NEONATAL PAIN MANAGEMENT PRACTICES BY HEALTH CARE PROFESSIONALS AT NYANGABGWE AND PRINCESS MARINA HOSPITALS, FRANCISTOWN AND GABORONE, BOTSWANA

By

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A dissertation submitted to the University of Zambia in partial fulfillment the requirements for the award of the degree of Master of Science in Neonatal Nursing

The University of Zambia

January, 2025

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Declaration

I, **Barulaganye Difsele**, declare that this work being submitted in partial fulfilment of the requirement for the award of **Master of Science in Neonatal Nursing** at the University of Zambia is a result of my own efforts. The various sources to which I am indebted to are clearly indicated in the text and references. This work has neither fully nor in part been submitted for any other degree, examination nor to any other university or institution. In the development of this proposal, I adhered to guidelines outlined for a Degree of Master of Science in Neonatal Nursing research projects as prescribed by the University of Zambia.

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Abstract

Neonatal pain management remains a global challenge, particularly in low- and middle-income countries such as Botswana, due to inadequate resources, training, and evidence-based practice. Despite all neonates experiencing pain, with preterm babies being especially vulnerable, pain assessment and management are often overlooked, potentially leading to adverse short- and long-term outcomes. The main objective of this study was to assess neonatal pain management practices among healthcare professionals in the Neonatal Intensive Care Units of Nyangabgwe Referral Hospital (NRH) and Princess Marina Hospital (PMH) in Gaborone and Francistown towns of Botswana. This study used a descriptive cross-sectional design. The study included 110 healthcare professionals, all of whom were enrolled into the study by census method. The data were collected using an online questionnaire with validated items of the Likert scale. The collected data was exported into Excel 2013 for cleaning. The data was further imported into Stata version 18 for analysis using descriptive and inferential statistics. Chi-square, Fisher's exact and binary logistic regression tests were used to statistically analyse the data. A confidence interval of 95% with a significance level of 5% was set. The results showed that 87 (79%) of the participants demonstrated good neonatal knowledge of pain management practices. The final analysis using binary logistic regression identified key predictors of good practice. Participants categorized as knowledgeable had 6 times odds of practicing good neonatal pain management practices compared to those not knowledgeable (AOR = 6.34; 95% CI: 0.10-22.7, $p < .001$). Participants with formal training in neonatal pain management had about 4 times odds of having good neonatal pain management practices compared to those who did not receive training (AOR= 3.974, 95%, CI: 0.37-1.82, $p = .046$) . Those who reported the presence of protocols in the Neonatal Intensive Care Units (NICUs) also had more than 1 times odds of having good neonatal pain management practices (AOR= 1.132; 95% CI: 0.12-1.02, $p = .012$). Non-Christian participants had 23% odds of having good neonatal pain management practices, while Christians had 76.9% odds of having good neonatal pain management practices (AOR= 0.231, 95%, CI:0.98-1.25, $p = .002$). Non-pharmacological interventions also mattered with respondents using non-pharmacological interventions to manage pain in neonates having better practices than those not using them (AOR= 6.863, 95%, CI: 0.001-63.2, $p = .27$). These results suggest that knowledge, training and adherence to protocols are crucial for improving neonatal pain management. The study highlights critical gaps in neonatal pain management practices in Botswana. The study recommends revising curricula, enhancing interdisciplinary training, and advocating for updated policies and protocols to improve assessment, documentation, and overall neonatal pain management practices.

Keywords: Infant, newborn, Botswana, pain management, hospitals, Health care professionals.

Acknowledgements

Firstly I want to thank God Almighty for the strength He has given me to carry out this study and the opportunity to undertake a course of Masters of Science in Neonatal Nursing at the University of Zambia (UNZA). I thank Ministry of Health of Botswana and Botswana government for sponsoring my education. I recognize Hospital management teams at Nyangabgwe and Princess Marina hospitals for their guidance and granting me the permission to conduct this study at their facilities. I also extend my appreciation to my main supervisor Dr Caroline Zulu and co supervisor Mrs. Natalia Mbewe Shitima for their guidance and mentorship throughout my research endeavor. I would also like to acknowledge Mr. Musenge and Mr Febiano Phiri for their unwavering dedication and guidance for the success of my dissertation. I also thank faculty members at the School of Nursing Sciences (UNZA) and my classmates for the indispensable support and assistance they offered to me. Lastly I thank my family members and my lovely husband Kagiso Marumo for being with me and giving me due support, my children Medrick Difsele and Nathan Difsele for allowing me to come to Zambia. Glory be to God.

