not always the case in the NICU settings.

Prerequisites for full oral feeds includes the infants' medical status stability, evidence of the rooting reflex, sucking reflex and presence of the suck-swallow-breath pattern (SSB), which usually matures between 32 and 34 weeks gestational age, in order to safely transition to oral feeds (Arvedson et al., 2020; Bertoncelli et al., 2012; Lau, 2014; Nye, 2008; Yin et al., 2015; Younesian et al., 2015). A study within South Africa found that neonates within the specific hospital setting started oral feeds when they reach 1500g weight, irrespective of their medical stability and their physiological and neurological readiness, which is of potential concern due to the possibility that the healthcare workers not taking the infants' other medical and developmental factors into consideration (Da Costa et al., 2019). Only when the infants are medically and physiologically stable can feeds given by mouth be initiated whilst still making use of feeding tubes to provide the infant with the remainder of the feed (Lau, 2014; Lubbe, 2018; Nye, 2008). The initial oral feeds can be done by making use of cup (or syringe) feeding and gradually transitioning to full oral feeds when the baby can suckle successfully and no other feeding difficulties becomes apparent (Department of Health, 2014).

Cup feeding is a simple feeding method commonly recommended by the Baby-Friendly Initiative to initiate oral feeds (UNICEF/WHO, 2006). Other feeding methods as an infant's first oral feed include a syringe or a spoon, as these methods allow the volumes consumed to be

measured (Da Costa et al., 2019; Lubbe, 2018; UNICEF/WHO, 2006). Cup feeding is a good alternative to bottle feeding because it uses less energy and prevents nipple confusion for the mothers who would like to breastfeed their infants (Lau, 2014; Lubbe, 2018; UNICEF/WHO, 2006). It is also believed that an infant can suck the milk from the cup if held appropriately and therefore assist in the development of the SSB synchrony (Gupta et al., 1999).

Therefore, literature recommends that infants should be put on the breast as soon as they are ready for oral feeds otherwise the expressed breast milk should be given by cup or gavage feeding methods (Da Costa et al., 2019; Pineda, 2011; World Health Organization, 2011). Mothers who wish to breastfeed but are unable to place their infants on the breast from birth will need to express their milk to stimulate its production. The expressed milk will initially be given to the infant via feeding tubes within the NICU environment (Bonet *et al.*, 2015; World Health Organisation, 2012; Underwood, 2013). Expressing milk has its own difficulties and challenges are even more pronounced with limited breast pump equipment available and when a mother cannot afford buying an electric breast herself (Martin-Wiesner, 2018; Naylor & Clarke-Sather, 2020). When a mother needs to use her hand or a breast pump to express the milk, she will require further support and information from healthcare workers, as well as assistance with the transition to oral feeds (Bauer, Prade, Keske-Soares, Haëffner & Weinmann, 2008; Bergh, Charpak, Ezeonodo, Udani & Van Rooyen, 2012; Bonet *et al.*, 2015; Boucher *et al.*, 2011; Department of Health, 2013).

2.7 Difficulties in the initiation of oral feeds

With the initiation and gradual increase in the volume of oral feeds, it is important to consider medical factors such as any infections, oxygen levels, apnoea and/or bradycardia episodes, the infant's state/behaviour, positioning during feeds, coughing or choking and the surroundings that could cause stress levels to increase (Da Costa et al., 2019; Lau, 2014; Lubbe, 2018). Reflux is another difficulty these infants may face due to their immaturity or the dysfunction of structures involved in feeding or incorrect positioning that may lead to more serious complications such as aspiration or pneumonia (Gulati & Jadcherla, 2019; Lau, 2014; Nye, 2008; Pike et al., 2016). Reflux can either be silent, therefore showing no symptoms, or be seen by physical symptoms during feeding times (Gulati & Jadcherla, 2019). These symptoms could include regurgitation, cardio and respiratory fluctuations, chocking, coughing, arching of the back, irritability during feeding times and insufficient weight gain (Czinn & Blanchard, 2013; Gulati & Jadcherla, 2019).

2.8 Assessment of feeding tolerance in infants

Weight gain can be used to measure feeding success, as this is a technique to ensure that the infant uses minimal energy during feeding times and gains the appropriate amount of weight from the nutrition taken in during feeding times (Lubbe, 2018; Department of Health, 2014). Feeding tolerance can also be assessed by the infant's abilities to attain oral feeds, gastric residue measured by aspirates before every feed, the infant's output (including urine, faeces and vomiting), appearance that could possibly include a distended abdomen and or any other changes in the medical stability of the infant (Yin et al., 2015). Radiographic assessments also include doing a video-fluoroscopy (VFSS) study or a milk scan performed by mixing breast milk, formula or milk mixed with a radioactive substance (usually barium). Assessments are performed by a radiographer and a speech-language therapist (Elidemir & Fan, 2011). Milk scans can be used to diagnose reflux, although it focuses more on the emptying of gastric functioning, and therefore, as per literature, is not used frequently (Jaksic, 2020). In severe cases, a VFSS study can be done to ensure the functioning of the pharyngeal and oesophageal phase; the anatomical structures and their coordination are examined during an infant's swallow (Lau, 2014).

2.9 Therapeutic measures to improve oral feeding

2.9.1 Kangaroo mother care

During the infants' stay in the NICU, they are distant from their mothers and therefore unable to engage in demand feeding, skin-to-skin contact or to bond with the mothers (D'Agata et al., 2016; Siziba et al., 2015; Department of Health, 2013). Being close to a mother during the post-partum period is preferable for the mother's recovery and overall development of the infant, especially when admitted to a NICU (Bonet et al., 2015; Mishra, Rai, Mishra & Das, 2017). However, mothers cannot always be with their infants during their admission or be able to engage in therapeutic interventions.

Kangaroo Mother Care (KMC) is the skin on skin contact between a mother/caregiver and the baby that supports the bond established between them when the infant is placed on the open chest (World Health Organisation, 2003). KMC provides manifold benefits, including the promotion of bonding, assisting in breastfeeding and weight gain, which makes this a useful technique to include in NICU (Bonet *et al.*, 2015; Maastrup, Hansen, Kronborg, Bojesen, Hallum, Frandsen & Hallström, 2014; Mishra *et al.*, 2017; Rossetti, 2001; World Health Organisation, 2003; 2012). However, in all NICUs, numerous reasons may interfere with the

closeness between mothers and infants that can be problematic for the development of the infant (Rhoda *et al.*, 2018). These challenges that include limited space for mothers to stay with their infants, inability to accommodate mothers for overnight rooming and mothers who are unable to travel to and from the hospital daily, apply specifically to South African NICUs (Rhoda *et al.*, 2018).

As an explanation of KMC may not have been possible during admission, healthcare workers within the NICU should explain the importance of KMC to the mothers and assist them to achieve it. KMC is proven to be a facilitating technique needing no equipment that lowers neonatal mortality in developing countries with lower-socio-economical areas and minimal resources (Mahwasane et al., 2020; Rhoda et al., 2018; Department of Health, 2013). However, KMC can still be troublesome to initiate within the South African context.

2.9.2 Oral stimulation.

Oral stimulation is another technique that does not need any equipment to perform and therefore important to consider within the public healthcare sector of South Africa. This technique is usually facilitated by the speech-language therapist (SLT) in the NICU and helps the infant to develop sensory regulation, oral reflexes, better range of movements and their coordination (Younesian et al., 2015). Since majority of infants within the NICUs are born prematurely and/or with LBW, their sucking abilities and suck-swallow-breathe pattern are not always mature enough for oral feeds, which is also the reason for the infants being fed by making use of tubes for an extended period of time during admission. This lengthy tube feeding period also further impacts their ability to develop and strengthen all of their sucking abilities unless the infants are provided with non-nutritive sucking stimulation, otherwise known as oral stimulation in order to strengthen their oral reflexes and sucking abilities (Younesian et al., 2015).

The oral reflexes, which include sucking, rooting, phasic bite and active gag, will first be assessed before the SLT can establish the type of oral stimulation to be provided based on the infant's abilities and needs (da Silva & de Almeida, 2015; Greene et al., 2016; World Health Organization, 2003). The oral intervention could consist of non-nutritive sucking, stroking of the mouth and oral structures as well as different types of stimulation provided to the infant's gums, lips, cheeks and palate (Greene et al., 2016; Mahmoodi et al., 2019). Research also confirms that infants can receive this type of intervention as soon as they are medically stable and could

assist infants in regulation and therefore aid their development. Infants who receive oral stimulation transition to full oral feeds better and are able to fulfil oral feeds sooner, gain weight faster and have a shorter length of stay than those who did not receive this type of intervention (Mahmoodi et al., 2019; Yin et al., 2015; Younesian et al., 2015).

2.10 Feeding difficulties post-discharge

Some infants continue to have trouble with oral feeding post-discharge. As many as 20–80% are discharged with some degree of dysphagia and many return to hospital with complications such as being underweight, aspiration and other difficulties linked to feeding difficulties (Caretto et al., 2000; Da Costa et al., 2019; Lau, 2014; Lubbe, 2018). To ensure that the safe oral feeds established in the NICU will continue post-discharge, it is important for healthcare workers to establish safe feeding practices before discharge. These difficulties should be adequately addressed by providing the parents with the information and support needed during feeding times within the NICU, educating them on possible methods that can be applied to improve feeding abilities, and giving clear explanations of the possible risks and signs of feeding problems (Caretto et al., 2000; Stevens et al., 2014).

2.11 Novel COVID-19 Infection within the NICU Environment

COVID-19, caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is an infectious disease spreading rapidly around the world. The World Healthcare Organization declared it a pandemic in March 2020 (Dashraath et al., 2020; de Miranda et al., 2020; Gale et al., 2020; Sumarni et al., 2020; Department of Health, 2020). Owing to COVID-19 being a novel infection, limited research has been done to understand the repercussions of this virus, the risk of pregnant mothers being infected, the transmission to an infant during or after birth and the exact precautions necessary before and after birth (Calil et al., 2020; Gunes et al., 2021; Pramana et al., 2020).

The WHO advises against the separation of a mother from her infant, explain the importance of rooming-in and the continuation of the mother providing care to her own new born infant, which includes maintaining breastfeeding when the mother is able to do so (Calil et al., 2020). These recommendations are based upon evidence indicating that little or no trace of the virus is found in the milk of a COVID positive mother. These mothers should be encouraged and assisted by healthcare workers to initiate breastfeeding after birth whether they are separated

due to COVID or NICU admission or not (Ahmad et al., 2020; Boscia, 2020; Calil et al., 2020; Dashraath et al., 2020; Department of Health, 2020; Tomori et al., 2020; Tran et al., 2020). A recent study investigated six COVID-19 positive mothers who breastfed their infants and all six of the infants were not infected during the time of investigation, thus confirming the evidence that COVID-19 positive mothers can breastfeed their infants (de Miranda et al., 2020).

It is important that the mothers who decide to breastfeed their infants comprehend and carry out all precautious and preventative measures to reduce the risk of transmitting the virus when providing new born care in close proximity, during physical contact with the infant and when expressing breast milk (Ahmad et al., 2020; Pramana et al., 2020; The Department of Health, 2020). (Calil et al., 2020; Department of Health, 2020). All prenatal, maternity and postpartum departments within hospitals have to take their patients' demographic and personal details as well as the hospital's facilities and capabilities into account when making the decisions (Juan et al., 2020; Tomori et al., 2020). This verifies that every mother and infant should be taken on a case-by-case basis, and decisions should be made based on the mother and infant's needs as well as the hospital's capabilities. Now, more than ever, healthcare workers must stay up to date with the latest evidence-based research so that informed decisions are made with a mother, the family and the healthcare workers involved in their care plan.

2.12 Multidisciplinary Team in the NICU

All healthcare workers within the NICU have knowledge of normal infant development, as well as specialised knowledge about the infants admitted to the NICU (Arvedson et al., 2020; Hardy et al., 2021). This includes the medical and social needs in the environment and all treatment processes (Lloyd & de Witt, 2018; Rossetti, 2001). It is important for healthcare workers to be retrained during their years in practice in order to stay up to date on all evidence-based information and infant and child feeding policies that should be implemented (du Plessis, 2013; Pieper & Hesseling, 2007; Rhoda *et al.*, 2018; Siziba *et al.*, 2015; World Health Organisation, 2002; van der Merwe *et al.*, 2015). This ensures that mothers receive appropriate antenatal and postnatal services to help make informed decisions regarding their child's health and feeding choices and provides encouragement and guidance to continue optimal and safe feeding for their infants once they are discharged (Almeida, Araújo, Luz & Ued, 2015; Pillay *et al.*, 2018; Rhoda *et al.*, 2018; Department of Health, 2013). However, a study done within South Africa by UNICEF showed that few of the nursing staff were properly trained in new-born care

and that healthcare facilities providing services to new-borns had insufficient infrastructure and equipment to provide the dire care that is needed (Mahwasane et al., 2020).

Especially due to the novel COVID-19 pandemic, it is crucial for all healthcare workers to also ensure that they stay up to date with the research being done within their field as well as recommendations made by literature and their national healthcare systems. Healthcare workers were advised to make use of personal protective equipment (PPE) during the initial stages of the pandemic, and had to ensure that they use PPE appropriately as recommended in evidence in order to protect themselves from acquiring the virus within the healthcare setting (le Roux & Dramowski, 2020). The full extent of effect the COVID-19 pandemic posed on healthcare workers within the NICU settings was not yet explained thoroughly within literature due to it being a new global pandemic.

With the vast amount of different cases and difficulties experienced in the NICU, it is essential to always make use of a multidisciplinary approach to address all the infants and parents' needs (D'Agata et al., 2016; Da Costa et al., 2019; Dutta et al., 2015; Matus et al., 2018). Parents should always remain at the centre of the multidisciplinary team with the rest of the team communicating efficiently throughout the treatment process and involving the parents in all decisions (Barbosa, 2013). It is up to the healthcare workers to set up each individual infant's treatment approach, including the proposed feeding plan; elect the team of medical professionals according to the infant's needs; and ultimately collaborate and discuss the progress made over the course of the intervention (HPCSA, 2018; Matus et al., 2018). Healthcare workers within the NICU consist of doctors, neonatal nurses and other developmental professionals including physiotherapists, occupational therapists, dieticians, social workers, psychologists and SLTs. Their unique roles are depicted in Table 1 below. The role of each healthcare professional is critical during the infants' hospital stay, however, there is little research available on the unique role of each team member in establishing optimal feeding practices within the NICUs in the South African public healthcare system (Hardy et al., 2021; Lloyd & de Witt, 2018).

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Table 1:

Roles of the Team Members involved in the Neonatal Intensive Care Units

	TEAM MEMBERS	SOURCE	ROLE IN THE NICU
MEDICAL TEAM	DOCTORS	Barbosa (2013) Lubbe (2018)	• Doctors are responsible for the infants' main medical care plan. • They should coordinate other services provided by the other team members.
	NURSES	Barbosa (2013) Lubbe (2018) Hallowell, Spatz, Hanlon, Ragowski & Lake (2014).	• Nurses are permanently on duty to monitor the infants' status, assist in medicine provision and all treatment processes that form part of the infant's healthcare plan • Nurses should coordinate all services provided by the other team members and therefore need to be trained on what the other professionals' roles entail. • Nursing staff are not always able to provide the support needed due to their workload and limited resources.
DEVELOPMENTAL TEAM	PHYSIOTHERAPISTS (PT)	Byrne & Garber (2013)	• Intervention to promote the infant's movements, including exploratory and developmental movements. • Helping with skin and scar management. • Splinting of their joints when needed. • Chest physiotherapy and secretion management.
	OCCUPATIONAL THERAPISTS (OT)	Caretto *et al.*, (2000) Barbosa (2013) (Hardy et al., 2021)	• OTs makes use of family centred intervention to focus on the interaction, dynamics and relationship between the infant and the parents/caregivers. • Provide appropriate assistance in the infant's feeding transition from tube to oral and the social activities surrounding feeding times. • Perform other interventions including splinting, positioning and handling support.
	DIETICIANS	Barbosa (2013) Matus et al., (2018)	• Dieticians work with the doctors, nurses and the speech-language therapists to determine the type of feeds given to the infants and specifically the volumes they need, in order to take in sufficient nutrients for weight gain and development.
	PSYCHOLOGISTS AND/OR SOCIAL WORKERS	Madhoun & Dempster (2019)	• Both of these professionals focus on the family dynamics, the needs as well as the strengths of the families to help them grow during the difficulties the face.

LACTATION CONSULTANTS	(Barbosa, 2013)	• Expressing milk sometimes requires the assistance of a lactation consultant additionally to nursing staff.
SPEECH LANGUAGE THERAPIST		• Explained below in section 2.13

2.13 Role of Speech-Language Therapists in the NICU

Speech-language therapists (SLT) form part of the neonatal healthcare professional team and are responsible for supporting the mother, monitoring the infant's progress in the NICU, advocating for them and providing the therapy needed for essential feeding and communication development (Barbosa, 2013; Hallowell et al., 2014; Ross, Heiny, Conner, Spener & Pineda, 2017). To date, South Africa has a total of 1272 registered SLTs and a total of 1450 professionals qualified as both a Speech Therapist and Audiologist to serve a population of 59,62 million people in South Africa (HPCSA, 2020; Stats SA, 2020).

The American Speech-Language-Hearing Association (ASHA) confirms that a SLT needs specialised skills to evaluate an infant's feeding, swallowing and communication to educate team members on the findings and to counsel parents throughout the feeding management period (American Speech-Language-Hearing Association, 2004; Rossetti, 2001). According to the South African Speech-Hearing-Language Association (SASLHA) (2011), the SLT's main role is to determine whether oral feeding is safe and to ensure that the method is sustainable when the infant is discharged (South African Speech-Hearing-Language Association, 2011).

The role of a SLT therefore includes recognition of family circumstances and medical history, understanding the infant's current state (deep/light sleep, drowsy, quiet/active alert, alert agitated or crying), assessing oral abilities and stimulation of the oral motor skills necessary for initiation of oral feeding, which could also include oral motor exercises (Bauer et al., 2008; Da Costa et al., 2019; Kritzinger & Mosca, 2017; South African Speech-Hearing-Language Association, 2011).

To ensure safe feeding practices, it is critical for the SLT to evaluate the infant's readiness for oral feeds during gavage feeding periods by assessing their oral reflexes and movements (Da Costa et al., 2019). When the infant is ready to feed orally, it is important to ensure that the current method of feeding is safe, maintain a cue-based feeding plan, explain positioning during oral feeds, describe the infant's communication cues to the mother to ensure responsive feeding and ultimately maintain safe oral feeds when the infant is discharged (Barbosa, 2013; Boucher *et al.*, 2011; da Silva & de Almeida, 2015; Lubbe, 2018; Rossetti, 2001; SASLHA, 2011).

The SLT is also part of the team who decides which feeding method is safest and sustainable at home and is part of the team who helps integrate the infants feeding routines into normal daily life for the family (ASHA, 2004). According to the policy and guidelines for SLTs at all healthcare levels of the South Africa Health Professionals Council of South Africa (HPCSA), the primary goal of intervention should be to integrate the patient back into normal daily routines and provide a developmentally healthy future (HPCSA, 2018).

2.14 Research Question

The only way to ensure the implementation of safe and optimal feeding practices is to design evidence-based feeding policies, ensure that these policies are put into practice, understand the needs of all the stakeholders, provide the NICUs with the medical and physical resources needed, educate and re-train healthcare workers; and most importantly support the parents to maintain optimal, appropriate and safe feeding post-discharge (Motsa et al., 2016; Rhoda et al., 2018; Siziba et al., 2015; SASLHA, 2011; Department of Health, 2013).

It is clear within this field of research that establishing oral feeds within the Neonatal Intensive Care Units can be challenging to the infant in need of severe medical intervention, the mother (and/or parents) involvement, as well as the healthcare workers within these settings. Support seems to be limited in the NICU environments within the South African healthcare context due to limited staff, resources needed and wards being at maximum capacity (Sicetsha, 2019; Department of Health, 2013). Compliance with infant feeding guidelines can assist in reducing infant mortality rates (Motsa et al., 2016), but little is known about the current feeding practices in the NICUs, the healthcare workers involved and the challenges faced at tertiary level in public hospital's NICUs with regard to feeding practices.

To the researcher's knowledge, only limited research was conducted to clarify and describe the current feeding practices within a tertiary hospital's NICU as well as the specific role of each healthcare worker involved in establishing successful oral feeding, during admission and upon discharge. Owing to the novel COVID-19 pandemic, a secondary objective was added to this study to identify the possible influence of COVID-19. Therefore, this study aims to answer the following research question:

What are the feeding practices in the neonatal intensive care units in tertiary public hospitals in Gauteng?

CHAPTER THREE

METHODOLOGY

Chapter three explains the aims of the research study and includes an overview of the research design, setting, participants, data collection instruments and procedures. It also provides an explanation of the pilot study conducted and how the data was analysed.

Aims and Objectives

The main aim of the study was to describe the feeding practices in the neonatal intensive care units at two tertiary public hospitals in Gauteng.

This aim was achieved by addressing the following objectives:

- To explore the feeding practices in the neonatal intensive care units within the two tertiary public hospitals of Gauteng, including the NICU environment.
- To identify the team members involved in the multidisciplinary team specifically with regard to their roles within the feeding practices and to validate the possible shortage of healthcare workers compared to the number of infants admitted within the two neonatal intensive care units.
- To explore how team members conceive the role of the speech-language therapist with regard to feeding practices in the two neonatal intensive care units, as well as the speech-language therapists' explanation of their role.

This research proposal was completed before the COVID-19 pandemic, but due to the global impact of the pandemic during the data collection phase of this study, the researcher added the following objective:

- To describe the possible effect of COVID-19 with regard to feeding within the two neonatal intensive care units within tertiary public hospitals of Gauteng.

Research Design

This study was qualitative in nature, by making use of an exploratory descriptive design, based on structured observations and semi-structured interviews. This study also identified limited quantitative elements in order to provide numerical data to confirm and increase the understanding of results as well as complement the qualitative research findings. Due to the limited quantitative elements within this research study this was not a mixed method study design. The quantitative data included the diagnosis of the infants, the number of admissions compared to the number of nurses on duty and information regarding

the number of infants receiving the respective type of feeds. COVID had no influence on the design of this study; however, as mentioned previously, an additional objective was added before initiating data collection.

Research Settings

The research setting included two neonatal intensive care units in tertiary level public hospitals in Gauteng. Both research site demographics characteristics include the population of mostly Black African, Coloured, White and Indian individuals, of which 7% are illiterate and 29% live in rural settings. The researcher gathered data from the NICUs, the Neonatal High Care Units (NHCUs) and Surgical Intensive Care Units since all of the units functioned together as the NICU of the hospitals. All the different sections are discussed under the umbrella term "Neonatal Intensive Care Units" within this document. The researcher initially aimed to include three tertiary public hospitals but due to COVID-19's influence on the hospital settings, it was difficult to get consent from the third hospital since they were allocated as a COVID-19 hospital. Therefore, this study included two research sites in data collection to understand the feeding practices of both tertiary public hospitals. Both research sites demographics characteristics include mostly Black African (76%), White (12%), Coloured (6%), and Indian (5%) individuals, of which 7% are illiterate and 29% live in rural settings within Johannesburg (World Population Review, 2021). This provides an even greater understanding with regards to the amount of individuals making use of the public healthcare system within this area of the South African country.

Research Site One is located in Soweto, Johannesburg and is the third biggest hospital in the world. This is a tertiary level hospital serving patients from South Africa and surrounding countries due to the hospital's expertise. This hospitals Maternity Unit treats up to 60 000 patients annually (DiagnoseMe, 2020). They have four sections under their NICU, which is named the Transient Intensive Care Unit (TICU) section, Neonatal Intensive Care Unit (NICU) section, Surgical High Care Unit (SHCU) and the High Care Unit (HC). The researcher spent 12 days doing observational data collection throughout all of the units mentioned above and completed 14 interviews with healthcare workers within these units.