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List of abbreviations

AAP: American Academy of Paediatrics

ALPS-neo: Astrid Lindgren and Lund Children's Hospital Pain Scale

AOR: Adjusted Odds Ratio

BHRDC: Botswana Health Research Development committee

BIIP: Behavioral Indicators of Infant Pain

CHERRIES: Checklist for Reporting Results of Internet E-Surveys

CINAHL: Cumulative Index to Nursing and Allied Health Literature

CPD: Continuous Professional Development

CRIES: Cry, Requires increased oxygen, Increased vital signs, Expression, Sleeplessness

FLACC: Face, Legs, Activity, Cry, Consolability

HCPs: Health Care Professionals

HINARI: Health Inter-Net Access to Research Initiative

HIV: Human Immunodeficiency Virus

KMC: Kangaroo Mother Care

IASP: International Association of the study of pain

ICU: Intensive Care Unit

IRB: Institutional Review Board of Botswana

LMICs: Low and Middle-Income Countries

MOH: Ministry of Health

NGOs: Non-Governmental Organisations

NICU: Neonatal Intensive Care Unit

NIPS: Neonatal Infant Pain Scale

NHRA: National Health Research Authority

NFCS: Neonatal Facial Coding System

N-PASS: Neonatal-Pain, Agitation and Sedation Scale

NPIs: Non pharmacological interventions

NRH: Nyangabgwe Referral Hospital

PIs: Pharmacological interventions

PPS: Probability Proportional to Size

PMH: Princess Marina Hospital

SOPs: Standard Operating Procedures

UNZA: University of Zambia

UNZABREC: University of Zambia Biomedical Research Ethics Committee

WHO: World Health Organization

CHAPTER ONE

1.1 Introduction

This chapter introduces the topic under study by giving background information to the topic, statement of the problem, justification of the study, theoretical framework, objectives, hypothesis, research variables and cut-off points, and conclusion. Cohen et al. (2018) defines pain as a mutually recognizable somatic experience that reflects a person's apprehension of a threat to their bodily or existential integrity. All babies experience pain and the smaller and sicker they are, the more likely they are to experience painful procedures (Mencía et al., 2022). The connections or structures needed by neonates for pain perception are developed by 24 weeks of gestation so this emphasizes the notion that preterm babies also feel pain. Mencía et al. (2022) opine that pain in neonates manifests itself by physiologic and behavioral indicators and its assessment is therefore complicated and needs the use of neonatal pain assessment tools. Improperly managed neonatal pain has the potential to cause both short and long-term effects on the neonate and can completely rewrite the adult brain (Eriksson and Campbell-Yeo, 2019; Johnston, 2020). The motivation behind this study revolves around the researcher’s love for neonates, seeing them suffer silently persuaded the researcher to want to understand more how these most vulnerable patients in the health system can be assisted. This can be achieved by ensuring evidence based compassionate care, improving outcomes, and advancing medical knowledge among HCPs who take care of the neonates globally.

1.2 Background

Although it is a critical aspect in healthcare, pain management in neonates remains inadequately addressed globally, particularly in low- and middle-income countries where analgesia is often underutilized (Elessi et al., 2019; Wade et al., 2020). The World Health Organization (WHO) recognizes that neonatal pain is a crucial issue with approximately 30 million neonates requiring treatment for pain every year globally (WHO, 2012). In routine neonatal intensive care, mild to moderate procedures may cause varying levels of discomfort, stress, or pain in newborns and therefore require proper management to prevent long-term adverse effects (Allegaert and Anker, 2016; Kim, 2020).

According to Gao et al., (2023), postoperative pain is substantially more common in Africa compared to developed countries due to a shortage of resources. Botswana is a middle-income country (MIC) in Sub-Saharan Africa**.** Studies suggest that lack of knowledge or expertise may also hinder the effective assessment and treatment of neonatal pain (Kim, 2020; Wari et al.,2021; Thacker et al., 2022, Agakidou et al., 2021, Mala et al., 2024; Wari et al. 2021). Moreover, individual and organizational factors may also influence neonatal pain management (Koskenvuori et al., 2019; Blomqvist et al., 2020; Kusi Amponsah et al., 2020; Neshat et al., 2023; Roga et al., 2023). Nyaloko et al. (2023) also found that cultural beliefs and religion may influence healthcare practices in Neonatal Intensive Care Units (NICU). In neonates, inadequate pain management can lead to impaired neurodevelopment, altered brain development, altered pain thresholds, altered physiological responses, and stress or pain-related behavior beyond infancy (Williams and Lascelles, 2020).

Effective neonatal pain management entails the availability of clear evidence-based guidelines/protocols, adequate training, and the use of appropriate and accurate pain assessment tools (Mala, Forster and Kain, 2022). More importantly, the American Academy of Pediatrics AAP (2021) recommends the use of validated tools to assess neonatal pain levels accurately. This is emphasized by Sarkaria and Gruszfeld (2022)**,** Elessi et al.(2019), Parvizy et al. (2020), and Mencía et al. (2022) who also state that pain assessment is the fifth vital sign, translating that it needs to be assessed along with other vital signs. WHO (2012) asserts that quality health care entails the provision of evidence-based, safe, and patient-centered care. Yiğit et al. 2018 conclude that there are over 40 validated neonatal pain assessment tools to be adopted or adapted worldwide. Increased education for healthcare providers on the nuances of pain signals in premature neonates is crucial (Llerena et al., 2023). This study aims to assess Health Care Professionals' neonatal pain management practices at NRH and PMH neonatal intensive care units (NICUs) in Botswana.

1.3 Statement of the Problem

Sarkaria and Gruszfeld (2022) posit that the presence of pain guidelines in NICUs and nurses specializing in pain management increase the chances of pain being assessed in neonates. Furthermore, effective pain management begins with proper assessment, which requires region-specific guidelines and protocols tailored to specific contexts (Yiğit, Ecevit and Köroğlu, 2018; Elessi et al., 2019; Eriksson and Campbell-Yeo, 2019; Ikechukwu et al., 2023). However, this ideal setup is not observed at Nyangabgwe Referral Hospital (NRH) and Princess Marina Hospital (PMH) in Botswana. Pain assessment guidelines do not seem to be available in the units, as a few nurses and doctors who were asked had no knowledge of availability of pain assessment scales for neonates in the units. It has been observed that HCPs in the neonatal units of these hospitals also lack specific training in neonatal pain management, as demonstrated by the records under workshops and career progression. Anecdotal data also shows potential shortcomings in neonatal pain management at NRH and PMH, with pain assessment scores often missing from neonates' records.

A random check of several files from NRH for the years 2021 to 2023 revealed no documentation of pain assessment scores in neonates' files, where it is supposed to be documented. At PMH, only 1 (5%) file had a pain score recorded. These hospitals admit quite a large number of neonates annually. For instance, NRH admitted 680, 814 and 796 neonates in 2021, 2022, and 2023, respectively, while PMH admitted 1043, 1106, and 1140 in 2021, 2022 and 2023 respectively (Table 1). Documenting neonatal pain assessment ensures that pain is properly recognized, managed, and monitored, which is essential for improving outcomes for neonates and upholding healthcare standards. Accurate pain documentation supports comprehensive care, helps prevent errors, and is vital for both clinical practice and institutional accountability. These discrepancies prompted the researcher to conduct a study to uncover the facts surrounding this phenomenon, given the large population of neonates admitted annually, which attests to the gravity of the problem. Gaps in neonatal pain management may compromise the quality of care rendered to neonates, leading to insufficient pain relief, potentially prolonging hospital stays, and increasing healthcare costs (Eriksson and Campbell-Yeo, 2019; Johnston, 2020).

Suboptimal management of pain in neonates may also have a negative impact on the neonates, their families, and the nation at large. This underscores the critical need to investigate and improve neonatal pain management practices by HCPs at NRH and PMH to enhance neonates' health outcomes.