The researcher made use of their admission books to identify the number of infants admitted on a daily basis as well as to identify the diagnosis of each of the infants admitted during the data collection timeframe. Their administration books provided the

number of nurses on duty as well as the type of feeds given to the infants admitted (which includes being NPO or provided with breast milk, donors milk, formula feeds or mixed feeds).

Research Site Two is also a tertiary level hospital situated in Johannesburg. This research site's NICU setting includes the Paediatric Intensive Care Unit (PICU) and their High Care Unit, as well as Ward 16B which is used as a normal paediatric ward but functioned as an NICU setting within the hospital during the time of data collection to facilitate the amount of infants needing intensive NICU care. The above mentioned sections aim to have 6 beds in PICU, 4 beds in High Care and 35 beds in 16B available for in-patient services (University of the Witwatersrand, 2020). The researcher spent five days doing observations in all of the units mentioned above and concluded another eight interviews with healthcare workers within this research site.
The number of infants admitted and their diagnoses were identified from the daily admission books, but their administration books could only provide the amount of nurses on duty. They did not keep record of the type of feeds provided to the infants admitted.

Note. Figure 1 and Figure 2 below provides a line drawing of the two research sites used within this study. It also illustrates the layout showing the different sections functioning under the umbrella term NICU. The maximum number of infants observed admitted into each of the cubicles respectively is also indicated within each cubicle.

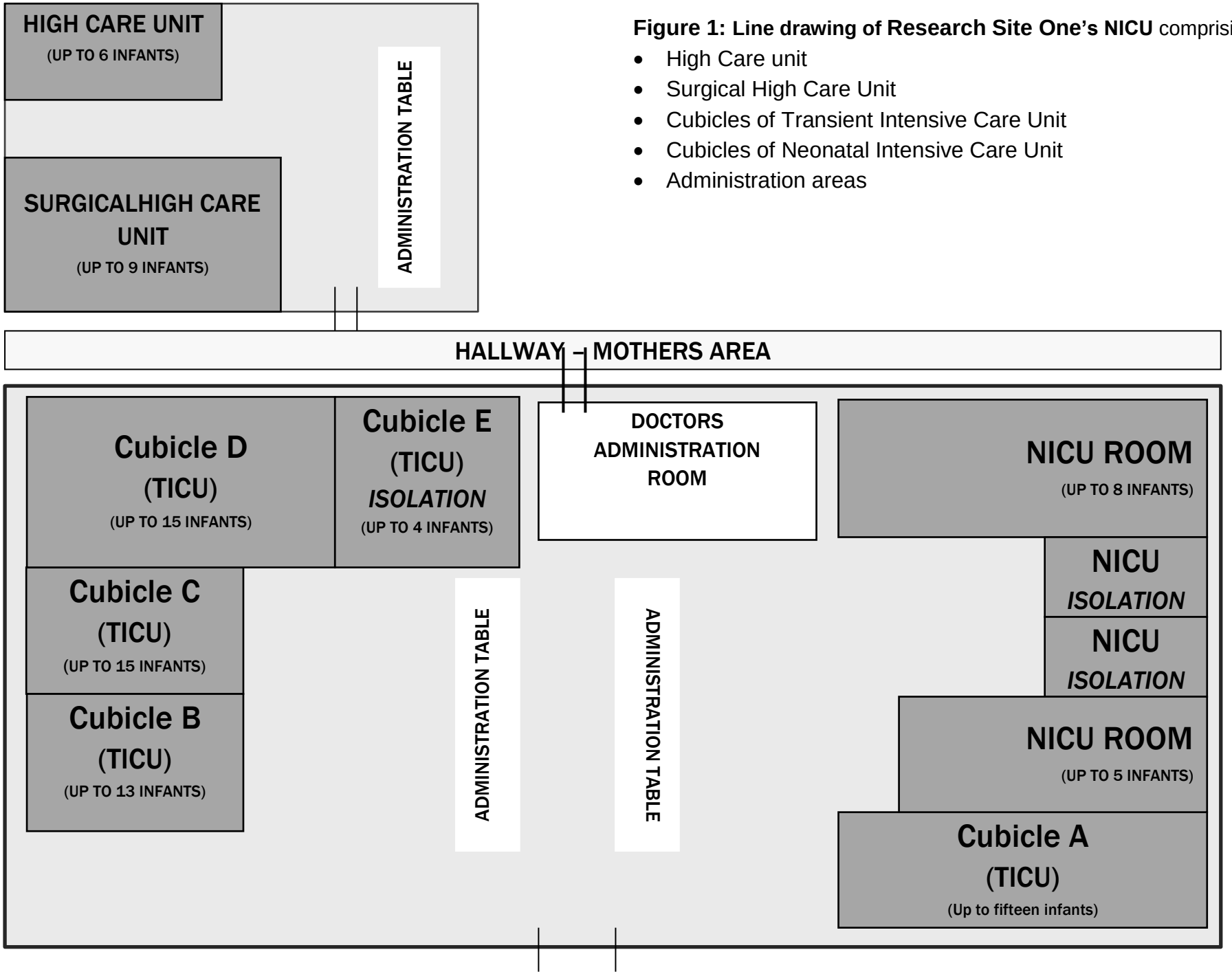


Figure 1: Line drawing of Research Site One's NICU comprising of:

- High Care unit
- Surgical High Care Unit
- Cubicles of Transient Intensive Care Unit
- Cubicles of Neonatal Intensive Care Unit
- Administration areas

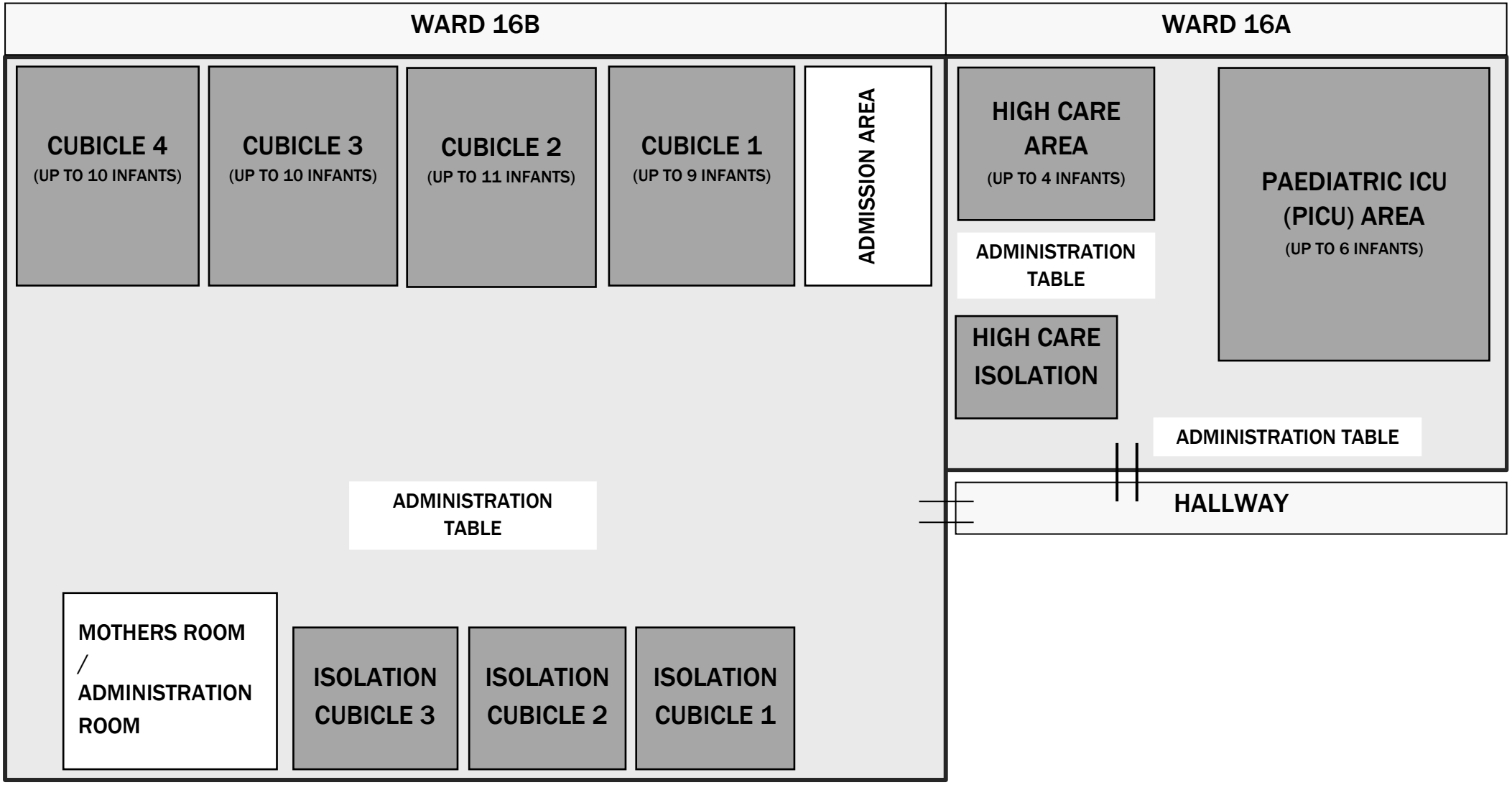


Figure 2: Line drawing of Research Site Two's NICU comprising of:

- Ward 16 A (High Care and PICU area)
- Ward 16 B (NICU area)

Research Participants

For the purposes of the study, all the healthcare workers working in the two research sites were observed during the structured observations and the following healthcare professionals were invited to participate voluntarily in one-on-one interviews: doctors, nurses, SLTs, occupational therapists, physiotherapists and dieticians, as they were the ones within the NICU settings at the time of data collection.

By means of convenience sampling, 22 healthcare workers across both research sites (Appendix M) agreed to voluntarily participate in the semi-structured interviews. Since no psychologists, social workers or lactation consultants were rendering services, the researcher did not interview them during the time of data collection.

Table 2:
Inclusion Criteria for Participants

INCLUSION CRITERIA	**RATIONALE FOR CRITERIA**
All healthcare workers working within the NICU settings were observed during the structured observation timeframes.	In order to identify the healthcare workers who are providing services in the NICU, and to establish the dynamics between the team members.
The interview participants had to be healthcare workers who were currently working within the NICUs of the two research sites.	This ensured they had the necessary knowledge and experience within this setting to answer the questions.
Participants could be male or female.	To ensure that none of the healthcare workers forming part of the multidisciplinary team were excluded due to their demographical status.
EXCLUSION CRITERIA	
Any participants who were not proficient in English**.**	All interviews were done in English and no translators were used during interviews.

The participants were coded as Participant A to Participant V and within the results section the participants profession is also placed for further clarity regarding the type of information provided within the interviews and the participants can be identified as follow;

Participant A	Dietician	Participant L	Speech Therapist
Participant B	Registered Nurse	Participant M	Speech Therapist
Participant C	Nurse	Participant N	Dietician
Participant D	Nursing assistant	Participant O	Dietician
Participant E	Consultant Doctor	Participant P	Consultant Doctor
Participant F	Doctor	Participant Q	Medical Officer
Participant G	Physiotherapist	Participant R	Nurse
Participant H	Intern Doctor	Participant S	Physiotherapist
Participant I	Occupational Therapist	Participant T	Occupational Therapist
Participant J	Speech Therapist	Participant U	Speech Therapist
Participant K	Registered Nurse	Participant V	Speech Therapist

Data Collection Instruments

Two self-developed instruments were used as a guide for the structured observation and the semi-structured interviews (Appendices H, I and J). The instruments and questions were created around the major themes found in the literature review, gaps of information identified as well as the specific aims set out for the study. The interview schedule differed slightly when interviewing the diverse disciplines of professionals, since their roles and responsibilities within the NICU all involved different aspects and due to the interviews maintaining a semi-structured approach.

A Phillips HQ Stereo Voice Tracer audio recorder was used to record the semi-structured interviews as this allowed the researcher to listen to all answers and information provided repeatedly for transcription purposes. All quantitative data, which included the number of infants admitted and their diagnoses, the number of nurses on duty and the types of feeds, were entered into a Microsoft Excel spread sheet, which was stored on an Acer Laptop (Appendix K).

Pilot Study

A pilot study was conducted over two days at one of the research sites. However, none of the data collected during the pilot study influenced the observations in the final data collection period and none of the pilot study interview participants was asked to participate in an interview again. This was explained to the participants prior to conducting the pilot study interviews.

The pilot study was conducted using the two self-developed data collection instruments in order to assess their relevance and feasibility, which also included two semi-structured interviews by making use of the relevant data collection instrument. Conducting a pilot study prior to data collection, ensured validity of all aspects and questions included into the data collection instruments, as well as provided an increased reliability of the instruments used and the final results of this study (Malmqvist et al., 2019).

Feedback from the pilot study was then used to refine the questions in both the observation and interview guides, which served as the final data collection instruments for

the data collection periods. The following changes were made to the documents in line with the findings of the pilot study:

- A timeframe of between 15 and 30 minutes was allocated to each interview conducted with a healthcare professional.
- The criteria for fluid or feed initiations were taken out of the observational schedule and rather included in the semi-structured interviews for discussion.
- Since the entire proposal of this study and the data collection instruments were designed before the COVID-19 pandemic, a section for the influence of COVID-19 had to be added in both the data collection instruments.

Data Collection Procedures

The researcher spent 12 days at research site 1 and 5 days at research site 2 performing data collection. Saturation (explained below) was reached at the end of day 5 at the Research Site Two, when it was confirmed that the feeding practices and dynamics between the multidisciplinary team was the same as at Research Site One, and saturation was reached with no new data obtained from the second site. This study initially aimed to perform observational data collection for a period of seven days at each of the hospital sites respectively, and to perform 20 interviews, but the researcher continued collecting data until saturation was reached at both of the research sites. Saturation was therefore evaluated based on no new data, themes or concepts being observed by evaluating all notes made on the daily observation schedules (Saunders et al., 2018). Daily observational schedules included notes made when observations were repeated; this assisted the researcher to understand when each of the different observational categories reached saturation. Only when all categories showed to have reached saturation, was data collection terminated at each of the sites.

Regarding the observational data collection, the researcher made use of the time spent at each research site to perform observations throughout the day specifically paying attention to the feeding times of the day. The researcher also included all the different feeding times during the day, which included the first feed of the day at 6 am and the later feeding times at 3 pm and 6 pm. By focusing on observing the feeding times, the researcher could establish the feeding practices and routines surrounding feeding times and simultaneously identify the team members involved and their dynamics.

The researcher conducted 22 interviews with the healthcare workers across both research sites as part of data collection. The one-on-one interviews were conducted in a private room or section in close proximity to the NICU and ranged between 9 and 38 minutes. The researcher also spent time gathering the quantitative data during the 17 days that included the number of infants admitted, their diagnosis, the total number of nurses on duty and the types of feeds provided from the admission and administration books in the NICU settings.

Data Analysis

The researcher used a combination of thematic analysis to analyse the data collected by means of observations and interviews, as well as the descriptive statistical method to analyse the quantitative elements included within this study. The researcher used the deductive approach, since the researcher had already identified themes expected to reflect within the data obtained based on theoretical information gathered as well as gaps identified within the literature review of this field of research and found in Table 3 below.

Table 3:
Codes and Themes confirmed during data analysis

PRE-SET CODES:	**CODES INCLUDED UNDER THE FOLLOWING THEMES:**
The NICU environment	**The NICU environment**
The layout of the environment	
The infants admitted	
Routines within the NICU	
Feeding routines	**Feeding practices**
Preferred method of feeding	
Type of feeds given to infants	
Mothers involvement	**The Multi-disciplinary team**
Doctors' role	
Nurses Duties and Role in feeding	
SLT's role explained by the other healthcare workers	
SLT's role explained by the SLT	
OT Role	
PT Role	
Dietician's Role	
Staff shortages – Nurses	
Staff shortages – Team members	
Hygiene Protocols	**COVID-19's influence**
Effect on feeding / breastfeeding	
Effect on mothers	
Effect on healthcare workers	

The researcher first transcribed all of the interviews captured on the voice recorder by taking the following into consideration:

- The data captured on the audio recorders during the interviews were transcribed verbatim to ensure that nothing said was taken out of context. A research assistant was then asked to check the transcriptions for reliability purposes. The use of the quotes and explanations was to confirm the findings of the structured observation.
- All the data collected, which included the transcribed interviews and notes made on the observational schedules, was analysed by making use of the six steps recommended by Braun and Clark (2006), as illustrated below:



To familiarise the data collected, the transcribed interviews and information on the observational data collection sheets were analysed numerous times to identify the usable data under the codes and themes set out. The data analysed under the codes were identified and the themes confirmed (see Table 3). The researcher made use of the data logically, reported the findings and drew final conclusions (Leedy & Ormrod, 2013; Wisker, 2001).

Statistical analysis

All of the quantitative data were entered into a Microsoft Excel spread sheet according to the following three categories, to organize the data:

1. The diagnosis of all of the infants admitted.
2. The number of admission compared to the number of nurses on duty.
3. The number of infants receiving the respective type of feeds (from Site One).

The data were analysed using SPSS version 27 software and the descriptive statistics method to investigate the data (Leedy & Ormrod, 2013). The researcher aimed at finding the percentage of infants admitted per diagnosis and used the results to identify which diagnoses had the highest percentage of admissions. The distribution of the number of infants admitted was compared to the amount of nurses on duty to establish the possibly of limited staff resources. By using descriptive statistics, the researcher was able to explain the amount of respective feeds provided by displaying the results in table format (Table 6).

Ethical Considerations

Prior to data collection, the researcher obtained permission from the two research sites (Appendix A–C). Ethical clearance was obtained from the Medical Human Research Ethics Committee of the University of Witwatersrand, as per Certificate M200220 (Appendix D).

All healthcare workers within the NICU setting received an information sheet (Appendix E) prior to data collection and the mothers of the infants who were admitted received a different information sheet (Appendix F) to inform them about the study and more specifically the observational part. A brief explanation of the study was given to the mothers upon providing them with the information sheet, the mothers' autonomy was protected by giving them the authority to accept the observational part of the study or to decline it, and the researcher assured the mothers that she would respect their need for privacy during their infant's admission. None of the mothers declined the observational part possibly because the observations simply included the dynamics of feeding practices rather than focusing on a specific infant. A signed consent form was completed and signed by each of the healthcare workers who voluntarily participated in semi-structured interviews (Appendix G). The Basic Ethical Principles of the Health Professional Council of South Africa was taken into account to ensure ethical values and standards, including:

Autonomy and non-maleficence/beneficence

An information sheet (Appendix E and F) was provided to all the individuals within the NICU settings (including the healthcare workers and mothers) to notify them of the objective of the research without informing them of the specific aims to avoid social desirability. A consent form was provided to each of the interview participants to provide them with additional information regarding their participation in the research project and to get their signed consent (Appendix G).

Both the information sheets informed everyone involved of non-maleficence by explaining that no risk or harm will come to them as a result of participation (Manti & Licari, 2018) as well as enlightening them about their right to withdraw from or object to participation.

Confidentiality

All participants remained anonymous as a coding system was used for the healthcare workers participating in the interviews as well as for each of the infants admitted into the

NICU when gathering data, such as their diagnosis. The researcher also kept the names of the research sites anonymous so that no identifying data was used during data analysis and reporting of the study.

Justice

To ensure justice within this study, no participants were excluded based on any personal characteristics.

Integrity

The researcher ensured that no plagiarism was committed by correctly referencing and citing all work used from other sources.

Data management

All data collected, namely, the research documents (which included signed consent forms and observational data collection sheets) and the audio recording, were stored on a password-protected laptop. Only the researcher has access to this laptop.

All audio recordings of the interviews were saved to ensure there was a backup of all the answers and information provided by the healthcare workers. All the data will be destroyed after five years.

Reliability

In order to ensure reliability of this research study's findings a pilot study was conducted on the two data collection instruments, to increase the reliability of the design of the instruments and the information yielded. The participants' actions and responses in the setting were not influenced by information provided or discussions regarding the study prior to data collection. This also ensured the reliability and conformability of this study's results (Pandey & Patnaik, 2014). Reliability was further increased by making use of a research assistant checking the transcriptions done to eliminate any possibility of research bias (Appendix L) (Pandey & Patnaik, 2014).

Validity

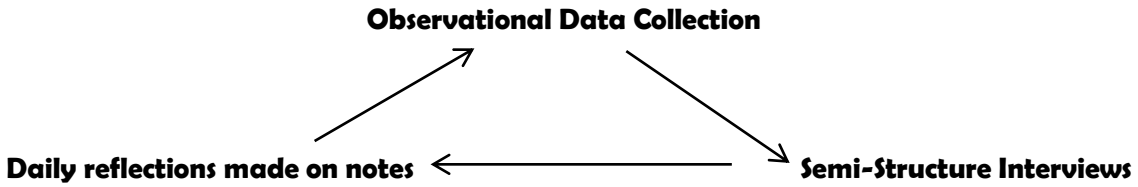
By including two methods of collecting data, as well as conducting 22 interviews increased the overall understanding of the data collected, the information obtained as well as the validity of the results of this study.

Trustworthiness

Lynne M Connelly (2016) describes trustworthiness as "the degree of confidence in data, interpretation, and methods used to ensure the quality of a study". The researcher spent a substantial amount of time during this study, observing and interviewing participants during the data collection timeframe in order to collect data and provide results and conclusions from the data analysed (Connelly, 2016). Including a pilot study on the data collection instruments ensured the validity of all aspects and questions included into the data collection instruments and provided an increased reliability of the instruments used and the final results of this study (Malmqvist et al., 2019). Trustworthiness can also be measured by the creditability, conformability, dependability and transferability of a study, as explained below;

Trustworthiness in terms of credibility:

Creditability and validity was similarly increased by involving triangulation within this study by including making use of two data collection sources including observations within both research sites and performing interviews with healthcare workers, and thirdly by reflecting on notes made every day of data collection in order to provide a comprehensive understanding with regard to the data collected and the results obtained, as illustrate below;



The researcher made sure to explain the confidentiality aspect to each of the interview participants and asked them to provide honest responses thereby ensuring the reliability of the data. A research assistant also ensured the reliability of all interview transcriptions done in order to eliminate any possibility of research bias when doing the transcriptions to further ensure credibility and conformability (Appendix L) (Pandey & Patnaik, 2014).

Trustworthiness in terms of conformability:

All of the healthcare workers within the NICU research settings received an information sheet providing them with information regarding the study but not about the specific aims and objectives. Therefore, the participants' actions and responses in the setting were not influenced by information provided or discussions regarding the study prior to data

collection. This also ensured the reliability and conformability of this study's results (Pandey & Patnaik, 2014). Leading bias during interviews was eliminated by making use of the same questions to all of the participants avoiding prompting a favourable or bias answer (Shah, 2019). Lastly, during reporting the researcher made sure to quote the participants' direct responses to ensure conformability and authenticity to the results and final conclusion of this study (Cope, 2014). This also ensures no potential research bias by using the direct quotes from the participants (Shah, 2019).

Trustworthiness in terms of dependability:

The researcher aimed to increase the dependability of this study by provided enough information pertaining to the methodology (including the semi-structured interview and observational schedules) for this study to be easily replicated in the future.

Trustworthiness in terms of transferability:

Generalizability and trustworthiness is based on this studies' transferability to other settings or context, which also includes similar situations and a similar population (Devault, 2019). This was achieved by provided sufficient detail on how this study was conducted for this study to be replicated in another setting with similar NICU population admitted.

CHAPTER FOUR

RESULTS

Chapter four provides a detailed description of the results. This chapter also includes quantitative data to provide more insight into the results found at each of the two hospitals' Neonatal Intensive Care Units. The results will be explained in line with the main objectives of this research study, as well as the themes and sub-themes identified, as outlined in the table below.

During the analysis of the data collection, and by making use of the six steps explained by Braun and Clarke (2006), the researcher confirmed the pre-set themes identified from the theoretical background of this research field. Table 4 below indicates the themes that form a part of the objectives set out for the study and includes the sub-themes identified and used to explain the results of this study.