Table 1: Pain assessment documentation for PMH and NRH NICUs from 2021 to 2023

Hospital	Total Admissions		Number of Files Reviewed	Number of Files With Documented Pain Scores	Percentage
NRH	2021	680	20	0	0%
	2022	814	20	0	0%
	2023	796	20	0	0%
PMH	2021	1043	20	0	0%
	2022	1106	20	0	0%
	2023	1140	20	1	5%

(Source: NRH and PMH NICUs Record, 2021 to 2023)

1.4 Justification of the Study

Literature alerts that neonates feel pain and need to be assessed and managed for it (Popowicz et al., 2021; Campbell-Yeo, Eriksson and Benoit, 2022). Various studies have shown persistent gaps in neonatal pain management practice, particularly in low and middle-income countries (LMICs) and referral hospitals with disparity between theory and practice. Therefore, findings of this endeavor will establish baseline information about the current neonatal pain management practices and associated factors in management of pain in neonates by HCPs at NRH and PMH. The study will inform targeted interventions, identify specific areas for improvement and develop contextually relevant strategies to enhance neonatal pain management at NRH and PMH.

It will also contribute to the body of knowledge by adding valuable insights to the limited research in LMICs' referral hospitals on neonatal pain management. The study will improve patient care by enhancing neonatal pain management practices which has a positive impact on the well-being and long-term outcomes of neonates at NRH and PMH. Moreover, it will impact policymaking as the study results will inform the development of national and regional guidelines on neonatal pain management especially in LMICs settings, promoting evidence-based practices and improved patient care. This study therefore, assessed neonatal pain management practices of HCPs concerning management of pain in neonates at NRH and PMH in Botswana.

1.5 Theoretical Model

This study was guided by Bernard Weiner's Attribution Theory (1976), which explores how individuals attribute success and failure to different factors and how these attributions influence behavior. Weiner's model identifies three key dimensions, locus of control, stability, and controllability, which individuals use to explain success or failure (Weiner, 2010). In the context of this study, the locus of control dimension was used to analyze the factors that healthcare professionals at Nyangabgwe Referral Hospital and Princess Marina Hospital in Botswana may attribute to their neonatal pain management practices. The researcher analyzed data related to internal factors (such as knowledge and formal training) and external factors (such as protocols availability, and pain relievers. The study assessed how these factors are associated with HCPs' neonatal pain management practices, providing insights into the internal and external influences that affect their practice.

1.5.1 Factors influencing pain management among health care professionals

1.5.1.1 Internal Factors

Internal factors, such as knowledge and formal training, are perceived as within an individual's control and are called individual factors. In this study, HCPs with better knowledge and formal training in neonatal pain management are likely to have good neonatal pain management practices compared to those with less knowledge or not trained.

1.5.1.2 External Factors

External factors, such as the availability of protocols for neonatal pain management and pain relievers, are beyond an individual's control, hence are called organizational factors. Princess Marina and Nyangabgwe Referral Hospitals are responsible for the supply of protocols for neonatal pain management and pain relievers. Health Care Professionals who have access to neonatal pain management protocols and have sufficient pain relievers are more likely to have good neonatal pain management practices than those who do not have.