Table 4:
Themes and sub-themes identified during the analysis of the results:

OBJECTIVE	THEMES IDENTIFIED	SUB-THEMES
	THEME 1: The NICU setting.	1.1 Healthcare workers descriptions of the NICU. 1.2 The infants admitted to the NICU.
OBJECTIVE 1 **Explore the feeding practices in the NICU.**	*THEME 2:* The feeding practices in the NICU.	2.1 Feeding routines. 2.2 Feeding policies. 2.3 Team Members responsible for feeding the infants. 2.4 Methods of feeding. 2.5 The initiation and transition to oral feeds. 2.6 Types of feeds. 2.7 Challenges identified with regard to feeding practices.
OBJECTIVE 2 **Identify the team members involved in feeding in the NICU.** **OBJECTIVE 3** **Identify the Speech-language therapists' role.**	*THEME 3:* Healthcare workers that form a part of the Multidisciplinary team in the NICU.	3.1 The team involved in the NICU (including the role of the SLT). 3.2 Challenges within the Multidisciplinary team.
OBJECTIVE 4 **Identify COVID-19's influence in the NICU.**	*THEME 4:* COVID-19's influence on feeding practices in the NICU.	5.1 Hygiene Protocols and protective measures. 5.2 COVID'S possible influence on breastfeeding in the NICU. 5.3 Family involvement within the NICU during COVID-19. 5.4 The effect of COVID-19 on the healthcare workers. 5.5 Carry-over of information in the NICU.

THEME 1: NICU SETTING

1.1 DESCRIPTIONS OF THE ENVIRONMENTS BY HEALTHCARE WORKERS

It was observed that the NICU environments were small, overcrowded, busy, and fitted with bright lights; loud machines were beeping disturbingly and the staff talking loudly. This was confirmed during the interviews as all of the participants (healthcare workers) working in the environment mentioned one or more of the above descriptions when discussing the NICU environment. Participant D, a nurse, noted, *"It's noisy! As you can hear them (nurses) there, they are noisy"*, which was also confirmed by participant S when she mentioned that it is *"Generally very crowded, uhm, very noisy, very bright."* Other participants also noted that the environment is "noisy" and added "full", "bright", "sounds of beeping", "busy", "hectic" and "crowded".

This goes against the recommendations made for a NICU environment, for example, that noise levels should be kept low to promote a calming environment for the infants admitted who need to recover and develop optimally before discharge (LINC, 2013; Rossetti, 2001). One participant mentioned that *"it should definitely be quiet, more calm, and lights down, and less noise, but it's obviously not" (*Participant I – Occupational Therapist).

It is concerning that Participant T (Occupational Therapist) felt that the staff are not "*really educated in terms of what's best for the neonates*", especially as the infants are admitted with various diagnoses and different medical and therapeutic needs. The participant might have felt this way because, due to COVID-19, the number of nurses decreased some days due to nurses having to isolate and some might have been "undertrained" when stepping in for those nurses (further discussed in section 5.4). Alternatively, there might just be too many infants to attend to and the staff cannot always switch off the lights, or pay attention to other possible changes within the environment when the infants have constant serious medical needs to attend to rather.

Healthcare workers who formed a part of the developmental team explained that they do spend time educating and encouraging the other healthcare workers, including the nurses, to create the ideal environment for the infants admitted (as explained by the SLT and physiotherapist below);

"We would do a lot of education about the NICU. That babies don't like loud noises, big light all those kind of things, but the NICU is literally just noise and lights." (Participant J – Speech-Language Therapist)

"One of the things we do with the nursing staff is about noise control and that sort of thing. I mean obviously lighting; you can't switch off the lights you know. But I do think that noise, uhm, and also the clustering of care is difficult, we have a high patient load." (Participant G – Physiotherapist)

As described by the participant above, the workers within the NICU settings had high caseloads and the researcher's observations confirmed that the NICUs were reaching maximum capacity for example a research site being able to accommodate 45 patients according to their NICU's in-patient abilities (described in methodology section), but admission ranged between 52 and 59 infants on a daily during the data collection period. This influences the environment layout (that can be seen in the methodology section), spacing between infants, caseloads for healthcare workers and possibly the overall care provided. This is highlighted by the following quote:

"It's very busy, uhm, I think everybody works very hard. I think there is not enough staff for all the babies that need to be seen [to]." (Participant N – Dietician)

Another nurse commented, "*due to the influx* (overload of infants admitted on a daily)*, it's very difficult to follow in the daily routine especially having these very sick babies" (*Participant R – Nurse). This elaborates on the fact that the NICU settings are reaching maximum capacity due to the increased amount of infants admitted. She also mentioned, *"it is no longer safe*, *it's over-crowded most of the time. We no longer have a quality set-up that we used to before the over-crowding*" (Participant R). Another participant mentioned, *"cribs and incubators are really like, very close to each other"* (Participant L – Speech-Language Therapist). Therefore, the concern is not only the number of infants admitted but also the additional risks to having so many infants admitted and their beds so close to one another. Literature explains that this increases the risk of hospital-acquired infections which, in turn, could influence the infants' development and possibly lead to neonatal deaths (Lloyd & Witt, 2018).

Lastly, the healthcare workers' view of the NICU can influence their opinion of their work environment and could possibly also impact their enthusiasm to provide the necessary services, as confirmed by Participant T (Occupational Therapist):

> "*Even I get over-stimulated being in that environment. So yeah, it's not a great environment."*

1.2 INFANTS ADMITTED TO THE NICU

The researcher observed that the NICUs were overcrowded due to being filled beyond capacity and, when analysing the daily admission books' number of admissions, it was evident that both of the NICUs reached maximum capacity at some point during the research data collection. For example, Research Site Two is capable of admitting 45 patients according to their NICU's in-patient abilities (described in methodology section), but their daily admission ranged between 52 and 59 infants admitted (as confirmed in Table 8). Overcrowding within cubicles where therefore unavoidable due to hospitals aiming to accommodate up to 6 infants per cubicle but having up to 15 infants in a cubicle.

When considering the variety of diagnoses of the infants admitted, one can understand the urgent medical requirements and need for medical interventions within the settings. By gathering data from the daily admission books of the research sites, the following table indicates the percentage of infants admitted per diagnoses during the timeframe of data collection at each of the research sites:

Table 5:

The percentage of infants admitted per the diagnoses during data collection period.

DIAGNOSIS	SITE ONE		SITE TWO	
	Frequency (%) of infants out of 100% of infants admitted		**Frequency (%) of infants out of 100% of infants admitted**	
Prematurity	59.2		46.5	
LBW <2500	24.5		23.8	
VLBW <1500	25.5	60.2	28.7	61.4
ELBW <1000	10.2		8.9	
Respiratory Distress Syndrome	50.0		44.6	
Neonatal Encephalopathy	12.8		8.9	
Hypoglycemia	5.6		3.9	
Neonatal Jaundice	5.6		6.9	

Meconium Aspiration	8.7	4.0
Meconium Strained Liquor	8.2	1.0
Necrotising Enterocolitis	1.0	2.0
Pneumonia	5.6	0
Seizures	1.5	1.0
Gastroschisis	3.1	0
Hypothemia	4.1	1.0
Sepsis	4.1	4.0
Hypertension (PPHN)	4.0	1.9

Note. Table 5 indicates the high percentage of infants admitted who were born prematurely at an average of 59% and 47%. Infants admitted during data collection at both research sites reached over 60% born with low birth weight and nearly 50% of the infants had respiratory distress syndrome, which is a typical diagnosis for infants born prematurely (Da Costa et al., 2019; Demitto et al., 2017). It also indicates the amount of infants born with Low Birth Weight (LBW), Very Low Birth Weight (VLBW) and Extremely Low Birth Weight (ELBW) respectively from each site. The variety of cases displayed in Table 5 includes the diagnoses with the highest frequencies, as opposed to the few infants who were given other diagnoses.

The infants who were admitted with other diagnoses and the number of infants per diagnosis during data collection timeframe included low APGAR scores, acute kidney injury (4), subarachnoid haemorrhage (aSAH) (2), hypoxic ischemic encephalopathy (HIE) (2), low APGAR scores (2), jejunal stenosis (3) atresia (1), patent ductus arteriosus (1), intrauterine growth retardation (1), stenotrophomonas(1), vomiting (3) diarrhoea (1), distended abdomens (3), dysmorphic features (7), pneumothorax (2), harlequin syndrome (1) and trisomy 20 (1) and 18 (1) infants – who all had a low frequency of the number of infants per diagnosis.

From the variety of diagnoses found, it is evident that the infants require either urgent medical attention that might also include receiving different types and amounts of medication right away, and/or lifelong interventions. This could influence their overall, and more specifically, their feeding development (Bertoncelli et al., 2012; D'Agata et al., 2016; Fouché, 2018; Fróes et al., 2020).

THEME 2: EXPLORING THE FEEDING PRACTICES WITHIN THE NICU

2.1 FEEDING ROUTINES

It was observed that both research sites followed a strict three-hourly feeding routine that started with daily care and monitoring activities and ended in a feeding time every three hours. Other healthcare workers and nine participants concurred; for example, Participant N (Dietician) mentioned, *"all babies will be fed three hourly."*

Regarding the routine care activities surrounding feeding times, a nurse (Participant C) explained, *"in that three hourly we change nappies, we feed babies, we do observations, suction if necessary, carry out doctor's orders and give treatment".* Most other nurses also mentioned that they do suctioning and check aspirates before every feeding time commences, which is recommended as a feeding tolerance assessment (Yin et al., 2015). A nurse added:

> *"We come in, clean our environment, prepare anything that we might need like your suctioning devices, your oxygen, you check if all those are working. Clean the baby and the baby's surrounding, and then around 9 o'clock, we preparing to feed, so by half past eight uhm you will be cleaning changing the nappy and so forth and suctioning. Nine o'clock we feed." "It's a three-hourly schedule. We'll do that at 12 o'clock, at 3 o'clock and at 6 o'clock"* (Participant B – Registered Nurse)

Infants were also weighed every morning, as stated by participant U (Speech-Language Therapist), which could serve as a method of assessing feeding tolerance (Lubbe, 2018):

> *"We know at what times they are going to be feeding, we know what times they will be doing daily maintenance and check-up and cleaning the babies, uhm essentially weighing them."*

Participant U elaborated on how other healthcare workers use the feeding times as a structure around their routines in providing the necessary intervention to the infants:

> *"In terms of the care of our patients in the NICU everything is done in a routine manner. Uhm I think it makes [it] easier in terms of, not only the nurses*

managing the day-to-day care of the patients but in terms of when the doctors are able to uhm attend to these patients for routine check-ups, it's not going to interfere with the nurses and the same with the developmental health care workers that are in there as well, including myself. We know at what times they are going to be feeding, we know what times they will be doing daily maintenance and check-up and cleaning the babies, uhm essentially weighing them, uhm, and so it makes it a little bit more structured and easy for us to work around." (Participant U – Speech-Language Therapist)

This confirms that strict feeding times provide a structure for the healthcare worker within the NICU settings, as confirmed by participant T, an Occupational Therapist: *"We need to know when feeding is because we don't then do hectic exercises right after feeding because you know they're going to vomit".* The strict feeding times also provide guidance for the mothers of the infants admitted, since they are encouraged to be present during feeding times. The mothers of admitted infants have to understand the routines and procedures within the units as well as other concepts such as methods of feeding, expressing breast milk, identifying support groups.

2.2 FEEDING POLICIES

The only observations made with regard to feeding policies included the one feeding policy found up on Research Site One's NICU, and several found at Research Site Two (which included the feeding policy described in different languages). This observation was confirmed by one participant when he mentioned that *"there is a paper up on the board there that guides us with regards to the fluid and feeding management of neonates"* (Participant F – Doctor). The Baby Friendly Initiative explains the importance of having a feeding policy within the unit, which is to be routinely communicated to all healthcare workers within the units (UNICEF/WHO, 2006).

However, during the interviews, when asked to describe their feeding policy within the unit, it was revealed that healthcare workers from both research sites had multiple views on the feeding policy implemented. Three nurses could not identify or explain the feeding policy within their NICU settings; this could be due to a lack of training on the feeding policies or that they were new within the ward due to COVID making use of new nurses when under pressure with staff having to isolate. A nurse admitted:

*"No, I don't know of a policy. I just know there is a standard operating procedure that we are taught … with regard to feeding." (*Participant C – Nurse)

It was observed that most of the doctors in Research Site One had a book (pink in colour) that they carried at all times. During the interviews, it was discovered that this pink protocol book included the NICUs procedures, protocols, feeding policies and guidelines for this research site. Participant E (Consultant Doctor) explained that *"we do have a protocol book, we do have feeding guidelines, depends on the patients gestational age, uhm their post-natal age obviously if there is any other complications, so we do have guidelines"*.

A dietician also mentioned that they collaborated with the SLTs to provide their input regarding the feeding policy described in the protocol book. The dietician added:

*"In that little pink protocol book, … the feeding protocol is in there as well, uhm and with that the dieticians and the speech therapists - we all helped with that protocol" (*Participant N - Dietician)

During the interviews, two other doctors mentioned the involvement of the dieticians and the SLTs who contributed to the development of the feeding protocols to follow. One of the doctors at Research Site One mentioned, *"we do have protocols and the speech therapists have actually drawn up guidelines".*

The healthcare workers knew about the Baby-Friendly Initiative (BFI) programme designed by the World Health Organisation (WHO) that encourages and promotes the breastfeeding of newborn infants. *"The feeding policy it's about uh encouraging the mom to breastfeed" (*Participant K – Registered Nurse), *"we obviously promote breast feeding as far as possible" (*Participant E – Consultant Doctor). Participant M (Speech-Language Therapist) mentioned that the unit includes *"the weaning protocol. And we are following the Baby Friendly Hospital Initiative".*

Other participants similarly elaborated on the weaning process when asked to elaborate on their feeding protocol within the unit. The participants explained that the speech therapy

department within Research Site One established the weaning process and that it includes the criteria infants need to be weaned onto an oral diet. A speech therapist explained:

> *"We have got the Weaning Protocol. I don't know if every hospital uses that, where kids need to be above 32 weeks, uhm they need to be medically stable. But with all of those measures put into place, like if they meet all that criteria the doctors need to start them with the weaning protocol and only once they face challenges can they refer to us" (*Participant M – Speech-Language Therapist)

Another dietician and SLT clarified that the Weaning Protocol was based on the literature and is used to guide the gradual transition to full oral feeds, as seen in the citations below:

> *"So the speech therapists here have developed uhm, a Weaning Protocol, and they've stuck up posters also and they educate the doctors on that. So uhm we've, between 32 and 34 weeks we usually follow that protocol. We'll start with the 5 mls of cup feeds and then increase it by five mls each day until the baby can complete a full cup feed. So the doctors and dieticians and other nursing staff, we're allowed to initiate or suggest that, uhm, and then if we pick up any problems then that's when we'll refer to the speech therapist*." (Participant A – Dietician)

> *"The Weaning Protocol is another thing that we do. So that's for like babies that are maybe like, normal developing, at over 32 weeks prematurity, medically stable, you can introduce the cup. They will be like 5 ml's and then the next day 10ml's the next day like 15ml's then the rest is done by the tube*." (Participant J – Speech-Language Therapist)

With South Africa's concern regarding the HIV population and feeding protocols, one should think that it is important for all healthcare workers to acknowledge and bear in mind the recommendations made when thinking of the feeding practices. However, only one participant mentioned the guidelines of mother-to-child transmission as part of the protocols to follow in the NICU. She included the following during her interview:

"We do educate the moms on what 'exclusive' means, and then uhm, we also use the new guidelines in terms of preventing mother-to-children transmission of HIV. We follow those guidelines as well… it's kind of our responsibility to, to look up and read up on that" (Participant A – Dietician).

It is worth noting that during the interviews, none of the healthcare workers mentioned any changes made due to COVID-19 when asked about the feeding protocols. From the above findings, it is concerning that each healthcare worker had a different view on the feeding protocol implemented within her/his unit, especially as healthcare workers have a vital role in the NICU feeding practices.

2.3 TEAM MEMBERS RESPONSIBLE FOR FEEDING THE INFANTS

The specific roles of the various team members involved in feeding the infants is explained under theme 3 when discussing the multi-disciplinary team and the role of the team members with regard to feeding practices.

2.4 METHODS OF FEEDING

Normally, the mothers would be encouraged to feed their infant during feeding times with whichever method is shown to them by the health workers. However, due to COVID-19's restrictions, mothers were unable to either get to or enter the hospital to feed their infants. This could explain why the feeding times seemed to be overwhelming for the nurses who had to feed 10 to 15 infants every feeding time within their cubicle simply because the mothers were not present during feeding times.

It was observed that the majority of the infants where either only fed by the enteral feeding method or still have a tube in-situ due to being in the transition period to oral feeds. With regard to the amount of infants per feeding method and their length on the feeding method – it was definitely not possible to gather data on the amount of infants per feed, since there were numerous infants admitted per day and these infants were moved between cubicles, discharged or diseased and also due to the researcher not being able to gather any information from their hospital files to establish how long the infants been on a specific feeding method.

When the majority of infants within the cubicle were fed with feeding tubes, the nurses would be able to feed up to two infants simultaneously by holding both of the syringes up at the same time since their beds are so close to one another. It was also observed that when nurses had a few incubators within their cubicle they would hang the syringe providing the enteral feed onto the infant's incubator so they could carry on feeding other infants in the meantime. This was possibly done because they know that feeding infants orally with cups could take longer as the nurses have to position the infants appropriately, ensure that the infants are in the right state of behaviour for oral feeds, etc.

Whether the infants are fed via NGT or OGT at first and then via cup, syringe, bottle or directly from the breast, it is important to maintain a gradual transition to full oral feeds to ensure tolerance of oral feeds and the discharging with an optimal oral feeding method (Department of Health, 2014). The observations and interviews revealed that the NICU settings had a variety of methods to feed the infants starting from IV fluids or TPN when infants are admitted to ultimately either feeding orally using a cup or directly from a mother's breast. The different methods and order of development from one method to the next is explained below.

2.4.1 IV (Intravenous) fluids

It was observed that the majority of the infants could not tolerate the feeds because they were not medically stable, were too medicated or may have been "Nil Per Os" (NPO) for a period. Participant O mentioned, *"A lot of babies in ICU are just NPO"* (Dietician).

These infants were provided with nutrition via IV fluids or received nutrition via the Total Parenteral Nutrition (TPN) method; nutrition was provided via a vein since the infants' digestive systems might not be developed appropriately to absorb the nutrition from feeds given into their stomachs (Fairview, 2020).

> *"Some are not on* (oral) *feeds at all, they are on full TPN."* (Participant N – Dietician)

2.4.2 Oro-gastric tubes (OGTs) and naso-gastric tubes (NGTs)

As mentioned previously, observations at both sites revealed that most of the infants had enteral feeds/feeding tubes or tubes might still be in-situ due to transitioning to oral feeds by still making use of OGTs and NGTs.

> *"Generally, in ICU most of the babies will be tube fed."* (Participant E – Consultant Doctor)

It was noted that other healthcare workers also explained that enteral feeds were provided because of a premature birth or low birth weight at the time. A dietician and intern doctor mentioned the following:

> *"Anyone below 1.5 kg they will have an OGT or a NGT in."* (Participant O – Dietician)

> *"In preemie babies, you can start oral feeds via an NG tube."* (Participant H – Intern doctor)

This was surely due to their maturity and overall readiness for oral feeds, as better explained by the following participant who mentioned that *"NGT's are used for our very 'prem' babies who haven't developed their suck and swallow yet"* (Participant U – Speech-Language Therapist).

During the interviews, the healthcare workers could not provide a valid reason for the decision made between the OGT and the NGT, where after it was also discovered that clear instruction and reasons for the preferred gavage feeding in infants admitted to an NICU cannot be found in evidence based research recommendations. In a summary of a systematic review study it was explained that the WHO stated that "there is currently insufficient evidence to inform practice or policy regarding the specific placement of enteral feeding tubes in preterm or low birth weight infants" (World Health Organization, 2013). Yet, observed proved both research sites making substantially more use of OGTs, as seen below;

> *"We don't use a lot of NGT's, so it's the oro-gastric instead of the Naso-gastric."* (Participant A – Dietician)

Doctors mentioned that the nurses decide to use either an OGT or NGT, since they insert the tubes:

> *"We usually just write in the notes – 'Insert the gastric tubes' and the nurses do that part for us."* (Participant F – Doctor)

> *"When it comes to the tube feeding, I think that choice becomes, like it, that decision is made more by the nurses because they are the ones that put the tubes."* (Participant Q – Medical Officer)

The reason for this might be that nurses are more comfortable inserting OGT, as seen below in a quote by one of the doctors:

> *"The sisters are quite comfortable doing an OGT."* (Participant P – Consultant Doctor)

During the interviews, a SLT confirmed that other healthcare workers are not trained to insert the feeding tubes and they therefore rely on the nurses to do so:

> *"We (SLTs) don't do that, we are not trained in the OG placements. Uhm, we probably should be and it would be nice."* (Participant J – Speech-Language Therapist)

2.4.3 Cup or syringe

In both the research sites, the infants who start taking oral feeds are mostly fed using cups, as mentioned in the two citations below:

> *"It will first be the tube feed and then we'll try and uhm wean them onto the cup feed. So our cup feeding would be our next preferred method"* (Participant A – Dietician)

> *"A lot of them in the NICU, a lot of them are being tube fed … and then cup feeding is usually then implemented. But jah then they, they try cup feeding and syringe."* (Participant L – Speech-Language Therapist)

It was observed that a few of the infants were also fed via syringes within Research Site One, possibly due to limited feeding resources (as confirmed by Participant M), or as a method to prevent the spread of infections (mentioned by Participant K).

> "*The past two weeks or so, there hasn't been enough cups, uhm, for us to actually even trial so even in our notes we will say 'syringe, no cups' and then you continue with your syringe assessment*." (Participant M – Speech-Language Therapist)

> *"You can use the cup, you can use the … the syringe. It's just that for measurements. The other thing, the syringe is closed so to prevent infection."* (Participant K – Registered Nurse)

During the interviews, all of the SLTs upheld breastfeeding as the prominent oral feeding method, preferably with the mother present and able to feed from the breast instead of using expressed breast milk in a cup or syringe to feed the infants.

> *"We would obviously start with either cup or syringe or breast, uhm - breast is the best. We would want to start with breast."* (Participant J – Speech-Language Therapist)

Another nurse (Participant C) confirmed that the nurses prefer putting the infants straight onto the breast if possible: *"On oral, if the mother is around, we prefer that they are put on the breast, if she is not then we can cup feed the patient".* However, it was observed that only a few infants were seen feeding directly from their mothers' breast within the NICUs at both research sites, as most of the infants were still NPO, either feeding via enteral feeding methods or in the transition period to oral feeds by making use of a cup. A SLT explained the methods of feeding within their hospital as follows:

> *"In our NICU, it's cup feeding, uhm, or breast feeding. During the nights, it would be cup feeding with expressed breast milk. Very very rarely, probably in the 1% will we use bottle feeds. The main feeding method would be between breast milk and expressed breast milk via cup."* (Participant U – Speech-Language Therapist)

It is worth noting that all the SLTs explained that using a bottle as a feeding method is only considered if an infant cannot manage feeds by any other method. Feeding with a bottle is not recommended within literature and the BFI further explains that healthcare workers should "counsel mothers on the use and risks of feeding bottles and rather make use of cup feeding when breastfeeding is not an appropriate option" (UNICEF/WHO, 2006). A SLT added that:

> "[If} *Baby is not coping with cup or syringe and you have tried quite a multiple of things, will you, then you have to get consent from mom and then you can try the bottle*." (Participant J – Speech–Language therapist)

2.4.4 Bottle feeds

It was observed that only one infant in Research Site Two was fed with a bottle because it was diagnosed with Trisomy 18 and did not tolerate other feeding methods well. The decision was made by the SLT who assessed the infant's feeding over time. She monitored the safety and tolerance of the feeding methods and then ultimately prescribed bottle-feeding because it was deemed to be the best feeding option for the infant. Two SLTs explained why bottle-feeding is recommended as a last resort:

> *"We will try the cup, then we will go to the syringe uhm, yeah cup, syringe and then breast, if baby is not coping and then bottle is like the last ultimate thing and based on certain factors."* (Participant M – Speech-Language Therapist)

> *"We normally get to trial them on the bottle and discharge them on bottle. So I think it's kid specific as well as diagnosis specific. Very very rarely, probably in the 1% will we use bottle feeds."* (Participant M – Speech-Language Therapist)

Research advises against the use of bottles, as mentioned in the Baby Friendly Initiative, due to the risk of infections spreading when using bottles as a feeding method (UNICEF/WHO, 2006). The following two participants demonstrate that the healthcare workers also understood the recommendations regarding bottle feeds:

> *"So there is no bottles in NICU for infection reasons, also for like the babies influences uhm, breast, like latching, because of breast uhm, nipple confusion*

so that we obviously go with. Only if in special cases ... baby is not coping with cup or syringe and you have tried quite a multiple of things, will you, then you have to get consent from mom and then you can try the bottle." (Participant J – Speech-Language Therapist)

"We avoid bottle feeding as far as possible because of infection control so we do the cup feeding." (Participant E – Consultant Doctor)

2.5 INITIATION AND TRANSITION TO ORAL FEEDS

As mentioned previously, it was observed that most of the infants had a tube in-situ as the possible feeding method or because they were transitioning to full oral feeds. Since majority of the infants were found being in the transitional phase, the researcher found it important to establish and explain within the result section when the healthcare workers do initiate the oral feeds and what the transition to full oral feeds entail. During the interviews, the researcher also made sure to ask the participants when oral feeds would be initiated and the guidelines used to transition infants in order to attain full oral feeds. Only one doctor included the initiation of oral feeds when term infants can tolerate feeds orally from admission.

"For a term baby, who doesn't have any respiratory distress, has a good suck, we'll put them on feeds straight away, which we'll start at sixty mils per day and then you build in each day by twenty until the maximum of hundred and fifty. For preemie babies, we normally start a little higher because they require more of nutrients to grow, so we normally start them of at eighty milligrams per kg per day, it can go up to hundred and eighty." (Participant H – Intern doctor)

As mentioned previously, most infants admitted to the NICU are not fed orally and will require a gradual increase in feeds initiated at the right time based on the infants' abilities. Research identified prerequisites for the initiation of full oral feeds as medically stable, evidence of the rooting reflex, sucking reflex and presence of the suck-swallow-breath pattern in infants (Bertoncelli et al., 2012; Lau, 2014; Nye, 2008; Yin et al., 2015; Younesian et al., 2015). Healthcare workers agreed that oral feeding should be initiated when the infants' sucking matures, as mentioned by Participant K: "*The baby starts to feed when the baby is sucking well"* (Registered Nurse).

Other healthcare workers elaborated when discussing the initiation of oral feeds based on the infants' gestational age and sucking abilities maturation, as seen in the following few citations:

> *"They need to be uhm over the age of 32 weeks because 32-34 weeks because that's when the sucking is uhm being developed so that's when babies can… you can start trialing oral feeds."* (Participant L – Speech-Language Therapist)

> *"When they get to 33, 34 weeks when the suck swallow reflex is supposed to develop so usually if I see they are that age I will refer them to the Speech or if you can see they start to make sucking uhm motions or so."* (Participant N – Dietician)

> *"We know by 32 weeks something is happening, by 34, 35 uhm developmentally or maturation wise what's supposed to be happening. So they can actually sort of suck nicely by 32, by 34 they're coordinating their SSB (Suck-Swallow-Breathe)."* (Participant M – Speech-Language Therapist)

However, one SLT explained that the decision did not rest on the infant's gestational age since the infant might have other difficulties or medication influencing their suck:

> *"We would always make sure the baby is older than 32 weeks because that is obviously when the suck starts to develop itself. Uhm medically stable is obviously is really really important as well as their suck in general. So every baby is different stage. Like I've got a baby that is 32 weeks who is sucking well, uhm then you get a baby that is at 34 weeks that is not sucking well."* (Participant J – Speech-Language Therapist)

The literature explains that infants who are ready to initiate oral feeds should transition gradually by initially providing the infant with a certain amount of the feed orally (usually via a cup or syringe). The rest of the feed will then be administered via the tubes already in-situ, as they are "building feeds", as described above by a Speech-Language therapist (Participant J) (Lau, 2016; Lubbe, 2018).

It was observed within both research sites that infants receive a part of their feed orally and the remainder of the feed via the tube in-situ. Two nurses explained the following:

> *"So, there is a time where we give both, both nasogastric and oral and if the patient can tolerate the oral, we keep increasing the oral until we exclude the nasogastric and then the patient is on oral."* (Participant C – Nurse)

> *"We give half of the feed via the tube, and then half of the feed orally. And then the more the baby gets used to cup feeding we will leave the tube, we take out the tube and then feed orally"* (Participant B – Registered Nurse)

The doctors from both research sites agreed that once the infants initiate oral feeds, the amount of the feed given orally will gradually increase by 10-20ml/kg per day a day (as described in research) as long as the infant shows tolerance of the feeds and no difficulties become apparent (Sparks et al., 2018; Yin et al., 2015). The following doctors elaborated on the initiation of oral feeds, as well as their gradual increase:

> *"We'll start at sixty mils per day and then you build in each day by twenty until the maximum of hundred and fifty."* (Participant H – Intern doctor)

> *"We build up 20 mls per kilo per day, uhm in terms of the feeds."* (Participant Q – Medical Officer)

> *"We start at 20 (mls) per kg. We build it slowly to 40, 60 – so by 20 every day."* (Participant P – Consultant Doctor)

Six out of the 22 healthcare workers (27%) who were interviewed, confirmed that their ultimate goal during feeding transition would be to either start on the breast or get the infant on the mother's breast before discharge. When the breastfeeding mothers are not present, the nurses will provide their infants with expressed breast milk left over from the previous expressed milk; this will be given via cup or syringe to build oral feeds.

2.6 TYPES OF FEEDS

It is recommended that infants who are admitted into the NICU units receive breast milk or donated breast milk as the first option, especially if they are pre-term and low birth weight infants (World Health Organization, 2011). However, it was found that the majority of the infants still receive formula or are mixed-fed during their admission. Research Site One had a daily administration sheet indicating the type of feeds given to the infants which indicated that many infants are being mixed-fed (given breast milk and formula) or simply fed with formula. Even though Research Site Two did not make use of administrative information indicating the amount of infants receiving each type of feed, observations still yielded that a large amount of formula feeds where prepared for the infants admitted every feeding time which indicates that Research Site Two might also still be providing an abundance of formula feeds to the infants, or providing them with mixed feeds. Table 6 below indicates the type of feeds given to the infants admitted each day.

Table 6:

Type of Feeds (in terms of milk) provided to the infants during data collection.

		TYPE OF FEEDS GIVEN TO INFANTS ADMITTED (n)				
DAY OF OBSERAVATION AT RESEARCH SITE ONE	NUMBER OF INFANTS ADMITTED ON THE DAY	NPO	BREAST MILK	MIXED FEEDING	FORMULA	DONATED MILK
1	71	29	14	10	15	3
2	73	25	15	11	17	5
3	74	23	15	15	16	5
4	72	16	19	14	20	3
5	67	14	26	5	21	1
6	67	14	23	8	21	1
7	66	14	19	10	22	1
8	67	15	18	17	15	2
9	57	11	17	15	14	0
10	52	11	15	15	10	1
11	58	14	15	6	18	5
12	57	15	13	13	12	4

Note. This table indicates the number of infants who are either "Nil Per Os", i.e. receiving breast milk, donated milk, formula feeds and/or receiving mixed feeds. This also means that even though all the participants in the study commented on their understanding of the

importance of breast milk and elaborated on how they encourage the mothers to express breast milk, the data in Table 6 indicates that infants are still receiving more formula as a type of feed than they should.

2.6.1 Breast milk

All the healthcare workers stated that they advocate breastfeeding, always consider donors breast milk, encourage expressed breast milk and that the first option regarding the type of feed provided is always the mother's breast milk. Out of the 22 interviews conducted, 19 participants (86%) discussed their advocacy for breast milk. It was also confirmed during the interviews that the doctors usually contact the mothers upon admission to discuss the type of feed:

> *"Usually on day zero when they're born, they (the doctors) will try and contact the mom as soon as possible to try and get her feeding choice, whether its formula or breast milk. The healthcare workers and the nursing staff are pro-breastfeeding. So we do try and promote it."* (Participant A – Dietician)

> *"I try [to] contact moms early like uhm at least the first day that they get admitted with us, I like to try and speak to the moms and try see if they are having trouble expressing. Uhm if they are then able to come through and then, if there are any issues like to give them medication and to try."* (Participant Q – Medical Officer)

The doctors and other healthcare workers explained that they would educate the mothers on the benefits of breastfeeding and the importance of breast milk for the premature or LBW infants admitted. One participant added:

> *"Uhm, if the mom does choose formula then the doctors do usually counsel her on the benefits of breastfeeding and try promote breastfeeding"* (Participant A – Dietician)

Two doctors explained that they would recommend donor breast milk as their second type of feed option if the mother decides against breastfeeding

"We promote breast feeding as much as possible, or get consent for donor milk if there is an issue." (Participant Q – Medical Officer)

"We always advocate for express breast milk as the first step. If there is no express breast milk for whatever reason, we definitely try to address that by calling the mom, finding out what's her difficulty. Trying to counsel her on how to do that and then we offer DBM, if it's available." (Participant P – Consultant Doctor)

2.6.2 Donor Breast milk

It was found that Donor Breast Milk (DBM) was supported in both the research sites, as it was observed to be provided to the infants admitted and quite a few of the healthcare workers discussed DBM in their interviews. It was evident that the doctors (or other healthcare workers) have to obtain permission (signed consent) from the infant's mother first. It was observed that doctors left forms on the incubators/beds requesting DBM consent from the mothers and that doctors went out of their way to contact the mothers themselves to request their permission to provide DBM to their infants. One nurse added that:

"We have premature babies they have DBM - donated breast milk or mother's milk." (Participant C – Nurse)

The importance of DBM was explained in the interviews, especially for infants weighing less than 1.5kg or born before 32 weeks (thus LBW or premature), as prematurity was also found to be the main reason for DBM provision in another study done within South Africa (Sparks et al., 2018). Another reason explained in the study done by Sparks and found in both the research sites, was the provision of DBM when the mother's milk is not available:

"The donor milk is…the doctor decides, but it's, it depends on the baby's weight. It's mostly premature babies who weighs less than 1.5, the mother cannot produce milk but she wants breast milk, but she…They do get consent from the mother first. It's mostly premature babies who weigh less than 1.5 and 1.4 because apparently its helps them gain weight and it's also safer for their gut." (Participant C – Nurse)

It is recommended that the infants get DBM if their mothers are not producing sufficient milk, especially, for example, when infants are just admitted and mothers are still adjusting to expressing their breast milk or not yet able to provide it due to being admitted or delivering the baby prematurely. The doctors then encourage the mothers to initiate expressing milk as soon as possible whilst the infant receives DBM.

> *"We try [to get] consent [from] the moms for donor breast milk as early as possible and get them expressing."* (Participant Q – Medical Officer)

> *"If they need like donor breast milk then we will tell the nurse that we have allocated them donor breast milk or if we need to tell the moms that to express, then we will tell the nurse that 'please can this, you make sure that this mom expresses."* (Participant O – Dietician)

Participant N also clarified that the infants usually only receive DBM for up to two weeks:

> *"We actually now [have] a very strict criteria. The idea is also that in those two weeks that the mom's start to express more and more everyday so that by the time the donor milk is stopped that she can go on."*

More than the strict protocol described by the participant, a Donor Breast Milk protocol was observed behind one of the administration desks at Research Site One. However, none of the healthcare workers mentioned or elaborated on this during the interviews. The effect of COVID-19 can also not be discussed due to not having any experience or data from DBM practices prior to this study's data collection and none of the healthcare workers identifying and describing the effect of COVID-19 on the use of DBM as well.

2.6.3 Formula or Mixed feeds with Formula

Research and policies state that only if breast milk is unavailable or the mother decides against breastfeeding, should healthcare workers consider formula (UNICEF/WHO, 2006). Healthcare workers did mention that they have to sometimes resort to formula feeds as the mothers sometimes find that expressing milk is too difficult to do, or do not have the means

to get to the hospitals to provide the breast milk. It might also be that the healthcare workers do not have sufficient DBM on hand and would then have to give formula:

> *"If they don't have exclusive breast milk from their own mommy then there's donor milk that we give to those babies, but if we really don't have donor breast milk because we running short on that, we only give S26* (formula) *for low birth weight babies."* (Participant H – Intern doctor)

> *"If there isn't any donor milk then we actually, we have to give Pre-nan* (formula) *if it's a premature baby or Nan* (formula) *if it's a term baby."* (Participant P – Consultant Doctor)

Another healthcare worker explained that formula would sometimes be used as a "top-up" where these infants then receive mixed feeds during feeding times:

> *"In terms of the prepared formula, I've seen it used in terms of a top up, a lot of moms, if on day two or three are struggling to meet the required amount of milk, they will then use the prepared formula as a top up, still giving mom's breast milk first."* (Participant U – Speech-Language Therapist)

2.7 CHALLENGES IDENTIFIED IN THE FEEDING PRACTICES

The first challenge identified was explained earlier under 2.6 when discussing the undesirable use of formula feeds and providing infants with mixed feeds during admission. Research also explains that prolonged enteral feeds (by means of feeding tubes) can complicate the transition to oral feeds (Greene et al., 2016; Pike et al., 2016; Yin et al., 2015; Younesian et al., 2015). During the interviews, it was found that most of the healthcare workers agreed upon the gradual increase of oral feeds during the interviews but that other healthcare workers identified how some infants are left feeding with a tube when they might be ready for oral feeds:

> *"The main struggle is the fact that people* [other healthcare workers] *don't initiate it, so you might find a baby that's now 36 weeks and still on tube* feeds. *So the healthcare workers that are not initiating or maybe delaying it.*" (Participant A – Dietician)

Another dietician identified the same problem with the delayed initiation of oral feeds due to healthcare workers simply leaving the infants on feeding tubes:

> *"Sometimes it may be that the people are just lazy to try. Uhm, so sometimes I will tell them, 'please try this baby' because they are supposed to try oral feeding."* (Participant N – Dietician)

Observation of one specific feeding time exposed a nurse who had removed an infant's feeding tubes prematurely and fed the infant's entire feed orally, when that was not the recommendation made by the SLT. As explained earlier, the literature includes various considerations to make when initiating oral feeds and highlights the importance of gradual transition to oral feeds. It was then observed that the SLT requested the infant's OGT to be re-inserted since the infant's feeding difficulties were still evident. Another healthcare worker explained this type of problem while explaining her observation of the same situation:

> *"Some sisters (nurses) find that the tube is quicker so they will stay with the tube for a very long time without even initiating any oral feeds. And then sometimes I think they don't want to insert the tube. You know the tube is a mission, so if it's your opinion and you feel that the tube is [a] mission, they will trial the cup when babies aren't necessary ready for the cup."* (Participant J – Speech-Language Therapist)

All of the above challenges may contribute to the difficulties faced when infants transition to oral feeds and when trying to achieve full oral feeds safely before discharge. These difficulties could hinder the infants' development and ultimately put them at risk for additional complications during admission and post-discharge.

Table 7 below provides a summary of the feeding practices observed during observations within the two research sites and the conclusion reached after analysing the interviews with the healthcare workers. It was found that feeding development will always be dependent on the infants need and overall improvement, and that it is important for all the healthcare workers involved to take each infant on a case-by-case basis.

Table 7:

A Summary of the Feeding Practices in the Neonatal Intensive Care Units

WHO FEEDS THE INFANT	TYPE OF FEEDS (I.T.O. MILK)	METHODS OF FEEDING	TRANSITION TO ORAL FEEDS	MONITORING FEEDING TOLERANCE
Mothers are encouraged to feed their infants with expressed breast milk or ultimately directly from the breast.	The first priority is Breastfeeding and providing expressed breast milk to their infants.	"Nul Per Os" (NPO) and provided with nutrition by making use of Intravenous (IV) Fluids, or Total Parenteral Nutrition (TPN) for immature digestive systems.	Oral feeds initiated at 32-34 weeks gestational age and most importantly – infant's medically stability.	Nurses check the infants' aspirates before every feed, and also the infants output after every feed.
Nurses will be feeding the infants if the mothers are not present, as well as throughout the night.	Donors Breast Milk (DBM) is available for infants below 1.5kgs if mothers are not able to provide expressed breast milk.	Once medically infants are usually fed by making use of Enteral feeding methods, which includes Orogastric - (OGT) or Nasogastric Tubes (NGT).	5-10mls via cup or syringe and the remainder of the feed via enteral feeding tubes. Gradually increasing it 10ml/kg/day until a full feed is tolerated orally.	Doctors and all other healthcare workers monitor infants' overall medical status and appearance.
Speech-Language Therapists sometimes feed the infants in order to assess and monitor the feeding development and the current method of feeding.	If mothers are unable to provide breast milk or decide against breastfeeding, the infants will be given Formula feeds/milk.	Infants above 32-34 weeks and medically stable are fed by Cups or Syringes or ultimately directly from the breast.	Discharge infants from NICU when medically stable, off oxygen and tolerating full oral feeds.	The weight of the infants are monitored daily to ensure they are gaining weight, thus tolerating feeds.

THEME 3: MULTI-DISCIPLINARY TEAM IN THE NICU

3.1 TEAM INVOLVED

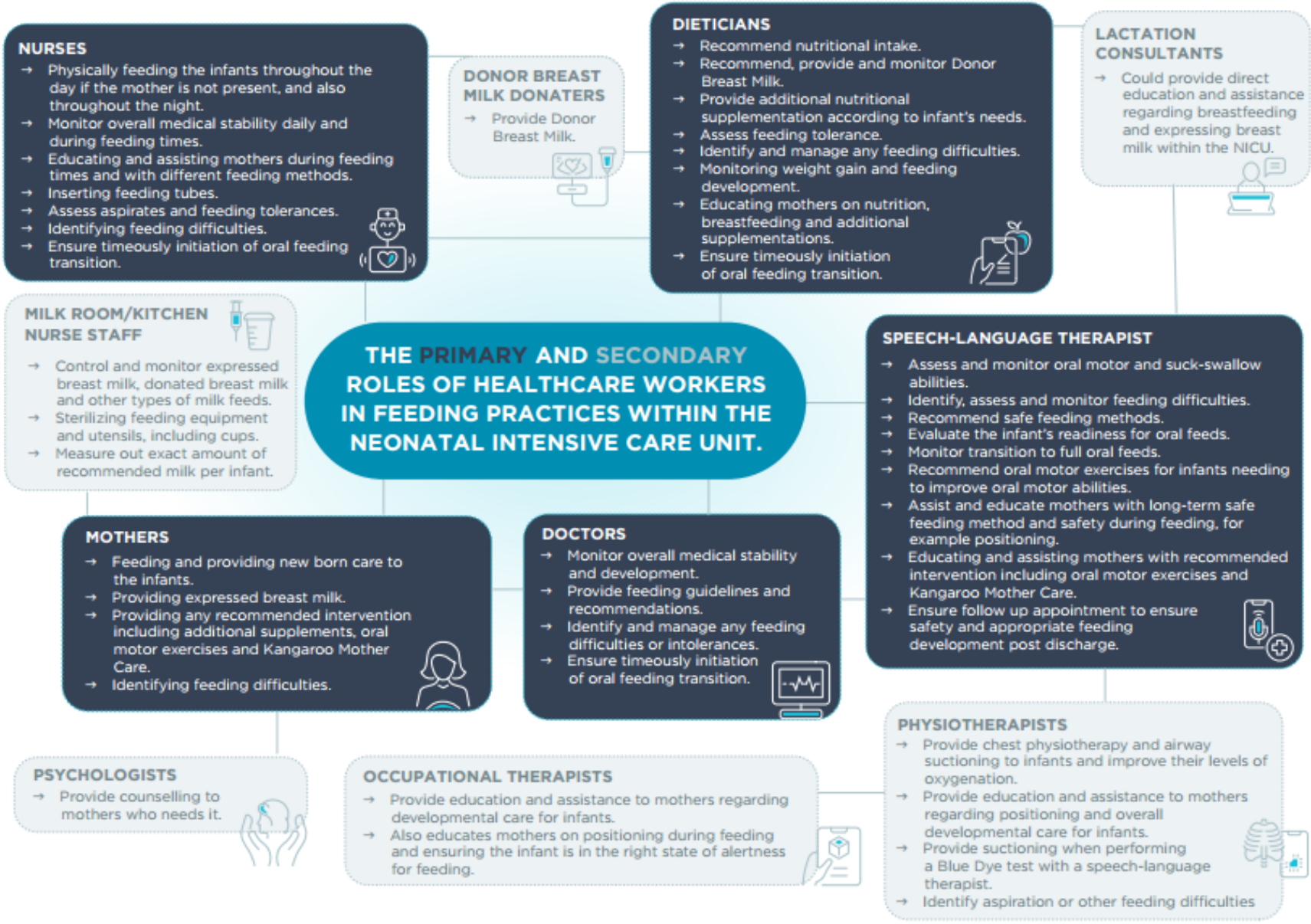
From observations completed at both the research sites and from the interviews conducted with the healthcare workers, it was clear that the NICUs made use of a multi-disciplinary team approach with regard to delivering services and the healthcare workers' feeding practices within the units. Eight out of the 22 (36%) participants explained the importance of making use of a multi-disciplinary team approach.

All of the healthcare workers within the multidisciplinary team share the responsibility to monitor the infants' feeding development, ensure progress, and manage any of the difficulties identified. From observations and the interviews, it was evident that the mother and the entire team of healthcare workers within the NICU either have a primary or secondary role in feeding (illustrated in Figure 3).

FIGURE 3 illustrates the respective roles each of the healthcare workers within the NICU units might have in the feeding development of the infants admitted and indicates whether it is a primary or secondary role.

Note. Figure 3 was designed based on the results found within the data and clearly depicts the healthcare workers/team members who could either have a primary or secondary role in the feeding practices within a NICU unit. The possible dynamics between the healthcare workers is also illustrated. For example, dieticians and nurses who have a primary role and responsibility regarding the donated breast milk. This figure also includes the possible role of the psychologist and lactation consultant (even though they were not observed during data collection) to clarify the role they could have and the responsibilities they would carry within the NICU units. The aim of this figure is to clarify the roles of the respective healthcare workers that form a part of the multidisciplinary team, sharing the responsibilities of the feeding practices and feeding development of infants admitted to the NICU.

FIGURE 3: The Primary and Secondary Roles healthcare workers have in feeding within the Neonatal Intensive Care Units.



The individuals who form a part of the multi-disciplinary team will be explained in depth below as well as the dynamics between the team members with regard to the feeding practices.