Conceptual Framework

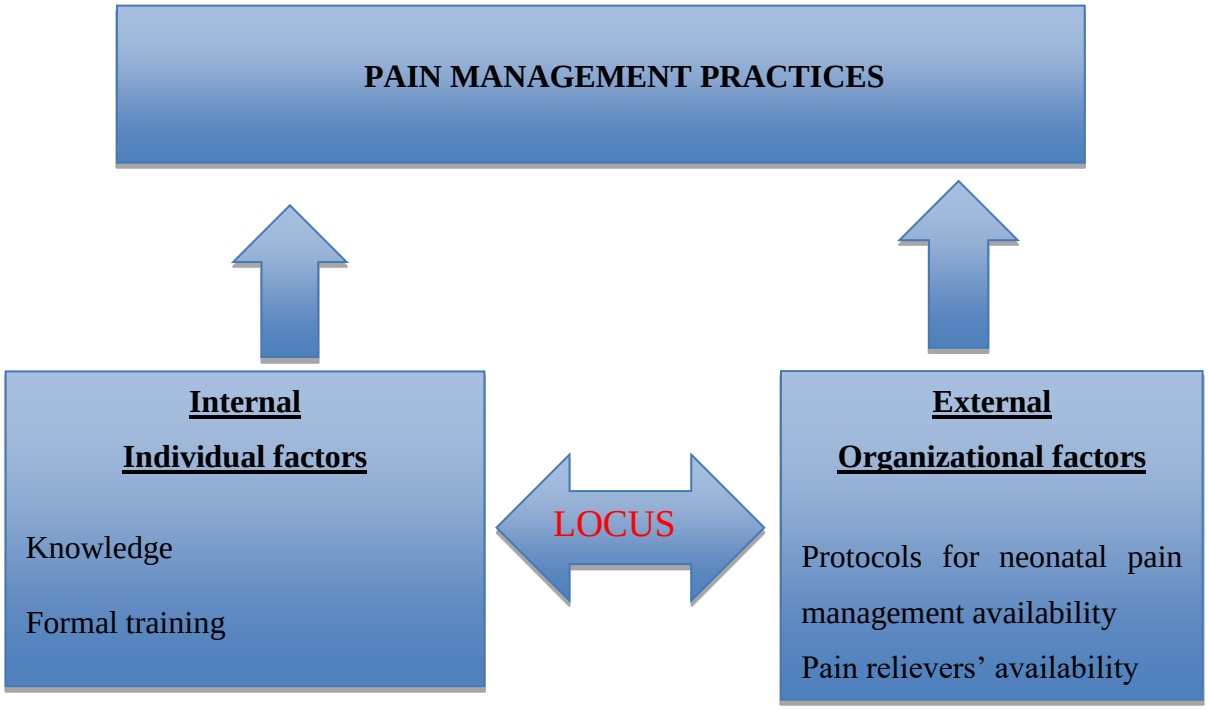

Figure 1: Conceptual framework (Adapted from Weiner [2010])

1.6 Research objectives

1.6.1 General Objective

To assess neonatal pain management practices of healthcare professionals in the Neonatal Intensive Care Units of NRH and PMH in Gaborone and Francistown, Botswana.

1.6. 2 Specific Objectives

1. To determine neonatal pain management practices by HCPs at NRH and PMH NICUs.
2. To identify factors associated with neonatal pain management practices by HCPs at NRH and PMH NICUs.

1.7 Null Hypothesis

There is no association between neonatal pain management practices and internal factors and external factors by HCPs at NRH and PMH.

1.8 Research Variables and Cut-off Points

1.8.1 Research Variables

1.8.1.1 Dependent variable

Pain management practices

1.8.1.2 Independent Variables

Protocols availability

Knowledge

Formal training

Pain relievers availability

1.8.2 Variables and Cut-Off Points

Table 2: Variables, Indicators, and Cut-off Points

Variable	Conceptual Definition of Variables	Operational Definition of Variables	Indicator	Cut-Off Points	Level of Measure	Qn #
Dependent Pain management Practices	Encompasses the strategies and interventions used by HCPs to alleviate, minimize, or prevent pain in neonates *(*Allegaert and Anker, 2016).	Consistent use of recognized pain assessment scale to evaluate and manage neonatal pain by HCWs	Good	Score of 80% and above on practice questions. (Jember et al. (2024).	Dichotomous	6-10
			Poor	Score below 80% on practice questions. (Jember et al. (2024).		
Independent Protocol availability	Refer to systematic guidelines or procedures for evaluating pain in specific clinical contexts (Trottier et al., 2022).	Presence and accessibility of standardized, written protocols that provide direction on the assessment, management, and treatment of neonatal pain.	Yes	Fully established and used protocols.	Dichotomous	11-12
			No	No fully established protocols exist or used.	Dichotomous	

Knowledge	Information, understanding, and skills that HCPs gain through education or experience (Wari et al., 2021).	Ability to recognize that neonates experience pain, understand the effects of pain on vital signs and development.	Knowledgeable Not knowledgeable	Score more than 80% on knowledge questions (Jember et al. (2024). Score less than 80% on knowledge questions (Jember et al. (2024).	Dichotomous	13-21
Formal training received	Deliberate, planned, institutionalised education accepted by private institutions and can be acquired that is through public organisations (Sukholova, 2020).	Training received from recognized channels, designed to provide specific knowledge related to assessing and managing neonatal pain.	Yes No	Formal, comprehensive training received No formal, comprehensive training received	Dichotomous	22-23
Pain relievers availability	Medications or drugs that stop a person from feeling pain (Trottier et al., 2022).	Pharmacological or non-pharmacological interventions used to alleviate pain in neonates.	Yes No	Stating the available pain relievers Unable to state the available pain relievers.	Dichotomous	24-25