3.1.1 Mothers

"The moms are one of the major players", said Participant U (Speech-Language Therapist) and the researcher adds that mothers together with their families, should remain the primary individuals in the infant's team. The healthcare workers contribute by educating, assisting, counselling, supporting and, as mentioned by Participant U, "*try to keep them as much a part of the decisions [as they can]".*

Most of the healthcare workers, especially the doctors and nurses, explained that they support and encourage mothers whose infants are admitted to the NICU to initiate expressing milk immediately after birth, as mentioned previously in Theme 2. As mothers of premature infants' might not yet be able to produce milk, the doctor might also have to assist the mothers with medication to support their bodies to produce milk (as explained by Participant Q in Theme 2). It was observed and mentioned in interviews that nurses, dieticians and SLTs play an important role in educating the mothers regarding feeding within the NICU, and have to provide the guidance required to initiate and maintain breastfeeding and/or expressing breast milk. The following two quotes serve as proof of these findings:

> *"The nurses, for me, will play the biggest role in terms of educating for breast feeding, advocating for breastfeeding and also explaining hand expressing. Even if mom is already hand expressing we* (as Speech-Language Therapists) *will once again cover hand expressing and what to do and how to do it and how to store milk for them just because I think the more information the moms are given, the better. But the main role would probably go to the nurses, in terms of education."* (Participant U – Speech-Language Therapist)

> *We also educate them a bit but it is more the dietician's role to educate them on the expressing and how often they should express and all of those things."* (Participant L – Speech-Language Therapist)

The mothers are encouraged to be present during feeding times to feed their infants and provide new born care, as confirmed in the following quotes, *"they [the mothers] will mainly come for feeding times" (*Participant A – Dietician) and *"the moms are encouraged to be there for most of the feeding times"* Participant U (Speech-Language Therapist). Nurses provide the guidance that mothers need on the different methods of feeding, which includes feeding via feeding tubes, cups or syringes or ultimately breast-feeding before discharge. The mothers who are within the unit during feeding times will feed their infants and the nurses will feed the rest of the infants.

"*Mom's will be allowed to feed*." (Participant G – Physiotherapist)

"Whether they were on breast milk or formula, then they (the mothers) would come and they would be responsible to feed their baby." (Participant A - Dietician)

The above findings confirm that mothers do form a part of the multi-disciplinary team and have a direct relation with the nurses, dieticians and SLTs during admission in order to understand the intervention provided to the infants, their development (which includes feeding development) and their role in caring for their infants (which includes feeding their infants). Other healthcare workers who formed part of the multidisciplinary team in the NICU included doctors, nurses, dieticians, physiotherapists, occupational therapists and SLTs, as discussed below.

3.1.2 Doctors

It was observed that the qualified doctors within the units included interns, medical officers, registrars and consultants. It was observed that each cubicle had 1 or 2 interns (or medical officers) monitoring the infants, requesting and administering medical tests, and assessing the results in order to make recommendations. These observational findings were confirmed by the following two quotes by doctors:

"In this NICU, there is currently nine babies here in this cubicle and there is two of us." (Participant H – Intern doctor)

"So for me, as a medical officer I'll be covering that side with an intern and I think it's around 45 babies that side. (Participant Q – Medical Officer)

Registrars were not often seen within the units. Participant Q mentioned that *"the registrar also does cover you but they sort of covering everywhere so they are not as directly involved."* It was also observed that both the research sites had between 2 and 4 consultants on shift assisting the interns and attending to emergencies. Both sites had a "Consultants Round" every morning where the consulting doctors came to discuss the overall development of all the infants admitted and provided guidance to the interns within the cubicles.

"There's also general consultant ward round that happens every day" (Participant A – Dietician)

"We have consultant ward rounds every day, which is a senior." (Participant H – Intern doctor)

Concerning the feeding development of infants admitted it was found that doctors also play an important role in initiating oral feeds since they are always monitoring the infants' overall development.

"Doctors and nurses are there throughout. Doctors also see the weight and how much the baby is feeding. They can also like see if babies are like medically stable to like start feeds and uhm they are the ones who make like the referrals for the feeding." (Participant J – Speech-Language Therapist)

Doctors could also have a direct professional relationship with the other team members involved, however due to the many infants to attend to their time is limited to converse with other professionals. Therefore, it is up to the other healthcare professionals to discuss any concerns or queries with the doctors as soon as they arise.

3.1.3 Nurses

It was observed at both of the research sites that between 2 and 3 nurses (at different professional levels) attend to the infants in each of the cubicles that ranged between one infant possibly in an isolation cubicle to 15 infants in a cubicle. The nurses do not only have to take care of the infants, they also have to educate and support the mothers. The nurses initially assist the mothers with the safety and infection control measures within the units, teach them to feed with a tube and cup later on during admission, advise them on how to provide new-born care and support the mothers who decide to breast feed and/or provide expressed breast milk.

> *"The nurses know a lot about breastfeeding, expressing and uhm latching, all those kind of things, and I find they often show the first time moms how to do it and how to handle the babies."* (Participant J – Speech-Language Therapist)

When it comes to feeding specifically, the nurses are central in monitoring the infants and writing up the findings, as this assists the doctors and other developmental workers to ensure progress in the infants' development. As the nurses are a constant presence, they play a significant role between the professionals and can contribute to the professional role sharing between the team members. It was evident from the observations and interviews conducted that the nurses were indispensable when it came to feeding the infants within the NICUs.

> *"I feel like the nurses are the main people that play a role on feeding and following those recommendations."* (Participant M–Speech-Language Therapist)

It was observed and highlighted during interviews that nurses also have the responsibility to insert and take care of the feeding tubes:

> *"We make sure the tube is still in-situ, or if the tube is out we put in the new one"* (Participant C – Nurse)

Nurses carry the biggest responsibility when it comes to physically feeding the infants admitted as feed all the infants admitted when the mothers are not present and they do all of the feeds during the night shift. These findings are o confirmed by the following quotes from a nurse and SLTs within the wards:

> *"Our (role) is to feed. We only tell the doctor if the patient is not taking the milk so well"* (Participant C – Nurse),

> *Nurses play a big role because they are doing the feeding when the moms are not there" (*Participant J – Speech-Language Therapist).

Nurses also have to ensure that the feeds' details (including method of feeding and amount of feed given) are written down in the infants' files in order to monitor the infants feeding development and tolerance.

> *"The nurses in that cubicle will observe if they are actually tolerating it (feeds) and struggling."* (Participant E – Consultant Doctor)

Observations at both research sites led to the conclusion that the nurses did basic assessment activities to examine the gut tolerance of enteral feeds and the overall digestion of feeds by assessing the infant's weight daily, as mentioned previously, and by assessing the infant's aspirates. Feeding tolerance is also measured by assessing the gastric residue measured by aspirates before every feed (Yin et al., 2015). It was also observed that the nurses assess the infants' gastric residuals by aspirating the feeding tubes as a part of the monitoring care activities within both NICUs in order to identify any problems regarding the infants feeding tolerance and nutritional intake.

> *"And then before feeding we aspirate, check if the patient is digesting the milk. If, if, if, their aspirate is 1/3 (one third) of the feed then I inform the doctor. He or she will probably say let's check another aspirate. If the patient continues to have a large amount of aspirate then they are not digesting."* (Participant C – Nurse)

"You going to aspirate the tube to see if the baby is tolerating feeds and depending on how much, what colour the aspirate, how much it is, will determine if the baby will eat or (not)….and then I actually do the feeding." (Participant B – Registered Nurse)

"We check the aspirate because the baby must not aspirate the amount that was fed. Which means that baby doesn't tolerate the feeds well." (Participant K – Registered Nurse)

Nurses also mentioned that they assess the infants' output and overall appearance as a part of ensuring the feeding tolerance of the infants in their cubicles

"We'll also have to monitor the abdomen and all that. How the baby retains feed." (Participant R – Nurse)

3.1.4 Nursing assistants / Kitchen nurses

Both research sites had nursing assistants working within the kitchen area of the NICUs. It was observed that they sterilize feeding equipment, store and prepare the expressed breast milk safely, prepare formula feeds and measure the specific amounts of milk prescribed for each infant. These healthcare workers are not usually considered as a part of the team, but from the finding of observations and interviews conducted it was concluded that they do play an important role in the feeding practices within NICUs. Every three hours, when feeding time commences within the NICU, the kitchen nurses came into the unit with a "trolley" to carry the expressed breast milk, donors' milk, prepared formula for the infants admitted and additional sterilized cups for the mothers to express milk during the feeding time.

"There are nurses who prepare the feed for us, so the milk comes already prepared." (Participant C – Nurse)

The mothers may express milk and bring it to the feeding trolley; the kitchen nurses then assist the mothers and other nurses to measure the exact quantity of milk prescribed for each infant. When the mothers are not available to provide milk or feed the infants, the nurses working in the cubicles will collect the milk for all the infants in the cubicles and ensure that each infant is fed at feeding time.

> *"After expressing the milk and then we measure the amount that is needed to the baby. Usually the doctor's order orders the amount for the baby and then I do measure that."* (Participant D – Nursing Assistant Kitchen Nurse)

The additional expressed breast milk left over after the feed is labelled with the infants name, taken to the milk room for storage and used when the mother is not present, for example, during night feeds.

3.1.5 Dieticians

Dieticians are developmental healthcare workers who are present within the unit throughout the entire day at both research sites. Observation and discussion during the interviews revealed that they have a key responsibility in ensuring that all the infants receive the necessary nutrition and that their intake supports their development.

> *"We [are] responsible for the feeds and to make sure the babies get enough energy, enough protein to be able to grow well, especially in the ICU. Basically just help them with their nutrients and supplement their feeds."* (Participant O – Dietician)

> *"For me, it's very important to try get them uhm to grow, if I want them to grow they must get nutrition. I will always check that they are not kept without any nutrition. Sometimes they may be NPO for quite a while so it's important they must get nutrition. It is also important for me is to make sure that the doctors prescribe all the vitamins and minerals."* (Participant N – Dietician)

Other healthcare workers within the units identified the role of the dieticians in feeding and nutrition and confirmed their responsibility to share with the mothers, doctors, nurses and SLTs with regard to the feeding development of the infants admitted.

"They are often working with the dieticians in terms of deciding what the feeds are and the amount of the feeds." (Participant U – Speech-Language Therapist)

"The dieticians come in regularly especially to assist us with babies that have been fluid restricting that maybe need more supplementation and kilo calories." (Participant P – Consultant Doctor)

"We also have dieticians in the ward uhm that help us monitor in terms of calories and TPN." (Participant E – Consultant Doctor)

While observing one of the dieticians' follow-up sessions, the researcher established that the dieticians also observe the infant's overall appearance and abdomen to assess their feeding tolerance and overall stability. During the interviews, it was mentioned that the dieticians monitor the infants' growth by monitoring their weight.

"*Dieticians will look at the weight gain".* Participant G (Physiotherapist)

"They're assessing the growth of the baby. Then they will start prescribing this sachet FM85. Maybe when they see the baby it's a pre-term and it's not ehh gaining weight then they will add that powder on the milk." (Participant K – Registered Nurse)

"Sometimes some of the babies are not picking up weight or uhm, they are either losing weight or they are just like plateaued. Therefore dieticians provide extra things to add to breast milk." (Participant L – Speech-Language Therapist)

As identified in the quotes from the healthcare workers above, the team within the NICU understood the value of the supplements that dieticians provide to ensure that the infants get the nutrition they need. Dieticians elaborate on supplements in the following quotes;

"Usually, when we start supplement with the mom's here we explain everything to them. We tell them 'it's for weight gain, it helps your baby to grow'." (Participant O – Dietician)

"Our role is to try get them to gain, not just to gain weight but also to get them right on the start … providing them with the correct nutritional support so that they can gain weight, and improve their overall health outcomes" "So we usually give them a supplementation that's added to the breast milk." (Participant A – Dietician)

"We have FM85 that we, it's a breast milk fortifier and we add it to breast and donor milk. Okay, let's say the baby is on a formula and they are still not gaining weight and we want to add supplement's there, then it's done in the milk room. So, then we have a protein supplement, a carbohydrate supplement and 2 types of fat supplements that we can add." (Participant N – Dietician)

By observing dieticians within the units throughout the day and considering the explanations provided by the healthcare workers regarding their role in nutritional intake, the researcher noted that dieticians have an important role to play in the infants' feeding and overall development.

3.1.6 Physiotherapist and occupational therapists

The physiotherapists (PT) and occupational therapists (OT) are part of the developmental team within the NICUs. They share similar responsibilities with regard to the developmental intervention provided but, as their services in terms of developmental care overlap with the rest of the team, they decided to split their caseloads at Research Site One. They see the infants on alternate days, except if there is something specific to do, such as provide an infant with a hand splint, which only the OT can do.

"There is a fair amount of overlap between OT and physio's role where, especially in early intervention. I'm talking about just developmental care and early intervention in terms of development and that sort of thing. So, we would alternate days." "They will consult with 'physio' for certain babies, just like here, I will refer certain babies to OT, like for example there is a baby that needed a hand splint." (Participant G – Physiotherapist)

"We do alternate because at that point our scopes do overlap quite a bit. Unless there is, uhm, sensory issues then OT will obviously step in a bit more. Or if there is any hand issues then I would go and make splinting, splint the hands and but if it's clubbed foot, then obviously physio will be more involved with the clubbed foot than what OT. So, it all just depends on the patient but generally it's dual." (Participant T – Occupational Therapist)

Participant S explained the physiotherapist's role and interventions within the NICU in depth:

"So there is the chest side and then the developmental side which is obviously early intervention. And then those babies who have the long-term feeding problems are often the babies that need developmental help on all levels. If babies are struggling with secretions and they are not going to feed well. So yes, I think any obviously chest clearance techniques and if you are optimizing chest clearance. Depends on the condition of the patient … chest conditions we will have to do suctioning and stuff. Teaching self-soothing or facilitating self-soothing, and then swaddling or positioning them in the most appropriate way … if we do happen to have a premature child then we do all our like supportive care stuff, so the positioning, caregiver education of our KMC all of that kind of stuff." (Participant S – Physiotherapist)

The following quote explains the OT's approach within the NICU environments:

"What I first do with the neonates, is uhm we first check what state they are in terms of their uhm awake-sleep state and then if they in the correct state or if we can get them into the correct state for assessment and treatment then we get them there, otherwise we leave them. We'll obviously do caregiver education. Lot of, especially with our neonates, it's a lot of positioning and handling uhm treatment." (Participant T – Occupational Therapist)

From observations and explanations provided during the interviews, the researcher discovered that the physiotherapists' suctioning intervention and developmental care intervention techniques (provided by either the OT or PT) could assist in the feeding development of the infants.

> *"That's why physio and OT are so important. The swaddling, the nesting, the deep pressure, just to calm a baby, depending obviously on what the baby needs at that time. So that stimulation and the exercises are important so that we can get oral motor function where we want it to be.* (Participant M – Speech-Language Therapist)

Interviews conducted with both a PTs and SLTs confirmed that PTs also have a role to play in identifying feeding difficulties:

> *"Physio's also help a lot because some of the babies with aspiration difficulties, sometimes we can't pick it up, uhm, because we have silent aspiration, uhm, and then the physio's listen to the chest a lot."* (Participant L – Speech-Language Therapist)

> *"There would be aspirates while I'm suctioning. I have been often in very close contact with the speech therapist because there are obviously signs of aspiration or something is not being picked-up."* (Participant S – Physiotherapist)

3.1.7 Speech-language therapist

Research Site One had one or two SLTs within the unit during feeding times every day, and Research Site Two had one SLT attending to the infants admitted most days during feeding times. The speech-language therapist (SLT) was a part of the developmental team and assessed, assisted and monitored the feeding of infants admitted to the NICU during feeding times at both research sites.

> *"So we have to be there for the feeding times'"* (Participant J – Speech-Language Therapist)

> *"I know the speech therapist they come in usually at feeding times, so just before nine o'clock, just before twelve o'clock, and then the other allieds* (other healthcare workers) *will also come in depending on their patients."* (Participant A – Dietician)

The SLTs were mainly observed assessing the infants' oral motor and sucking abilities, assessing the feeding methods and monitoring the transition to oral feeds by providing assistance to the mothers. Sometimes they also fed the infants or assisted the mothers when feeding their infants, as this forms part of assessing and monitoring feeding development.

> *"Sometimes the speech therapies, they do feed the babies" (*Participant K – Registered Nurse).

Other healthcare workers within the units also identified the SLT as being part of the multi-disciplinary team and confirmed their contribution to feeding development in the NICU by identifying various ways in which they are involved. While observing a SLT during one of the sessions, the researcher identified that she assessed the infants oral motor functioning and development to identify the infant's readiness for oral feeds. She also gave the mothers who were present at the time some oral motor exercises to perform r to keep strengthening their infant's muscles.

> *"To assess their, uhm, their reflexes. Ja, so it's not necessarily just feeding or so to strengthen their muscles and oral motor development."* (Participant A – Dietician)

> *"The speech therapist comes in to assess, they sit with the baby just for assessment to see if they're swallowing is it ok, is the baby…. Will the baby be able to feed orally."* (Participant R – Nurse)

The researcher observed that the SLTs would assess and recommend the safest feeding method for the infants as is recommended in the literature (SASLHA, 2011).

"We try to get babies off of tube feeding and onto oral feeds. And just getting the best and safest way for the baby to feed for uhm to be able to get discharged uhm Ya and also getting the baby onto breastfeeding. Uhm because we know that is the best way to feed babies." (Participant L – Speech-Language Therapist)

"Mostly we are there to see what uhm, what method maybe or what manner can we make sure our patient is going to get feeds and be safe and not aspirate or uh to struggle in that regard. So that's when we will come in and look at maybe alternative methods to feeding, uhm, stimulation to them to get to a normal feeding." (Participant V – Speech-Language Therapist)

Another dietician also identified the SLTs' ability to guide the transition process in attaining full oral feeds:

"They uhm, direct us a lot, like they will tell us how much oral, how much in the NG.. If the baby has been NPO for a long time, we refer to speech to tell us how to start" (Participant O).

It was also explained during an interview, a participant mentioned that healthcare workers appreciate having an SLT within the ward for the feeding development of the infants admitted.

"*from NG to all the way to breast feeding, like I feel like speech [therapist] needs to be involved* (with feeding practices)*."* (Participant S – Physiotherapist).

The SLTs from both research sites explained that they do not have the capacity to screen the infants in order to identify the infants' who might need assistance or intervention, and they therefore rely on the doctors, nurses and other developmental workers to refer infants to the SLT department when sucking, swallowing, breastfeeding and other feeding difficulties become apparent. Participant A mentioned that as healthcare workers receive training on the weaning protocol (explained in theme 2), they understand that they have to refer infants with feeding difficulties to the SLT department.

"We get referrals either from members of the team, so from physio, OT or from the doctor's. Doctors need to start then with the weaning protocol, and only once they face challenges can they refer to us." (Participant M – Speech-Language Therapist)

The healthcare workers also acknowledged their personal role in monitoring feeding difficulties and referring infants to the Speech Department.

"If we pick up any problems then that's when we'll refer to the speech therapist. (Participant A – Dietician)

"If we see, the baby is not tolerating at that point, then that's when we call in a speech therapist. If they are struggling with the cup feeding then we will call in the therapist to come and assist. (Participant P – Consultant Doctor)

"If the baby is struggling to feed then like speech therapy gets involved. (Participant Q – Medical Officer)

When healthcare workers identified other feeding difficulties the SLT would follow up on the referral made by performing an assessment on the infant to identify the infant's current level of development as well as his/her needs.

It was observed that the SLTs share the role of educating mothers on overall new-born care such as the feeding methods implemented, enlightening the mothers on monitoring feeding tolerance as well as other interventions to assist in feeding success.

"We also train the moms in developmental care talks in terms of all the weaning protocol, the exercises and all things that you could be doing with your baby and when is your baby ready to start feeding. We would do a lot of education about how to hold you baby, how to pick your baby up, how to swaddle your baby uhm, how to nicely wake your baby up, educate about the NICU and like, also like Prematurity." (Participant J – Speech-Language Therapist)

"*They* (SLTs) *help the mothers, uhm, when the babies do breastfeed, you have to make sure that they latching well and that they are feeding well*." (Participant N – Dietician)

The researcher observed intervention techniques such as oral motor exercises used to better the infants oral motor abilities, their oral motor coordination and stimulating the suck-swallow-breathe reflex amongst other reflexes that form part of the education provided by SLTs. One SLT within Research Site One educated a mother on swaddling.

"We do give oral motor exercises." (Participant M – Speech-Language Therapist)

"We do the oral motor exercises- a lot, uhm, and then we do a lot of positioning and external positioning, a lot of pacing (during feeding)*."* (Participant L – Speech-Language Therapist)

The SLTs also helped to initiate and assist the mothers to do KMC. However, as both research sites did not have the space needed to comfortably do KMC with the infants in the NICUs, only three mothers were seen doing KMC at both research sites. Nevertheless, both sites have a separate unit operating as a KMC unit that serves as a step-down unit. Infants who need to gain weight could be discharged to the KMC unit (with their mothers) when they are off oxygen.

"There is a dedicated KMC unit uh at ward 40." (Participant F – Doctor)

"If they are off oxygen they can go to the Kangaroo mother care unit if they are less than 1.65. Generally they like to take babies who are more than 1 kilo and obviously they must be sucking and feeding well and growing adequately." (Participant P – Consultant Doctor)

"I think the doctor's criteria is medical stability and a certain weight and to ensure that they are feeding nicely. But the majority still get sent to 66 (a step down ward) *and then 40 for KMC."* (Participant M – Speech-Language Therapist)

3.1.8 Psychologists and social workers

No psychologists or social workers were observed within either of the research sites. This could be because their services are only needed on referral or due to COVID-19 placing a limitation on services at the time of data collection. One of the participants did however explain that the mothers could be referred to a psychologist or social worker when necessary.

> *"There is an option to always refer mom to psychology but there is not much communication with us and psychology. For us to make referrals we kind of just say, social work please to come follow up and then the doctor's make that referral."* (Participant J – Speech-Language Therapist)

3.1.9 Lactation consultants

Not one of the research sites had a lactation consultant rendering services or mentioned to have nurses qualified in lactation services specifically,. A participant from Research Site One explained that certain nurses used to provide lactation services within the unit a few years prior to this research study. Therefore the absence of a lactation consultant within the wards seemed to be prevalent but definitely not due to the influence of COVID-19 pandemic. The following quote confirms that their services were terminated some time ago;

> *"[This hospital] used to have lactation nurses but I haven't seen them in a while. I think about two years back was the last time I saw a lactation nurse."* (Participant M – Speech-Language Therapist)

It was found that all the qualified healthcare workers within the NICU share the role of monitoring the infants' medical status and overall development on a daily basis, as well as educating the mothers on the infant's status, needs, development and the intended intervention plan for the infant.

3.2 CHALLENGES WITHIN THE MULTIDISCIPLINARY TEAM

3.2.1 Nursing shortages

As mentioned earlier, both the NICU units included in this study reached maximum capacity. As the number of infants admitted increases, the caseloads of all the healthcare workers will be affected, however, an additional burden will be placed on the nurses because of the existing shortage of nursing staff to care for the infants admitted on an average daily basis. All of the nurses interviewed complained about the staff storage and that on some days they have up to 20 infants to monitor and ultimately feed as well.

> *"Most of the time in a cubicle, you find that there is only one sister and a nurse, sometimes you'll find that it's a very new nurse in the ward that you have to work with. And then you've got about 10 babies."* (Participant R – Nurse)

> *"The nurses would be very frustrated because they, they, it is three nurses to feed all 20 babies all within half an hour, 45 mins and it's just a lot."* (Participant U – Speech-Language Therapist)

> *"I have seen it like first-hand where they have two nurses to a cubicle and there is like 20 babies and they all have to be fed."* (Participant S – Physiotherapist)

The following quotes from interviews confirm that other healthcare workers within the units also identified the shortage of nursing staff within the environments:

> *"I think from a nursing point of view, we definitely have too few. There's often days where we don't have enough sisters for the number of patients that we have and they have to stretch themselves. Nursing has always been an issue where we're short-staffed for nurses."* (Participant P – Consultant Doctor)

> *"The nurses do always complain that they are understaffed. Normally in ICU it should be one nurse per baby but I don't think our ICU is one nurse per baby so I definitely think there is a certain extent of understaff."* (Participant O – Dietician)

It was also found that due to the nurses' caseload, they could not always provide the care requested from other healthcare workers due to not having sufficient time to do so.

> *"Sometimes we struggle with, uhm, the nurses in terms of asking them to do certain things"* (Participant A – Dietician)

> *"Our nursing ratio to patient ratio is down… so because of that… it makes it difficult to actually practice proper care for individual patients so you don't have enough time to spend on the patients."* (Participant E – Consultant Doctor)

Another healthcare worker elaborated on the consequences of nurses having an overload of patients and an abundance of care duties to perform routinely:

> *"Nurses are under a lot of pressure because they need to bathe the babies, make sure they get their medication, monitor them… There is a lot going on, so I think they know feeding is important, they get training on how to feed and they get training on how to look out for signs that baby is not actually feeding nicely. Uhm, but the pressure! I think that's what causes for them to just throw the milk in the baby's mouth as long as the SATS is still fine and there aren't any major aspiration indications - they can just continue with just that."* (Participant M – Speech-Language Therapist)

It is understandable that when the nurses have an overload of infants to attend to, they cannot provide the optimal care that is needed by the infants who are admitted. Therefore, it is important for hospitals in the public healthcare system to ensure that the units are not only big enough for all of the infants needing care but that there is enough staff to provide this care. Owing to the vulnerable population admitted into the NICU, it can be life threatening if any medical or developmental difficulties are left unattended, but even worse, when the infants are actually at risk due to the care provided. Participant M mentioned that the nurses "*just throw the milk in the baby's mouth as long as the SATS is still fine".*

This research study identifies and confirms by quotations and quantitative data (seen in Table 8) that the NICU environments need more staffing resources, specifically nursing staff. From observations, the two tables below indicate the number of infants admitted every day within the two research sites compared to the number of nurses on duty.

Table 8:

The number of infants admitted compared to the number of nurses at both research sites.

DAILY NUMBER OF ADMISSIONS COMPARED TO NURSES ON DUTY			DAILY NUMBER OF ADMISSIONS COMPARED TO NURSES ON DUTY	
RESEARCH SITE ONE			**RESEARCH SITE TWO**	
DAY OF OBSERVATION	TOTAL ADMISSIONS	TOTAL NURSES	TOTAL ADMISSIONS	TOTAL NURSES
1	71	29	55	25
2	73	30	59	26
3	74	31	52	27
4	72	30	52	27
5	67	31	56	29
6	67	27	55	25
7	66	30		
8	67	29		
9	57	26		
10	52	24		
11	58	22		
12	57	23		

Note. Table 8 indicate that on average, there could be two infants for each nurse to take care of; but all the nurses on duty are not necessarily allocated to work in the cubicles, as they must perform other duties within the NICUs. It was observed that some of the nursing staff provided educational training sessions for upcoming nurses daily (as both of the research sites are academic hospitals) and other nurses are on kitchen duty to control the milk/feeds. This leaves the nurses allocated to cubicles with as many as 20 babies to attend to, as mentioned in quotes previously. This situation could lead to frustrated, tired nurses with a possible negative influence on their service delivery.

Table 8 above revealed that the same average number of nurses were on duty per day at both research sites despite the varying numbers of infants admitted that required additional nursing staff. The number of developmental healthcare workers also remained the same even though there were more infants to attend to within the unit. For example, Research Site One had two SLTs providing services within the unit whereas Research Site Two only had one SLT to carry the entire load of infants needing intervention. This could lead to staff shortages within the developmental healthcare worker departments as well. An added explanation is provided below:

3.2.2 Developmental healthcare worker team shortages

As all the healthcare workers within the NICU settings confirmed that they do not have enough staff within their departments to care for the number of infants admitted, the developmental healthcare workers suggested that the infants would benefit more from their services if they could have a developmental worker from each of the departments dedicated to the NICUs. The healthcare workers in both units supported this during the interviews.

> *"We often have staff shortages"* (Participant A – Dietician)

> *"I wouldn't say any department has enough capacity with the amount of babies. Our department, we've been struggling for a year."* (Participant U – Speech-Language Therapist)

> *"So if we had a full time physio only doing the NICU, then I think we would be able to do that a lot more. If they had a person [Speech-Language Therapist]*

full-time they could be going around and assessing every baby." (Participant G – Physiotherapist)

This also applies to the Speech Therapy Department and the contribution their services could have on the infants' feeding development during hospitalisation and post-discharge if they had a SLT dedicated to providing services in the NICU environment only.

THEME 4: COVID-19 PANDEMIC IN THE NICU

To the researchers understanding, there is limited data available explaining the burden of COVID-19 on South Africa's NICUs, specifically on the neonates admitted. Since it is a novel infection, this might be why no mothers and/or infants impacted by COVID-19 were directly observed within the NICUs at the two specific hospitals. However, the strict hygiene protective precautions taken by the healthcare workers and the implications and consequences might have minimised the impact of COVID-19 on admissions, breastfeeding and expressed breast milk during COVID-19. For instance, the mothers' visitation periods and family presence was decreased and the developmental staff provided limited services. Nevertheless, the influence on the education and training of staff members and mothers and the overall burden COVID-19 had on the staff within the NICU, was evident. These sub-themes were identified when discussing COVID-19 during the semi-structured interviews with the healthcare workers within the two settings, and will be discussed further below.

4.1 HYGIENE PROTOCOLS AND PROTECTIVE MEASURES

NICUs have always had strict hygiene protocols due to the vulnerable infants admitted (Naylor et al., 2020). These protocols have always included the importance of proper hand washing upon entering and before and after touching any infant or surface. It also includes the wearing of aprons and/or medical gloves when in contact with an infant, as well as hand sanitising after touching any infant or surface. Only the wearing of masks is a new regulation within the units, as it is worldwide (Green et al., 2021; Lugli et al., 2020). Other safety measures explained by the research done on decreasing the transmission of the virus included never touching the face, covering a cough or sneeze and ensuring a minimum of two metres social distancing (Department of Health, 2020; Tomori et al., 2020). The Department of Health recommended a minimum space of 2 to 3 metres between each bed within the intensive care units. However, this cannot be implemented when units exceed maximum capacity of infants admitted, which was the case at both of the research sites (as seen in Figure 1 and 2).

As mentioned previously, both hospitals sites made an effort to educate their staff and visitors by putting up information notices on walls regarding COVID-19. These posters included the symptoms to be aware of ways to prevent the spread of the disease and the WHO posters encouraged mothers to breastfeed even when tested positive for COVID-19 which is in line with the general feeding recommendations prior to COVID as well.

4.2 COVID-19'S POSSIBLE INFLUENCE ON BREASTFEEDING IN THE NICU

The majority of research suggest that all mothers, including COVID-19 positive mothers, should be encouraged to initiate breastfeeding within an hour after birth, even more so when an infant is born prematurely or with growth difficulties (Calil et al., 2020). COVID-19 positive mothers, whose infants were admitted during the data collection timeframe, had to express their breast milk so that milk could be given to their infants by alternative methods

> *"The mothers will come in to bring in expressed milk. A COVID positive mom we still allow breast milk to be dropped."* (Participant P – Consultant Doctor)

> *"Moms were so involved in every part of our therapy and coming from having moms one day to having practically no moms - only moms that could express and then leave their milk, or moms that eventually when they were lodging were allowed to be here."* (Participant J – Speech-Language Therapist)

Doctors within the research sites also confirmed the assistance they provided when they discussed how they fetched the milk from the mother's homes:

> *"They* (the mothers) *were expressing and maybe giving the breast milk to send it to the hospital. A lot of the moms didn't have transport to deliver the breast milk so a lot of babies started very early on formula feeds where they could have, uhm, had breast milk."* (Participant L – Speech-Language Therapist)

> *"We had doctors driving from their houses to fetch milk during COVID."* (Participant E – Consultant Doctor)

Research within South Africa confirms that mothers whose infants are admitted to the public healthcare facilities do not always have the means to travel to the NICUs. However, during COVID-19, it might have been even more difficult for mothers to have access to the NICUs in order to be there for their infants, breast-feed their infants or deliver the expressed breast milk.

4.3 PARENTAL INVOLVEMENT WITHIN THE NICU DURING COVID-19

Worldwide, parental presence within NICUs and hospitals in general decreased due to the COVID-19 pandemic guidelines, lockdown measures and newly adapted hospital specific protocols (McKechnie et al., 2020). Before the COVID-19 pandemic all mothers, usually the fathers and occasionally the grandparents were also allowed into the NICU and could assist in the postpartum care of their infants within both the research sites.

> *"So, before we used to be quite lenient with letting fathers in, uhm, or even if the mom didn't have the support of a partner- to allow a granny or someone to come in to support the mom."* (Participant P – Consultant Doctor)

> *"Previously, we would allow the moms to come in almost whenever they wanted, now it is really restricted to certain times. Previously we would allow the dads in, uhm, to come and visit at mealtimes and now they are not allowed at all. We used to have a specific hour for grandparents coming in to meet their children, and that is not allowed at all."* (Participant U – Speech Language Therapist)

When an infant is admitted into the NICU environment, it already places a great deal of anxiety and stress upon the mother and family of the infant, and now more so that the mothers who have to deal with this pandemic and sometimes be at the hospitals without the support of any other family member. Owing to COVID-19, only the mothers who decided to breastfeed their infants were allowed to come into Research Site One, whereas Research Site Two allowed all mothers to come in during feeding times to visit, care for and assist in feeding their infants. However, no other family members, including fathers and grandparents, were allowed to visit, assist or even be seen in the NICUs. This places mothers at a greater risk for anxiety and stress during admission and mental difficulties during and after admission (Anderson & Lee-davey, 2020; Green et al., 2021). Participant T shared the following during an interview when she was asked how COVID-19 influenced the NICU unit:

> *"The moms not having the support, I would say. Uhm, because they obviously have to come in but then the dads and it, they are not allowed in the hospital grounds at all."* (Participant T – Occupational Therapist)

During the initial Level 5 lockdown within South Africa, mothers were not allowed to come into the NICU facilities or assist in taking care of their infants at all (as mentioned by Participant I below). This posed an even greater challenge to the nursing staff to monitor all infants on a daily basis, which included observing their medical statuses, physically feeding every infant admitted whether on oral or non-oral feeding, changing nappies, monitoring their discharge, keeping the infants clean as well as cleaning all the areas within their workspace. One developmental healthcare worker mentioned in her one-on-one interview that she and her colleagues assisted the nurses to care for the new-born infants so that the nurses could have time to focus on the medical services they needed to provide to the infants. All of the above findings are supported by the quotes below:

> *"There was a time where we didn't allow moms in because of COVID."* (Participant O – Dietician)

> *"When it was hard lockdown we used to bath the babies, just so the nurses could do medication and that kind of stuff, coz the moms usually come in for that."* (Participant I – Occupational therapist)

In summary, not allowing the mothers to be present not only impacted the mother's involvement with her infant, but the healthcare workers workload and overall care provided to the infants was also affected.

4.4 EFFECT OF COVID-19 ON THE HEALTHCARE WORKERS

Research indicates that babies born to mothers who are affected with this virus are placed at risk for premature birth and intrauterine growth retardation (IUGR) (Boscia, 2020; Dashraath et al., 2020; Gale et al., 2020; Pramana et al., 2020; Tran et al., 2020). When an infant is born with complications like prematurity or IUGR, or born to a COVID positive mother who is critically ill, the infant will be admitted into the NICU (Gale et al., 2020; Pramana et al., 2020). When public hospitals, including the two research sites, are already reaching or exceeding their maximum capacity it places additional pressure on the healthcare workers caseload (Tomori et al., 2020).

Furthermore numerous developmental healthcare workers' departments worldwide reduced their staff capacity and in some instances limited or completely terminated their services to

decrease the risk of transmission (Mahoney et al., 2020; McKechnie et al., 2020). As mentioned previously, the physiotherapist took over the OTs entire caseload at Research Site One, unless the OTs had to work on a specific case, for example, splinting an infant's hand. This was confirmed during the interview with Participant G, a physiotherapist from Research Site One:

> *"We used to prior to COVID, alternate days. When COVID hit, we could no longer send too many different people coming in and out of units. So initially we withdrew some services, but then when we needed to implement again and we realized that you know just handing pamphlets to parents is not really going to help – since then NICU and TICU is done by physio … I will refer certain babies to OT like for example if there is a baby that needs a hand splint."* (Participant G – Physiotherapist)

Healthcare workers are also at risk of acquiring the infection when working in an overcrowded ward where mothers are now allowed to visit their infants again, as well as being in contact with other staff working in their shifts (McKechnie et al., 2020). When a nurse (or any other healthcare worker) was tested positive, the entire nursing shift (or developmental department) needed to undergo a quarantine period at home, which influenced service delivery greatly, as described below:

> *"For us specifically as a department we had a positive COVID case with one of our audiologists and so our whole department was shut down for three days. Which means there was no one, because of such a small department, to see any of our babies in the NICU."* (Participant U – Speech Language Therapist)

In this case, the NICU had even less staff, the units' nurses had to do additional shifts and they had to make use of "new" nurses who were not necessarily trained sufficiently for such a specialised area of nursing. This left the staff tired, overworked and negative, ultimately influencing the overall service delivery and attitude at work.

> *"In the first wave we had a lot of* (COVID-19) *positive nurses so that affected the feeding of the babies and stuff a lot."* (Participant O – Dietician)

"The staff are burnt out and exhausted. And when you are exhausted and burnt out your productivity and functional levels are not as good as, you know, you would." (Participant P – Consultant Doctor)

"So we were only three on duty on that day and there were with only two, uhm, what can I say, sessional. Imagine the cubicle only one nurse, only one assistant in the cubicle." "I was extremely exhausted; my energy level was very low." (Participant R – Nurse)

The following statement also confirms the impact on the nurses due to the workload during COVID-19:

"I think the nurses became a lot more stressed and stretched. I think their whole routines were thrown out the window." (Participant J – Speech Language Therapist)

From the above information, it is evident that COVID-19 did have a great impact on the healthcare workers within the NICUs which could have influenced their overall service delivery as well as the involvement and care provided to the feeding development of the infants admitted, as this was noted during observations for data collection during the timeframe of this study as well.

4.5 EDUCATION AND TRANSFER OF INFORMATION IN THE NICU

The training and information sessions that are crucial for all healthcare workers and mothers in the NICU used to be done by the developmental healthcare workers. However, these sessions, including the training of the nursing staff, have been disrupted since it is recommended to avoid having a group of people together, as it increases the spread of the COVID-19 virus.

"We also do nurses training. Uhm, it had to stop during COVID." (Participant J – Speech-Language Therapist)

"Obviously we have a role in nurses education and obviously with parent education - so parent education came to a halt with COVID and even now we need to be careful of groups." (Participant G – Physiotherapist)

ne participant explained that they also facilitated developmental care talks with the mothers while they waited for feeding times. However, the education of mothers and family members regarding the infant's individualized intervention plan, as well as the "carry-over" post discharge was greatly influenced since only some mothers were able to enter the NICU to visit their infants during COVID-19 (McKechnie et al., 2020).

> *"I think we have missed having the mothers because if you have a more sort of a long-term baby, we would rely on the mom to carry over what we have been doing. It not only affects the treatment here, but the fact that I don't have a mom to give input to means that when she goes home, or when this baby goes home, so she will then just come and get her baby in order to go home. And so she hasn't had those two/three bits of input. Part of early intervention is actually connecting with the moms. So when COVID hit and the moms were no longer coming in, I would say yes our practice changed a lot."* (Participant G – Physiotherapist)

The NICU unit is such an intricate environment, with infants needing constant monitoring, healthcare workers feeling burdened with the limited staff resources as well as mothers needing on-going support and guidance. This was made even more challenging due to the COVID-19 pandemic and the full effect will only be noticeable in the future.

CHAPTER FIVE

DISCUSSION

Chapter five provides a discussion entailing all of the results found in chapter four in relation to existing literature within this field of research. The researcher will also provide possible reasons for the similarities and differences found between the recommendations discovered in literature and the results realized within this study.

Tertiary public hospitals' NICU in South Africa

In South Africa, majority of the population makes use of the public healthcare sector, including the NICU facilities. This was apparent and contributing to the distress when the NICU environments both reached (and exceeded) the maximum capacity with regard to capabilities per hospital site respectively. This contributes to the concern already established that the public healthcare sector within South Africa already have limited resources, which could further influence the services delivered to the infants admitted (Da Costa et al., 2019; Lloyd & Witt, 2018).This research study also confirms that the population within the NICU mainly comprises of infants born prematurely and/or with LBW and other diagnoses that affect the infants feeding initially and development in all areas, as seen in Table 5 (D'Agata *et al.*, 2016; Kritzinger & Mosca, 2017; Rossetti, 2001). The high frequency of prematurity might be due to South Africa's history of lower socio-economic status or to infants currently born to a COVID-19 positive mother which research proves are at risk of prematurity (Demitto et al., 2017; Tran et al., 2020). The number of infants born with LBW might present as a comorbidity of prematurity, or possibly be due to other risk factors which also include the socio-economic characteristics and educational status of their mothers (Altenhöner et al., 2015; Demitto et al., 2017; Nayeri et al., 2013).

The diagnoses and co-morbidities of the infants admitted within the timeframe of data collection, confirms the need of vital medical assistance after birth and/or lifelong interventions to ensure that the infants ultimately have an optimal day-to-day life post-discharge (Da Costa et al., 2019; Demitto et al., 2017). The interventions might initially include high doses of medication or a need for oxygen that in turn could influence their state of alertness during admission, their recovery and ultimately their development within the NICU and in future (Greene et al., 2016).

The longer the hospitalisation period of the infants, the more the limited resources and bed availability will be influenced, contributing to the challenges faced due to the overpopulated NICU settings (Da Costa et al., 2019; Lloyd & de Witt, 2018). The infants' length of stay and risks of acquiring additional infections or difficulties during their admission depends on their needs, the treatment and care provided, and their overall development, which usually includes the long-term goal of establishing safe oral feeding practices as a prerequisite before discharge (Da Costa et al., 2019; Demitto et al., 2017; Mahwasane et al., 2020; Nayeri et al., 2013; Orsido et al., 2019; Pike et al., 2016; Rossetti, 2001). It is therefore important for all healthcare workers with a role in the feeding development of infants admitted to be aware of the infants' feeding needs and identify any feeding difficulties as early as possible. Early identification of feeding difficulties can initiate management and reduce the impact of the feeding difficulties, in order to prevent for example, growth and weight complications during admission, and in the long run contribute to the infants being discharge sooner and with better feeding abilities.

Feeding practices within the NICU environments

It is important to take into consideration the type of feeds provided to the infants admitted as all of the national and global feeding policies include the importance of breastfeeding infants exclusively for the first six months of life (The World Health Organization, 2002, 2007; UNICEF/WHO, 2006; UNICEF, 2018). Majority of the healthcare workers explained their knowledge of the importance of breast milk and their support in assisting the mothers to breast feed their infants, however it was found that a number of infants were still being fed with formula, or being mixed-fed as seen in Table 6. This goes against the recommendations made by literature and global feeding guidelines aiming to provide infants with formula only when no breast milk is available either from a mother or a donor, for example, when a mother cannot provide breast milk to her infant and DBM is unavailable within the hospital setting (Pillay et al., 2018; Department of Health, 2013; UNICEF/WHO, 2006; Van der Merwe et al., 2015; WHO, 2011). This is even more concerning because the population within the NICU mainly comprises infants born prematurely, born with LBW and born to families from a lower socio-economic status. Research explicitly explains the importance of providing infants born prematurely or with low birth weight with a mother or donors breast milk due to the benefits mothers milk has to offer and the additional risk of providing them with formula which includes amongst other risks NEC and other digestion difficulties and ultimately longer hospitalization (Dutta et al., 2015;

World Health Organization, 2011). Furthermore, due to the high likeliness of these infants being born to a family from a lower socio-economic status, chances are that they do not meet the "Acceptable, Feasible, Affordable, Sustainable and Safe" (AFASS) criteria explained by the WHO essential to meet in order to safely provide formula feeds to their infants (UNICEF/WHO, 2016).

As mentioned above, research recommends providing infants with DBM before considering formula, but as seen in Table 6, only a few infants are provided with this option (Dutta et al., 2015; The World Health Organization, 2011). The inability to provide the infants with DBM might be due to the known scarcity of DBM within South Africa and no reason was made known during data collection that COVID-19 and the restrictions had an impact on the distribution of DBM within the public sector. Healthcare workers, and especially the dieticians since this forms a part of their role (as seen in Figure 3), should look into advocating for DBM instead of resolving to formula. It could also help to educate all healthcare workers on the DBM protocol again, ensuring that they understand the importance of DBM as well as the process of getting DBM, and possibly assist in identifying mothers within the units who could be donors. If this were to be done within all the NICUs within South Africa, the use of DBM might become more frequent, ensuring that formula is then used only when really needed as recommended in research.

Furthermore, Table 6 and observational findings from Research Site Two proves that there are still a number of infants either receiving formula or mixed feeds during their admission. This is of great concern, as research clearly depicts the risk of providing formula, which includes digestion and feeding difficulties, longer hospitalization, acquiring NEC, pneumonia and possibly diarrhoea which all leads to an increased risk of neonatal death (Assad et al., 2016; Department of Health, 2013; World Health Organization, 2019). One study confirmed that infants have longer hospitalization periods when fed formula or mixed feeds, with an increased risk of feeding intolerances (Assad et al., 2016). Other studies explain the risk of providing infants with formula instead of breast milk, which includes feeding and digestion difficulties, increased risk of NEC due to immature digestive systems, possibility of diarrhoea and pneumonia later on in life and an increased risk of neonatal mortality (Department of Health, 2013; World Health Organization, 2019; Yin et al., 2015). The provision of formula might be due to the mother's lack of education, not having been assisted optimally to provide breast milk, or due to the decreased presence of mothers in

the NICU because of financial constrains or COVID regulations. As the healthcare workers mentioned that they tried to contact the mothers to further educate and assist them in coming to the units to provide breast milk, the cause is more likely due to COVID-19 restrictions, the lockdown and the fear of contamination of the COVID-19 virus by the mothers coming into the NICUs.

Nevertheless, the type of feeds provided to the infants admitted is an area of concern from the results found within this study and is something that the NICU settings will have to address and monitor in future to ensure optimal feeding practices during the infants' admission with regard to the feeds provided. This can be done by included daily administrative documents not only identifying the methods of feeding as found within the units, but also the type of feeds they received in order to monitor the provision of breast milk to the infants as this should remain a priority within the NICU settings.

The transition process to oral feeds within tertiary level hospital's NICU settings

All the healthcare workers explained that regardless the type of feed, the infants initially receive enteral feeds before initiating oral feeds with either a cup or syringe as recommended by research and feeding guidelines (Da Costa et al., 2019; Lubbe, 2018; Pineda, 2011; Department of Health, 2014; UNICEF/WHO, 2006; WHO, 2011). There is an understanding amongst the healthcare workers as to why these infants do not feed orally from admission and the reasons for making use of alternative feeding methods. However, from results found within this study, majority of the infants still have tubes in-situ and possibly still in the transitional process in attaining full oral feeds and it was also found that infants initiate oral feeds at a different time but furthermore that there is limited to no specific control with regard to the monitoring the periods of gavage feeds and the initiation of oral feeds amongst the healthcare workers, including the nurses. Prolonged gavage feeding can influence and complicate the transition to oral feeds and therefore healthcare workers need to ensure the appropriate commencement of oral feeds when each of the respective infants shows readiness (Greene et al., 2016; Pike et al., 2016; Yin et al., 2015; Younesian et al., 2015)

The healthcare workers understood that it was necessary for the infants to show readiness in order to initiate feeds given orally. They explained during interviews that an infant's readiness for oral feeds depends on his/her medical stability, improved and

maintained oxygen levels, optimal oral-motor functioning that includes sucking and the suck-swallow-breathe pattern, and lastly, feeding tolerance without any identified risks (Bertoncelli et al., 2012; Lau, 2014; Nye, 2008; Yin et al., 2015; Younesian et al., 2015). Several healthcare workers also immediately elaborated that they preferred putting the infant on the mother's breast as soon as the infant shows readiness for oral feeds; as recommended by research. However, it was observed that only a few of the mothers were feeding their infants directly from their breast. This may have been due to infants still receiving feeds via enteral feeding methods and being in the transition to oral feeds, as mentioned in Theme 2, or due to COVID restricting the presence of mothers within the units at the time of data collection. The results may or may not have been different if the data was collected before the global pandemic, but due to these findings, the possible influence of COVID can be understood with regard to the feeding methods involving infants being put on the mother's breast when ready for oral feeds.