1.9 Summary

This is a summary that gave the background information to the topic, statement of the problem, justification of the study, conceptual framework, objectives, hypothesis, and lastly research variables and cut-off points. The study presented a structured framework for conducting this research, leveraging a quantitative method to gather data.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter presents literature review for the study, which included an overview of neonatal pain, summary of the reviewed literature on key variables, and an overall conclusion. Literature review provided essential background for understanding neonatal pain management practices by healthcare professionals. It also helped establish foundational knowledge on the topic while identifying gaps in existing research. Keywords used to search for relevant information included "neonates and pain," "neonatal pain assessment tools," and "pain management in neonates." Sources for this literature review were drawn from both local and international publications, such as books, and articles accessed through databases and search engines like Google Scholar, PubMed, Research4Life, HINARI, and CINAHL.

2.2 Overview of Neonatal Pain

Neonatal pain is understood differently by various scholars. For instance, Cohen et al. (2018) define pain as a somatic experience recognized mutually, which signals a threat to an individual's bodily or existential integrity. In contrast, the 2020 revised definition by the International Association for the Study of Pain (IASP) describes pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage (Raja et al., 2020). This definition emphasizes that pain exists when the person who is experiencing it says it does, which has implications for neonates who cannot express themselves verbally. For these nonverbal individuals, pain can be assessed using other validated indicators (Stevens, 2021; Mencía et al., 2022). While it's universally recognized that all babies experience pain, those who are smaller or sicker are particularly vulnerable to painful procedures. Pain receptors begin developing as early as 20 weeks of gestation, and by this time, fetuses already have a comparable number of pain receptors to those found in adults (Tucker et al., 2023). Physiology of pain according to De Ridder et al. 2011, cited in De Ridder et al. 2021 is as thus:

“A stimulus produces an effect on the different sensory receptors, which is being transmitted to the sensory cortex, inducing sensation. Further processing of this sensory stimulation by other brain networks such as the default mode, salience network, and front-parietal control network generates an internal representation of the outer and inner world called a percept. Perception can thus be defined as the act of interpreting and organizing a sensory stimulus to produce a meaningful experience of the world and oneself".

According to Xia et al. (2020), infants inevitably experience numerous painful interventions. In fact, Grunau (2020) reported that neonates in NICUs endure an average of 8 to 17 painful procedures each day, many of which can be moderate to severe. This frequent exposure to pain is particularly concerning for very preterm infants, as studies by Grunau (2020) and Van Dokkum et al. (2021) highlight the potential for long-term negative effects, impacting cognitive, motor, and emotional development, as well as brain structure, imaging outcomes, and even epigenetic changes. Given the profound developmental consequences, Wari et al. (2021) emphasize that preverbal infants communicate pain through a variety of responses, which are behavioural, physiological, and biochemical. Physiological effects may include tachycardia, fluctuations in blood pressure, increased oxygen consumption, and hypoxemia. Behaviourally, neonates may show facial grimacing or crying, while biochemical reactions could involve limb withdrawal and back arching (Yiğit et al., 2018). These observations underscore the critical need for HCPs to use reliable pain measurement tools. As Elessi et al. (2019) suggest, observational scales that assess both physiological and behavioural responses are invaluable for ensuring accurate pain assessment in this vulnerable population.

2.3 Pain management Practice

Neonatal pain management is critical for providing optimal care, and the cornerstone of this process lies in accurately assessing and measuring pain levels (Mala et al., 2022; Ikechukwu Angela and Augustine, 2023; Roga et al., 2023). Leading health organizations, including the American Academy of Paediatrics, AAP (2021) along with researchers like Elessi et al. (2019), Campbell-Yeo et al. (2022) and Mencía et al. (2022), recommend using validated tools for precise neonatal pain assessment. Yiğit et al. (2018) noted that there are over 40 validated tools available; however, the researcher has observed a lack of such tools at both NRH and PMH.

Commonly used tools by healthcare providers include the Neonatal Infant Pain Scale (NIPS), Neonatal Facial Coding System (NFCS), Neonatal Pain, Agitation, and Sedation Scale (N-PASS), the Cry, Required Oxygen, Increased Vital Signs, Expression, Sleeplessness Scale (CRIES), and the COMFORT Scale.