Owing to the inability to initiate breastfeeding when infants show readiness, the NICU settings mostly made use of cups to feed the infants orally. Cup feeding is a simple feeding method recommended by the Baby Friendly Initiative, because feeds can be measured, it requires less energy than feeding with a bottle and can assist in reducing the spread of infections because, as mentioned by the nursing kitchen staff, cups can be washed and sterilized appropriately (Da Costa et al., 2019; Lubbe, 2018; UNICEF/WHO, 2006). It was found that Research Site One made more use of syringes for a period of time during observational data collection, which is also recommended by the Baby Friendly Initiative alongside feeding with a cup, but this was simply due to a limited supply of cups at the time, which again confirms the limit resources available within public healthcare setting within South Africa (Lubbe, 2018; UNICEF/WHO, 2006).

The interviews revealed an understanding among the participants that bottle feeding should remain the last feeding method to be implemented, which is in accordance to research recommendations and this was also confirmed as only one infants was found to be fed by making use of a bottle during observations and for appropriate reasons (Lubbe, 2018; UNICEF/WHO, 2006). Research addresses the concern of using bottles as a feeding method as it uses more energy and can lead to nipple confusion, but healthcare workers within this study simply explained the risk of infections when using bottles as their reason for not considering it as a feeding method (Lubbe, 2018; UNICEF/WHO, 2006).

Problematic aspect identified with regard to the transition to full oral feeds

Doctors within the research sites all mentioned that they understood that the initial amount of an oral feed would be different for each infant and their specific needs, and they all agreed upon the gradual increase of an average of 10 to 20ml/kg per day as long as the infant shows tolerance of the feeds and no complications become apparent. It was understood that the transition to full oral feeds will be different for each of the infants admitted, which would require in-depth monitoring and guidance from all of the healthcare workers who have a primary role and secondary role in the feeding development of infants admitted (as displayed in Figure 1) (Greene et al., 2016; Mahmoodi et al., 2019). Once oral feeds are initiated (either by means of cup, syringe or breastfeeding) healthcare workers need to ensure that a gradual transition is made to full oral feeds to ensure that no feeding difficulties or intolerances are left unidentified (The Department of Health, 2014). However, it was found within this study that some healthcare workers disregarded the importance of establishing safe oral feeding gradually under the supervision of the relevant healthcare workers who play a role in feeding transition, as quite a few participants mentioned that nurses leave the feeding tubes in for too long or remove them prematurely.

Furthermore, supporting the above statement made by some of the healthcare workers the participants also mentioned that doctors would want to discharge the infants whilst still being fed by a tube and before they have completed a steady transition to oral feeds, which could indicate that the infants were left being fed with a tube even though they may have been ready for oral feeds. The infants would then have to initiate oral feeds immediately and be discharged as soon as they are on a full feed which would be rushed without the supervision and guidance of a SLT who plays an important role in the monitoring of the transition to oral feeds. This might also be due to SLTs not being able to attend to all of the infants admitted and doctors needing beds available for other infants to be admitted but this contributes to the individuals not having the gradual transition in establishing oral feeds, which could lead to feeding difficulties being left unidentified and infants ultimately being discharged with some form of feeding difficulty as confirmed in previous studies in South Africa (Da Costa et al., 2019). Healthcare workers, such as nurses, doctors, dieticians, SLTs and also importantly the mothers, who have a primary role in feeding development within the units, need to be educated on the signs of oral readiness before initiating the oral feeds, and the importance of the gradual transition to full oral feeds (Lubbe, 2018; Nye, 2008).

A family centred approach and the mothers needs within the NICU

With NICUs reaching maximum capacity within a limited space, there is no room for the mothers to remain with their infants, breastfeed on demand and provide KMC, as recommended by new-born health policies (Rhoda et al., 2018). Furthermore, research addresses the concern that the NICU environment, with the separation, stress and pain experienced, may be a contributing factor for infants developing lifelong difficulties post-discharge (D'Agata et al., 2016; Madhoun & Dempster, 2019). The medical needs of the infants, emotions experienced by the parents, medical monitoring and treatments, feeding challenges, and lack of interaction between a mother and her infant, all contribute to the stress levels experienced in this setting and could possibly also influence feeding development (Barbosa, 2013; Bertoncelli et al., 2012; D'Agata et al., 2016; Fróes et al., 2020; Medeiros et al., 2017; Pinelli et al., 2001; Rossetti, 2001). For this reason, mothers will need continuous support from all of the healthcare workers within the challenging NICU environment and additional guidance when it comes to the feeding development of their infants (Greene et al., 2016; Pike et al., 2016; Younesian et al., 2015).

It is clear that the maternal and family presence was influenced by COVID-19 pandemic, however NICU settings have to ensure a family centred approach is put in place where the mothers especially should remain one of the primary team members with regard to the infant's overall development, progress and intervention plan. Mothers, and/or primary caregivers will be the individuals feeding the infants post discharge and will therefore also be the ones to monitor the infants' feeding development. For this reason, mothers should be assisted within the NICU in establishing safe and optimal oral feeding methods that will be maintained post discharged as well as educated on any possible difficulties as this will then empower her to feed her own infant during admission and post discharge. It was established that mothers were encouraged to be present during feeding times as well as throughout most of the COVID-19 pandemic , therefore the nurses and other healthcare workers should make use of numerous opportunities during feeding times every 3 hours to educate the mothers and provide them with the assistance and guidance they need. Nurses (and other healthcare workers) should provide the mothers with additional information regarding their infant's feeding method and development to empower the mother's abilities while, in addition, taking some infants off their caseload during feeding times.

As explained previously, doctors, nurses and dieticians also encouraged the mothers to provide their infants with breast milk when their infants are admitted, and since the infants are being fed by alternative methods initially, the mothers had to express their breast milk at first (Lester et al., 2014)**.** Expressing milk presents its own difficulties as a mother needs to use her hand to express the milk, requiring further support and information from healthcare workers as well as requiring help during the transition to oral feeds (Bonet et al., 2015; Boucher et al., 2011; Department of Health, 2013). However, having mothers present within the NICU and able to provide their infant with breast milk is not always possible within South Africa since mothers are either unable to stay in hospital with their infants due to space restrictions or are unable to travel to the hospital because of financial restrictions (Rhoda et al., 2018). These difficulties may have been more pronounced due to COVID-19 lockdown measures and restrictions of COVID-19 positive cases further contributing to the decreased family centred approach within the NICU, the lack of interaction, stress experienced by the mothers and infants and possibly feeding difficulties amongst infants admitted (McKechnie et al., 2020).

The healthcare workers primary or secondary role in the feeding development

Research explains that with the vast amount of different cases and difficulties experienced in the NICU, it is essential to always make use of a multidisciplinary approach to address all of the infants and parents' needs (D'Agata et al., 2016; Da Costa et al., 2019; Dutta et al., 2015; Matus et al., 2018). All healthcare workers contribute to the feeding practices by either having a primary or secondary role in the feeding progress (as displayed in Figure 1 in chapter four). They also share the responsibility of providing interventions to address the infants' environment, behavioural/alertness state, positioning, respiration support, development of oral-motor skills; supporting family-centred care and contributing to the specific needs of the infants to ensure the successful discharge and optimal development thereafter (Barbosa, 2013; Byrne & Garber, 2013). There is scant research on the unique role of each team member in establishing optimal feeding practices within the NICU (Lloyd & de Witt, 2018) as well as how their distinctive patterns of providing intervention can relate to one another in providing optimal care to the infants admitted.

This study established that all the healthcare workers could either have a primary or secondary role in the feeding development of the infants admitted and they therefore need to understand and respect their responsibilities. The multidisciplinary team within the NICU

includes the mothers, doctors, nurses (including kitchen staff), dieticians, milk donors, physiotherapist, occupational therapists, speech-language therapists and possibly a lactation consultant (see Figure 1) as explained by one previous research study by Barbosa (2013). The healthcare workers who are involved in the multidisciplinary team will have to ensure that they maintain their knowledge in terms of the infants admitted and understand their important role in feeding development (Rhoda et al., 2018; Siziba et al., 2015; World Health Organization, 2002). The team members will have to comprehend the role they have with respect to their scope of practice, and understand the medical interventions provided by each of the other healthcare workers to make the necessary referrals timeously (Pieper & Hesseling, 2007; Siziba et al., 2015; World Health Organization, 2002; Van der Merwe et al., 2015). For example, nurses and doctors who spend most time with the infants need to understand the crucial role the SLT has in assessing oral motor abilities and monitoring the initiation and transition to oral feeds, in order to make the necessary referrals as soon as infants might be ready for them to undergo a steady transition and attain optimal feeding before being discharged.

Future research could also provide additional guidance to the healthcare workers within the NICU environment as to the dynamics between the different team members involved, their specific roles with regard to feeding and how each of these healthcare workers could contribute to the feeding policy within the hospitals of the public healthcare sector. Addressing feeding development and managing any feeding difficulties will be a multidisciplinary team's responsibility as depicted within figure 3 but a SLT also have an imperative role specifically assessing any evident feeding difficulties and creating a management plan for the infants' feeding, discussing the feeding development plan with the rest of the team and the mothers who should also remain as a part of the team throughout the infants admission (Da Costa et al., 2019; South African Speech-Hearing-Language Association, 2011). Therefore a dedicated SLT in the NICU environment could screen all of the infants admitted to identify their needs, ensure they get the interventions needed, introduce oral motor exercises according to the infants' development, assess all the infant's readiness for oral feeds, timeously initiating oral feeds and thereafter ensure safe and gradual transitions to full oral feeds before the infants are discharged (Barbosa, 2013; Da Costa et al., 2019; da Silva & de Almeida, 2015; Lubbe, 2018; Rossetti, 2001; South African Speech-Hearing-Language Association, 2011). According to SASLHA, the SLT's main role is to determine whether oral feeding is safe and to ensure that the method is sustainable

when the infant is discharged and having the dedicated SLT will assist the SLT department to achieve this according to their scope of practice (South African Speech-Hearing-Language Association, 2011).

Limited staff resources

A concern raised within literature for a long period of time includes the general limitation of resources within the South African healthcare context, which also includes the inadequate number of staff in the healthcare sector compared to the amount of infants needing care. The results from this study also confirms the desperate need for more healthcare workers within the public sector and specifically so the NICU settings (Lloyd & Witt, 2018; Pieterse, 2017; Rhoda et al., 2018; Department of Health, 2013; UNICEF/WHO, 2016; Yang et al., 2018). There is a need for these environments to have more staffing resources due to the number of infants admitted with serious medical needs. The mothers and families need information, education, support and guidance every step of the way during admission in order to have a successful discharge and include safe daily routines for normal development post-discharge (Matus et al., 2018). Sadly, it is well established that the lack of guidance, information and support provided to mothers and families in public healthcare NICUs at feeding times might lead to feeding and secondary difficulties post-discharge, as well as readmission to an already full public healthcare facility (Da Costa et al., 2019; Madhoun & Dempster, 2019).

The South African healthcare sector and the public hospitals should follow up on the recommendations made to ensure that the NICU environment is not only big enough to allow the capacity of infants being admitted, but also that there are sufficient healthcare workers within the units to provide the services needed by the infants. The developmental healthcare workers all explained the contribution it would make to have enough staff within the units and more so to have an individual professional from each of the developmental departments to focus purely on the infants admitted into the NICU instead of having other duties to focus on within the hospitals. This includes dieticians, physiotherapists, occupational therapists, speech-language therapists and possibly a lactation consultant in order for all of the infants admitted and their families to benefit from the services provided by the healthcare workers.

Figure 4: The problematic cycle within tertiary public hospitals leading to feeding difficulties

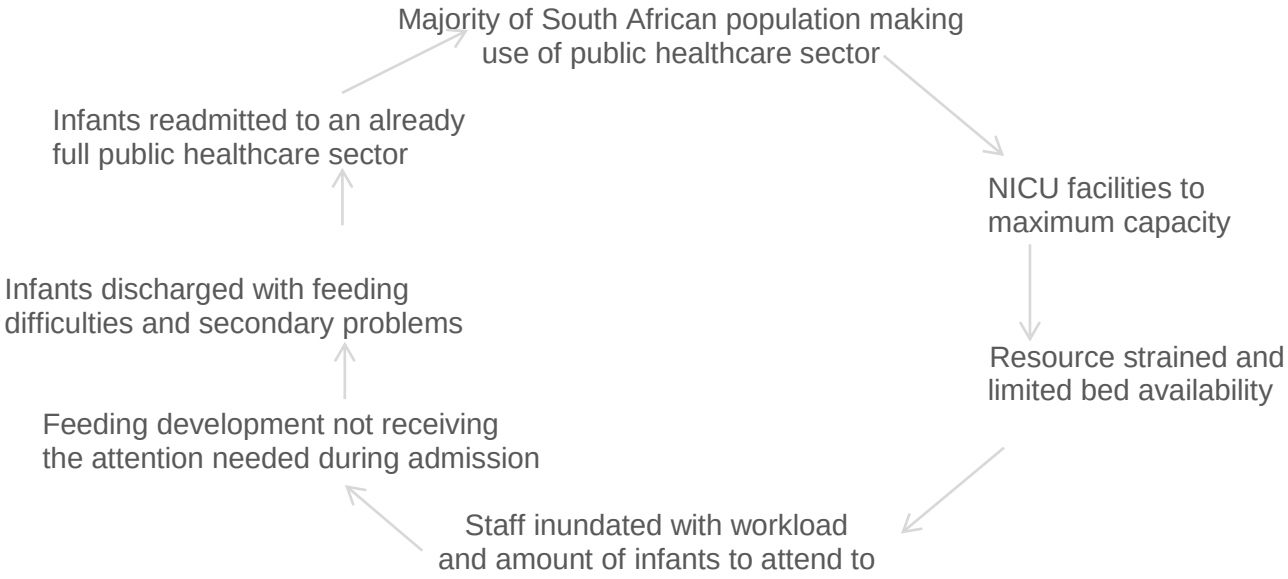


FIGURE 4 illustrates the challenges identified within tertiary public hospitals NICUs which could possibly be contributing to infants being discharged with feeding difficulties and further impacting the healthcare sector already under strain due to limited resources and beds available. This highlight the cycle present in the public healthcare sector which could be alleviated by ensuring that the public healthcare sector has the resources and amount of staff needed to attend to all of the infants admitted appropriately and provide all of the services needed for a successful discharge.

Influence of COVID-19 within the NICUs

The above mentioned challenges faced within the public healthcare sector were also further influenced by the novel COVID-19 virus declared a pandemic by the WHO in March 2020. Mothers tested positive where at risk of premature birth and this could have contributed to the high rates of premature infants admitted at the time of data collection which in turn could also have caused the units being full to maximum capacity placing the healthcare workers under pressure due to the case load of infants to attend to. However, South Africa has a history of high prematurity rates so this confirms minor impact COVID-19 has on the ward being filled to maximum capacity (Mahwasane et al., 2020; Rhoda et al., 2018).

It was found that COVID-19 mainly influenced the presence of the mothers within the units due to the lockdown regulations or possibly also acquiring the virus and having to then isolate. But with the decreased maternal and family presence, a few other aspects were influenced within the NICU units. The provision of breast milk was influenced since mothers where not always able to get the expressed milk to the unit or be in the units during feeding time to breastfeed their infants. This could also further influence the bonding and attachment between the mothers and their infants, and the overall development of the infant during and post discharge (Fróes et al., 2020). Mothers are usually encouraged to be present during feeding times to not only assist in feeding their own infant, but also providing new born care. Therefore nurses had more infants to feed and provide care to when the mothers are not in the units placing an additional burden on their caseload. An Occupational therapist further mentioned that they had to help with new born care within the NICU during the hard lockdown within South Africa in order to help the nurses with the additional burden placed on them.

Furthermore, with the decreased family presence and mothers sometimes facing difficulties getting to the units during COVID-19, the family centred approach recommended within the NICUs was also influenced. Family members could not enter the hospitals to assist and provide support to the mothers and mothers could therefore have experienced more stress during the time of the pandemic. The carry-over of treatment and information usually provided to the mother and other family members were influenced due to not being within the units and healthcare workers limiting their overall contact with others including

family members. Healthcare workers explained that they used to have information session with the mothers prior to the pandemic in order to providethem with additional information regarding caring for an infant during and post discharge which was also terminated due to limiting contact with individuals and groups of people. Carry-over is an essential part of early intervention which includes the treatment provided to infants admitted to the NICU. As mentioned previously, mothers or the main caregivers will be the ones feeding the infants post discharge and if they did not receive any guidance on the safest method of feeding and what to keep in mind during feeding times, the feeding development of the infant could be affected post discharge as well.

Regulations were put in place to prevent the nurses and/or other healthcare workers from getting COVID, for example wearing a mask becoming compulsory throughout South Africa and only the mothers being allowed within the hospitals and NICUs to minimize the amount of people coming into the NICU and possibly spreading the virus. The developmental healthcare workers' departments of the occupational therapists and physiotherapists also decided to rather share the caseload meaning that some of the infants only received input from one of the departments. It was explained that this was done to further decrease the chances of the healthcare workers acquiring the virus. However, nurses and other healthcare workers still tested positive and there after the entire nursing shift or developmental healthcare workers department (of physiotherapist, occupational therapists, dieticians and speech-language therapists) had to isolate for a period of time. This placed additional pressure on the nurses and overall staff needed within the units or further implicating the services provided to the infants. Nurses further explained that the hospitals had to make use of nursing staff possibly not optimally trained and educated to be working within the NICU, or unknown to the NICU environment. This confirms the findings of a study done within South Africa that indicated that a few of the nursing staff on duty sometimes had incomplete training in new-born care (Mahwasane et al., 2020). This should not be the case when the nurses have the constant role of monitoring and caring for the infants with serious medical needs. More than any of the influences described above, the nurses, doctors and other healthcare workers in general were under more pronounced pressure, overworked, tired and exhausted working during a worldwide pandemic and caring for the individuals within the hospitals.

The above findings proves that COVID-19 did have an influence on the already established burden within the public healthcare sector (shown in figure 4) having limited resources and staff resources available, which in turn further affected the overall care and intervention provided to the infants admitted during the COVID-19 pandemic. The findings highlights the importance of having strict protocols in place to manage all services delivered and specifically with regard to feeding practices, ensuring that all of the healthcare workers that form a part of the multi-disciplinary team monitor the feeding development of infants closely in order to prioritise the early identification and management of any feeding difficulties identified.

The overall results of this study confirmed an abundance of infants with severe medical needs, and mothers who need continuous support and education throughout admission from the healthcare workers due to their central role assisting the feeding development of their infants. Results also yielded that there is a need for more healthcare workers to not only provide the services needed by the infants but also provide the guidance to the mothers. Therefore, to realistically meet the aims of the South African government to decrease neonatal mortalities (Department of Health, 2013), tertiary public hospitals will enlarge the NICU facilities to optimally accommodate the number of infants generally admitted, establish a feeding protocol to be implemented within the NICU settings and take responsibility for the amount of healthcare workers desperately needed to provide the care, attention, and interventions needed by the infants admitted and their mothers.

CHAPTER SIX

CONCLUSION

The final chapter of this study aims to explain the conclusion of the results identified within this research study as well as end the document with the limitations and recommendations.

In conclusion, it is important to keep in mind that global health policies highlight the importance of the first 1000 days of an infant's life due to this period being a highly developmental stage within an infant's life. It lays the foundations of brain development, feeding and overall health more than any other time in their lives (The World Health Organization, 2002, 2007; UNICEF, 2018).

This research study aimed to describe the feeding practices of the neonates admitted and healthcare workers involved in feeding in the NICU in two tertiary hospitals in Gauteng. By using a qualitative approach to collect data, it was confirmed that most of the infants within the NICU are not fed orally at first due to being medically unstable, receiving high doses of medication and/or having a too immature functioning of oral motor skills and other reflexes (Da Costa et al., 2019; Demitto et al., 2017; Greene et al., 2016). It was also confirmed that these infants initially receive nutrition via IV fluids, total parenteral nutrition, or making use of enteral feeds (Bonet *et al.*, 2015; Maastrup *et al.*, 2014; Rhoda *et al.*, 2018; Rossetti, 2001; World Health Organisation, 2011; 2015). It was established that the initiation and transition to full oral feeds could be different for each of the infants admitted and therefore, a multidisciplinary team is needed to gradually transition infants to oral feeds in order to discharge successfully (Greene et al., 2016; Mahmoodi et al., 2019).

Healthcare workers with either a primary or secondary role in feeding, need to respect their responsibility and understand the different roles of the other team members in order to make the necessary referrals timeously when difficulties are identified, and avoid further risks and longer hospitalization (HPCSA, 2018; Lloyd & de Witt, 2018; Matus *et a*l., 2018; Rhoda *et al.,* 2018; Department of Health, 2012; Yang *et* al., 2018).

This study confirmed that a shortage of healthcare workers could possibly influence the wellbeing and attitudes of the staff, the care provided with regard to feeding development and ultimately trouble the overall services provided to the infants and their mothers

(Mahwasane et al., 2020; Pieterse, 2017). The support provided to the mothers seems to be inadequate in the NICU environments within the South African healthcare context due to limited staff and wards being at maximum capacity (Sicetsha, 2019; Department of Health, 2013).

Furthermore, this study proves that COVID-19 did have an influence on the already established burden within the public healthcare sector (shown in figure 4) having limited resources and staff resources available, which in turn further affected the overall care and intervention provided to the infants admitted during the COVID-19 pandemic.

To discharge the infants successfully, integrate them into normal daily routines and provide a developmentally healthy future post discharge, NICUs will have to look at creating more space for the number of infants admitted, especially because almost 83% of South Africans make use of the public healthcare sector (Stats SA, 2017). More importantly, these environments need more healthcare workers to provide the services needed by the number of infants in need of critical medical interventions (du Plessis, 2013; Pieper & Hesseling, 2007; Rhoda et al., 2018; Siziba et al., 2015; World Health Organisation, 2002; van der Merwe et al., 2015). With more healthcare workers and dedicated developmental team members within the NICU, the feeding development of infants can be supported optimally and guided safely to discharge infants successfully and ultimately decrease neonatal deaths.

LIMITATIONS AND RECOMMENDATIONS

Limitations

The proposal for this study was finalized before the COVID-19 pandemic; however, the initiation of data collection happened concurrently with the global pandemic. As the study's final stages were completed during the COVID-19 pandemic, some valuable information was gained; on the other hand, the pandemic presented some clear and possibly unknown limitations to this study.

The first limitation that became evident was that the mothers from Research Site One were only allowed to enter the NICU or visit their infants if they were breastfeeding at the time. This influenced an understanding of the full extent of the mothers' involvement within the NICU since not all the mothers were allowed into the NICU during the time of data collection. As explained in the results chapter, this possibly placed healthcare workers under some strain having more infants to feed.

The other limitation to this study was that most healthcare professionals already felt pressured by their daily workload and even more so now that mothers could not be in the NICU to assist them with the daily care of the infants. As a result, all the healthcare workers had limited time available to do interviews and, if they agreed to participate, they sometimes gave short answers, as they felt they had to get back to their duties. This lead to an additional limitation of some interviews only being between nine and fifteen minutes in duration. Due to the time constraint, the researcher decided to conduct more interviews than originally planned.

In reflection, more time should have been spent on the development of the data collection instruments including a more in depth pilot study in order to ensure that all questions asked are relevant to each profession of healthcare worker and making use of more open-ended to guide the interviews.

Finally, the proposal of this study aimed to include three research sites, but due to limited time and because the third hospital was allocated a COVID-19 hospital in South Africa, the study finally only included two NICUs. Consequently, the results may not be representative of all NICUs within South Africa; however, this may encourage more research to be done within these NICUs, and specifically to feeding within these units.

Recommendations

Within this field of research, a gap for future research and some changes that could be implemented remains within the NICUs to optimise feeding practices within the NICU settings.

- The recommendations made by the healthcare workers to have more nursing staff and a professional from each of the developmental teams dedicated to providing the care needed by infants admitted to the NICU units, could be followed up.
- Lactation consultants could be introduced within the NICU environments of tertiary hospitals to assist the mothers to express milk initially and transition to oral feeds from the breast.
- Investigating the transition period to full feed and addressing all the dynamics within the transitioning period could help healthcare workers design a specific protocol to follow and provide more guidance on how to assist an infant to attain oral feeds successfully.
- For the development of data management systems, it would be helpful for other tertiary public hospitals and all other NICU settings to implement the daily sheet keeping record (recommended by the Baby Friendly Initiative) of the type of milk provided to infants so that the head of the NICU can monitor the feeds provided to the infants and implement changes when needed.
- Future research could look at gaining a better understanding into the assistance that mothers need post discharge with regard to feeding, feeding progress and feeding difficulties.
- Studies should be done to evaluate the full effect that the COVID-19 global pandemic had on mothers having babies during this time and the effect it had on the NICU setting overall. If healthcare workers understood the effect of the pandemic, they could help appreciate the needs of the mothers and the difficulties faced, and learn from mistakes made within the NICU settings when facing a pandemic.

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APPENDICES

Appendix A

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

SCHOOL OF HUMAN AND COMMUNITY DEVELOPMENT
SPEECH PATHOLOGY AND AUDIOLOGY

24 June 2020

Dear Dr Benson as CEO,
Dr Joy Frederick as head of the Neonatal Intensive Care Unit,
Or to whom it may concern at Rahima Moosa Mother and Child Hospital.

RE: Request for consent for Nicole Louw, MA (Speech Therapy) student at the University of Witwatersrand (Student number 2259764) to conduct research in the Neonatal Intensive Care Unit, RMMCH.

My name is Nicole Louw and I am an MA (Speech-Language Pathology) student at the University of the Witwatersrand. My study aims to explore the feeding practices within a Neonatal Intensive Care Unit in a tertiary public hospital in Gauteng as well as establish which healthcare workers have a role in this area of Neonatal Care. The research question of my study is: *What are the feeding practices within a NICU in a tertiary public hospital in Gauteng?*

In order to answer this research question, I would need to conduct a structured observation within the NICU (for 6 hours over 5 days) to gain perspective of the feeding practices. This observation will take place by observing all healthcare workers within the 6 hours, specifically paying attention to feeding times and practices.
I would then also request some of the healthcare workers to voluntarily participate in one-on-one interviews. The interviews will allow me to gain a better understanding about the healthcare workers whom have a role in the feeding practices and it will add multiple perspectives from the healthcare workers too. This information will also help to validate the findings from the observations. Healthcare workers targeted to participate within the interviews include doctors, nurses, speech-language therapists, occupational therapists, physiotherapists, dieticians, psychologist, social workers as well as lactation consultants if they are rendering services within the specific NICU settings at the time.

All of the professionals working within the NICU will be provided with an information sheet and consent will be obtained from the head of each of the departments before making informing any of the professionals. This information sheet will provide the professionals with a clear description of their specific involvement in the research project, assure them of no risk from participation and **full confidentiality** at all times. The participants will remain anonymous as a coding system will be used for identification and participants have the right to object or withdraw at any given time. All information gathered throughout this project will be stored securely.

All mothers/caregivers within the NICU will also be provided with an Information sheet to inform them about the observational part of this study and ensure they do not have any objections, thereafter no further contact will be made with the patients or parents to ensure minimal disruption of all services within the setting.

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This benefit of the study is that it will provide a more in-depth understanding of the current feeding policies and practices in NICU, specifically in the context of public hospitals. The results will clarify the specific roles of the different team members in the NICU and could help to ultimately establish if there is a shortage of staff for the amount of infants admitted in the NICU. I assure you that Rahima Moosa Mother and Child Hospital will not incur any costs or will be at risk of any harm.

This letter also wishes to inform you that this research study received provisional acceptance from the Medical Human Research Ethics Committee of the University of Witwatersrand (protocol number M200220). Full ethical clearance is now only awaiting this study receiving consent from the participating hospitals. Once I have all of the hospitals consent forms, including Rahima Moosa Mother and Child Hospital's, signed I will then receive a clearance certificate and protocol number from the Ethics Committee.

With this letter I would like to request the permission of the hospital's CEO, Research department, the Head of the Paediatrics as well as the Head of the NICU of Rahima Moosa Mother and Child Hospital, to conduct this research study within your Neonatal Intensive Care Unit.

If you have any concerns regarding the nature of this study, or have any questions during or afterwards, feel free to contact me or alternatively my supervisors on the details provided below.

I am looking forward to hearing from you.

Yours sincerely,

Researcher: Mrs Nicole Louw
nvlaca02@gmail.com
0820909006

Research Supervisor
Dr Kim Coutts
kim.coutts@wits.ac.za

Research Supervisor
Dr Joanne Neille
joanne.neille@wits.ac.za.

Appendix B

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Department of Paediatrics and Child Health
Metabolic Unit
Chris Hani Baragwanath Academic Hospital
P. O. Bertsham
2013

7 July 2020

The Research Protocol Review Committee
Chris Hani Baragwanath Academic Hospital
Soweto
Johannesburg
South Africa

Dear Madam/ Sir

I would like to inform you that **Nicole Louw** has been given a permission to conduct her research study in the Department of Paediatrics at Chris Hani Baragwanath Academic Hospital. The title of her study is: **"Feeding practices within neonatal intensive care units in tertiary public hospitals in Gauteng."**

While she has been given permission to conduct this study, she cannot start with data collection until she has provided the Department with Ethics Committee Clearance Certificate.

Yours Sincerely

Professor SC Velaphi
Head of Department of Paediatrics
Chris Hani Baragwanath Academic Hospital

Appendix C

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

RAHIMA MOOSA MOTHER AND CHILD HOSPITAL

Enquiries : Karen Marshall
Tel : (011) 470 9284
Fax : 086 553 4623
Email : Karen.Marshall@wits.ac.za

TITLE OF RESEARCH PROJECT:
"FEEDING PRACTICES WITHIN NEONATAL INTENSIVE CARE UNITS IN TERTIARY PUBLIC HOSPITALS IN GAUTENG"

NAME OF RESEARCHER:
MS. NICOLE LOUW
Speech Therapy Department
Faculty of Humanities
University of the Witwatersrand

NHRD REF NO: GP_202008_074

Dear Ms. Louw,

Permission is granted for you to conduct the research as indicated in the title above.

The terms under which this permission is granted is contained in the Researcher Declaration form that you have signed. Failure to comply with these conditions will result in the withdrawal of such permission.

It is crucial for you to inform the Research Coordinator, Karen Marshall of the actual start and end dates of your study. This could be done by e-mail.

Should the study commence more than 12 months after receipt of this approval letter you will have to go through the process of applying again.

You are strongly advised to keep a signed copy of the declaration form so as to ensure that the terms of this agreement are complied with at all times.

Yours sincerely,



ACTING CHIEF EXECUTIVE OFFICER
2020:09:16

ADDRESS: Cnr FUEL & OUDSTHOORN STREET CORONATIONVILLE 2093 / PRIVATE BAG X20 NEWCLARE 2112 JHB

UNIVERSITY OF THE
WITWATERSRAND
JOHANNESBURG

R14/40 Ms N Louw

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M200220

NAME: (Principal Investigator)	Ms N Louw
DEPARTMENT:	School of Community Development Department of Speech Pathology and Audiology University
PROJECT TITLE:	Feeding practices within neonatal intensive care units in tertiary public hospitals in Gauteng
DATE CONSIDERED:	2020/02/28
DECISION:	Approved unconditionally
CONDITIONS:	Approved study sites shown on Annex 1 hereto
SUPERVISOR:	Drs K Coutts and J Neille
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2020/11/05

This clearance certificate is valid for 6 years from the date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the 3rd Floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report.** When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **February** and will therefore reports and re-certification will be due early in the month of **February** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature

2020/11/06
Date

Appendix E

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

SCHOOL OF HUMAN AND COMMUNITY DEVELOPMENT
SPEECH PATHOLOGY AND AUDIOLOGY

25 October 2020

INFORMATION SHEET FOR HEALTH CARE STAFF

STUDY TITLE: FEEDING PRACTICES IN A NEONATAL INTENSIVE CARE UNIT WITHIN A TERTIARY PUBLIC HOSPITAL IN GAUTENG

Good day,
My name is Nicole Louw and I am an MA (Speech-Language Pathology) student at the University of the Witwatersrand. My study aims to explore the feeding practices within a Neonatal Intensive Care Unit in a tertiary public hospital in Gauteng as well as establish which healthcare workers have a role in this area of Neonatal Care. The research question of my study is: *What are the feeding practices within a NICU in a tertiary public hospital in Gauteng?*

In order to answer this research question, I would need to conduct a structured observation period within the NICU to gain perspective of the feeding practices. This observation will take place by observing all the healthcare workers within the NICU, specifically paying attention to feeding times and practices.
I would then also request some of the healthcare workers to voluntarily participate in one-on-one interviews. These interviews will be conducted in a private room allocated by your Head of the NICU at a time convenient to the healthcare worker. The interviews will allow me to gain a better understanding about the healthcare workers who have a role in the feeding practices and it will add multiple perspectives from the healthcare workers. This information will also help to validate the findings from the observations. Healthcare workers targeted to participate within the interviews include doctors, nurses, speech-language therapists, occupational therapists, physiotherapists, dieticians, psychologist, social workers as well as lactation consultants if they are rendering services within the specific NICU settings at the time.

All mothers/caregivers will be given an Information sheet to inform them about the observational part of this study, however there will be no further contact made with the patients or parents to ensure minimal disruption of all services within the setting.

As part of this project, I would like to invite you to participate in an interview if you are one of the targeted healthcare workers. There will be no consequence to declining my invitation to be interviewed. This interview will invite you to answer questions regarding this NICU and the feeding practices at the NICU. It will take approximately 30 minutes of your time and will be done in private at a time convenient to you.

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With your permission, this interview will be recorded using an audio recorder for analysis purposes after all interviews are completed. I will be using direct quotes in the research report but will be using a coding system as identification to ensure your confidentiality. All data collected, namely, the research documents, audio recordings, signed consent forms and notes from observations, will be stored on a password-protected laptop for five years.

This information sheet assures you that no risk or harm will come to you through your participation. It also ensures you of confidentiality during all stages of the research process. No direct benefits will be provided for participation in this research project, and you may withdraw at any time or not answer any question if you do not want to. All information shared during the interview will be kept confidential and stored safely.

If you have any concerns regarding this study, or have any questions during or afterwards about this research project, feel free to contact me on the details provided below. This study will be written up as a research report. If you wish to receive a summary of this report I will be happy to send it to you.
This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg. A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research.
If you have any concern over the way the study is being conducted, please contact the Chairperson of this Committee who is Dr Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za.

Thank you for reading this Study Information Sheet.
Yours sincerely,

Researcher: Mrs Nicole Louw
nvilaca02@gmail.com
0820909006

Supervisor: Dr Kim Coutts
kim.coutts@wits.ac.za
011 717 4572

Co-Supervisor: Dr Joanne Neille
joanne.neille@wits.ac.za
011 717 4574

Appendix F

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

SCHOOL OF HUMAN AND COMMUNITY DEVELOPMENT
SPEECH PATHOLOGY AND AUDIOLOGY

25 October 2020

INFORMATION SHEET FOR MOTHERS

STUDY TITLE: FEEDING PRACTICES IN A NEONATAL INTENSIVE CARE UNIT WITHIN A TERTIARY PUBLIC HOSPITAL IN GAUTENG

Good day,
My name is Nicole Louw and I am a Masters student at the University of the Witwatersrand. My study aims to explore the feeding practices within a Neonatal Intensive Care Unit in a tertiary public hospital in Gauteng as well as establish which healthcare workers have a role in this area of Neonatal Care. The research question of my study is: *What are the feeding practices within a NICU in a tertiary public hospital in Gauteng?*
In order to answer this research question, I will be doing an observation within this NICU over the next few days to gain an understanding of the feeding practices. Observations will mostly include observing the healthcare workers within the NICU as well as their engagements during feeding times.

This study will aim for minimal disruption of all services as there will be no involvement of any patients (infants) or you as their parents during observations.
This information sheet assures you that no risk or harm will come to you or your infant during the time of the observation. It also ensures you of confidentiality during all stages of the research process by informing you that no personal information will be used within the research study. If you have any objection regarding the observation, your decision will be respected and your infants feeding times will be excluded from our observations. There will be no change to the level of care you and your child receive while in this hospital, should you decline to participate.

This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg ("Committee"). A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research.
If you have any concern over the way the study is being conducted, please contact the Chairperson of this Committee who is Dr Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za.

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I would like to hereby get your verbal consent to include the feeding practices of your infant as a part of the observation, should you not have any objections.

Thank you for reading this Study Information Sheet

Yours sincerely,

Researcher: Mrs Nicole Louw
nvilaca02@gmail.com
0820909006

Supervisor: Dr Kim Coutts
kim.coutts@wits.ac.za
011 717 4572

Co-Supervisor: Dr Joanne Neille
joanne.neille@wits.ac.za
011 717 4574

Appendix G

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

SCHOOL OF HUMAN AND COMMUNITY DEVELOPMENT
SPEECH PATHOLOGY AND AUDIOLOGY

Participant Consent Form: Semi structured interviews with Healthcare Workers and Speech Language Therapists

I, Participant C hereby agree to participate voluntarily in the research project conducted in our Neonatal Intensive Care Unit at CHBAH *(name of hospital)*.

Please circle below, if you agree:

I have read the information sheet	YES	NO
I understand the nature of my participation	YES	NO
I know that I am able to withdraw during the process with no negative consequences	YES	NO
I understand that my participation will remain anonymous	YES	NO
I agree to have an audio recording of the interview	YES	NO
I agree that the researcher may use anonymous quotes in her research report	YES	NO
I agree that the information I provide may be used anonymously for academic purposes	YES	NO

[signature]	P/A	13/11/20
Signature (Participant giving consent)	Job Title of the Undersigned	Date
[signature]	NICOLE LOUW	25/11/20
Signature (Researcher seeking consent)	Name	Date

Appendix H

OBSERVATIONAL GUIDE

Hospital Site: _____

Date and Time: _____

WITHIN THE NICU		
AREA	**OBSERVATION**	**ADDITIONAL NOTES**
The layout: **See Simple line drawing of layout on the back for reference.**	Number of rooms in NICU: _____ Number of beds to accommodate infants: _____	
Rooming-in facilities:		
Routines:		
NICU environment:		

Infants admitted currently:

WITHIN THE NICU		
AREA	**OBSERVATION**	**ADDITIONAL NOTES**
Number of infants admitted on the day: Per cubicle/room		
Number of infants diagnosed with:	(SEE ADMISSION SPREADSHEET) Other reasons for admission: _____ _____ _____ _____ _____ PHOTOTHERAPY:_____ NUMBER OF INFANTS FEEDING:_____ NUMBER OF INFANTS NPO:_____ INFANTS ON OXYGEN:_____	

The current feeding policies within the NICU that guide all feeding practices, whether DOH policy, WHO policy, BFI or any self-developed and hospital-specific policy (also who developed this hospital specific policy):

_____

_____

_____

_____

_____

_____

_____

_____

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_____

Feeding practices:

WITHIN THE NICU		
AREA	**OBSERVATION**	**ADDITIONAL NOTES**
Feeding times during the day:		
Who feeds the infants:		
Feeding methods within the NICU:		
Any infants in the process of		

transitioning to oral feeds: (thus partial oral feeds and gavage feeds for the remainder of the feed)		
Mothers involvement in feeding times:		
Breastfeeding within the NICU:		

Methods of feeding within the NICU:

IV feeds / NGT / OGT / PEG / breast / cup / spoon / syringe / bottle /

Preferred method of feeding:_____

Method of feeding:		**Number of infants:**	**Additional comments**
Intravenous feeding	IV feeds		
Gavage feeding	NG tube		
	OG tube		
	PEG tube		
Oral feeding	Breast		
	Cup		
	Spoon		
	Syringe		
	Bottle		
Number of infants receiving:			
Breast milk			From biological mother: From donor bank:
Formula			

Additional notes on feeding:

Speech-language therapist's role in NICU:

Number of SLT in NICU:	
Role of the SLT: **OR Type of cases:**	
Involvement in KMC, or other intervention:	
Role in feeding practices and transition to oral feeds:	

Team members involved in the NICU:

Number of nurses on duty: _____

Number of doctors on duty: _____

Healthcare worker in the NICU and their general roles:	Their role in the feeding practice:
Doctors	
Nurses	
Physiotherapists	
Occupational Therapists	
Dieticians	

Additional Staff **-** **-** **-** **-** **-** **-** **-**	

COVID PANDEMIC WITHIN THE NICU:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Layout of the NICU:

Appendix I

Semi-Structured Interview – Healthcare Worker
Interview number: _____
Date: _____
Hospital: _____

(1) Description of the NICU

1.1 In your words what is the **layout** of the NICU, including the number of beds?
1.2 Are there routines guiding **daily activities** within the NICU?
1.3 What are the **feeding routines** like in the NICU?
1.4 Are the mothers involved in any of the routines?
1.4 How does this NICU embrace **KMC practices** within daily routines?
1.5 Any **barriers or facilitating factors** within this NICU?

(2) Infants in the NICU

2.1 What is your description of the **infants admitted**?
2.1.1 On average, how many infants are admitted and needs monitoring?
2.1.2 What is your view on the variety of patients seen, prematurity and LBW infants, etc.?
2.2 What is an average timeframe of **admission** for the infants in this NICU?
2.3 What is the criteria for discharge of the infants?

(3) Feeding policies and practices

3.1 What do you know about the current **feeding policies and recommendations** pertaining to feeding infants in an NICU? Is there a ward specific policy?
3.2 Is there any **training/education** regarding on these feeding policies?
3.3 Upon **admission**, does the infant receive any fluids or type of feeds immediately or within a certain timeframe?
3.4 What is the most used **method of feeding** method within this NICU?
3.5 According to you, what is the cue to **initiate oral feeds** after an infant was fed via parenteral or enteral feeds?
3.5.1 Who makes the call and decides that the infant is ready for the transition to oral feeds?
3.6 What is the **transition process** like to get infants from parenteral and/or enteral feeds to full oral feeds?

(4) Team members involved in the feeding practices

4.1 What are the **staff resources** like in this NICU and does this affect the feeding practices?
4.2 How do the **team members** complement each other and what are the dynamics?
4.3 Which team members would you say are specifically involved in the **feeding** practices?
4.4 Which team members are involved in the **transition process** to full oral feeds?
4.5. What is your specific role within the NICU, and also specifically regarding feeding?

(5) The speech-language therapist's role

5.1 What in your opinion is the **role** of a speech-language therapist in the NICU?
5.2 What is the speech-language therapist's specific role in the **feeding practices** and the transition process to full oral feeds?

(6) COVID-19's influence

6.1 Have you noticed any challenges or changes due to COVID-19 pandemic?
6.2 Did COVID-19 influence your practice and/or service provision in any way?
6.3 Any other way COVID-19 possibly influenced anything within the Neonatal Intensive Care Unit?

Appendix J

Semi-Structured Interview – Healthcare Worker
Interview number: _____
Date: _____
Hospital: _____

(1) Description of the NICU

1.1 In your words what is the **layout** of the NICU, including the number of beds?
1.2 Are there routines guiding **daily activities** within the NICU?
1.3 What are the **feeding routines** like in the NICU?
1.4 Are the mothers involved in any of the routines?
1.4 How does this NICU embrace **KMC practices** within daily routines?
1.5 Any **barriers or facilitating factors** within this NICU?

(2) Infants in the NICU

2.1 What is your description of the **infants admitted**?
2.1.1 On average, how many infants are admitted and needs monitoring?
2.1.2 What is your view on the variety of patients seen, prematurity and LBW infants, etc.?
2.2 What is an average timeframe of **admission** for the infants in this NICU?
2.3 What is the criteria for discharge of the infants?

(3) Feeding policies and practices

3.1 What do you know about the current **feeding policies and recommendations** pertaining to feeding infants in an NICU? Is there a ward specific policy?
3.2 Is there any **training/education** regarding on these feeding policies?
3.3 Upon **admission**, does the infant receive any fluids or type of feeds immediately or within a certain timeframe?
3.4 What is the most used **method of feeding** method within this NICU?
3.5 According to you, what is the cue to **initiate oral feeds** after an infant was fed via parenteral or enteral feeds?
3.5.1 Who makes the call and decides that the infant is ready for the transition to oral feeds?
3.6 What is the **transition process** like to get infants from parenteral and/or enteral feeds to full oral feeds?

(4) Team members involved in the feeding practices

4.1 What are the **staff resources** like in this NICU and does this affect the feeding practices?
4.2 How do the **team members** complement each other and what are the dynamics?
4.3 Which team members would you say are specifically involved in the **feeding** practices?
4.4 Which team members are involved in the **transition process** to full oral feeds?
4.5. What is your specific role within the NICU, and also specifically regarding feeding?

(5) The speech-language therapist's role

5.1 What in your opinion is the **role** of a speech-language therapist in the NICU?
5.2 What is the speech-language therapist's specific role in the **feeding practices** and the transition process to full oral feeds?

(6) COVID-19's influence

6.1 Have you noticed any challenges or changes due to COVID-19 pandemic?
6.2 Did COVID-19 influence your practice and/or service provision in any way?
6.3 Any other way COVID-19 possibly influenced anything within the Neonatal Intensive Care Unit?

(7) The speech-language therapist's role

7.1 What in your opinion is the role of a speech-language therapist in the NICU?
7.2 What are the types of referrals/cases received in the NICU?
7.3 What is the speech-language therapist's specific role in the feeding practices and the transition process to full oral feeds?
7.4 Who of the other team members also plays a big part in the transition process?
7.5 How involved are you in the KMC practices and are there any other therapies or treatments provided by yourself as an SLT?

Appendix K

TABLE USED TO ANALYSE QUANTITATIVE DATA COLLECTED										
DAY OF OBSERVATION	NUMBER OF ADMISSIONS	PRETERM/TERM		STAFF		FEEDING				
		PRETERM INFANTS	LBW	NURSES	ADMIN STAFF	INFANTS NPO	TOTAL EBM	MIXED	FORMULA	DBM

Appendix L

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

SCHOOL OF HUMAN AND COMMUNITY DEVELOPMENT
SPEECH PATHOLOGY AND AUDIOLOGY

26 February 2021

RESEARCH ASSISTANT: CONFIDENTIALITY FORM

I, Sasha Frade-Bekker hereby acknowledge that I acted as a 'research assistant' to ensure the reliability and validity of the interviews transcribed for the study named: *What are the feeding practices within a NICU in a tertiary public hospital in Gauteng?*
I hereby provide acknowledge the confidentiality principle regarding the information collected during the interviews and I confirm that all participants were given a code as identity and therefore no personal data was identifiable.



Signature

26th February 2021
Date

Sasha Frade-Bekker
Name of undersigned

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Appendix M

RESEARCH SITE	PARTICIPANT	PROFESSION
Research Site One	A	Dietician
	B	Registered Nurse
	C	Registered Nurse
	D	Nurse
	E	Consultant Doctor
	F	Doctor
	G	Physiotherapist
	H	Intern Doctor
	I	Occupational Therapist
	J	Speech-Language Therapist
	K	Registered Nurse
	L	Speech-Language Therapist
	M	Speech-Language Therapist
	N	Dietician
Research Site Two	O	Dietician
	P	Consultant Doctor
	Q	Medical Officer Doctor
	R	Registered Nurse
	S	Physiotherapist
	T	Occupational Therapist
	U	Speech-Language Therapist
	V	Speech-Language Therapist