Studies from some European countries highlight a higher prevalence of pain assessment; France at 100%, the Netherlands at 80%, and Belgium at 75% (Sarkaria and Gruszfeld. 2022) . This points to a more consistent practice of neonatal pain assessment in these countries, which could be influenced by various factors impacting healthcare providers' approaches like use of pain assessment scales and knowledge of neonatal pain management. On the other hand, Popowicz et al. (2021) in Poland found that only a small number of medical centres actually use standardized assessment methods. This suggests that, even with recommendations and multiple pain assessment tools, neonatal pain is often inadequately assessed. Agakidou et al. (2021), who conducted a cross-sectional survey in Greece with the aim to explore changes in physicians' perceptions and practices regarding neonatal pain management, found that neonatal pain management practices were suboptimal, leading to the recommendation that globally accepted management protocols should be adopted, alongside continued education and the routine application of pain assessment tools to improve procedural pain management practice in neonates.

A study conducted in China by Qiao et al. (2019) revealed that more than 50% of neonates in domestic NICUs undergo frequent painful procedures without adequate pain relief. This suggests that some healthcare providers in China may still hold misconceptions about neonatal pain, or may not be fully aware of the importance of proper pain management. A quantitative study conducted in Rwanda to assess the knowledge, attitudes, and practices of nurses and midwives involved in neonatal pain management at two hospitals in Kigali revealed that many nurses and midwives lacked adequate knowledge of neonatal pain management and rarely incorporated pain management practices into their work. This gap underscores the need for education to enhance their ability to assess and manage neonatal pain effectively (Muteteli, Tengera and Gowan, 2019).

However, the study's limitation lies in its focus on nurses and midwives, excluding other key members of the healthcare team, such as medical officers and physicians, who also play an active role in neonatal care. This could limit the generalizability of the findings, especially in settings like Botswana, where nurses may not initiate pharmacological pain management, potentially resulting in poor pain management practices. A study conducted in Nyanza and Western Kenya revealed that only a few nurses use both pharmacological and non-pharmacological pain management strategies in neonatal pain management, with rare assessment of pain. The study recommended enhancing nurses' knowledge and awareness of neonatal pain to improve their practices (Okiri, Kiperemero and Mukabana, 2023). Similar studies by Mala, Forster and Kain (2022), Ikechukwu, Angela and Augustine (2023) and Roga et al. (2023) explored neonatal pain management practices among healthcare providers in newborn units. The studies found discrepancies between healthcare providers' understanding of pain and their practice, suggesting a need for further training in proper neonatal pain management techniques.

Roga et al. (2023) outlined a range of pharmacological methods for treating neonatal pain, including topical anaesthetics such as lidocaine, tetracaine, and liposomal lidocaine, as well as acetaminophen, local anaesthetics like lidocaine injections, and sedative medications such as morphine, fentanyl, and ketamine. In addition, non-pharmacological approaches commonly used include oral sucrose, breast and kangaroo care, feeding, swaddling, facilitated tucking, non-nutritive sucking, and positioning. Recent studies, Sharara-Chami et al. (2022), also emphasize the effectiveness of music in managing neonatal pain. Empirical evidence suggests that combining pharmacological and non-pharmacological methods often yields synergistic effects, enhancing pain management. Despite this, a lack of adequate knowledge about neonatal pain management remains a barrier to optimal practices, which can compromise long-term outcomes for neonates (Mala, Foster and Kain, 2022; Wari et al., 2021). On a more positive note, Kebede et al. (2023) in Eastern Ethiopia found relatively high levels of good neonatal pain management practices, particularly in public hospitals. This improvement was linked to the availability of pain management protocols, guidelines, in-service training, and access to analgesics.

In Ghana, Wuni et al. (2020) reported that 57.8% of healthcare providers demonstrated good neonatal pain management practices while 42.2% demonstrated poor practice. However, in Botswana, a study by Matula et al. (2022) on paediatric pain management in hospitalized children found that pain was not consistently documented in patient files at NRH and PMH. The most commonly used analgesic for children (2 months to 13 years old), was acetaminophen, regardless of the source of pain. The reasons behind the lack of pain assessment and documentation at these hospitals remain unclear. These findings point to a significant gap in both the assessment and management of pain in the paediatric populations in Botswana. Notably, the researcher found no studies focusing specifically on neonatal pain management in Botswana.

2.4 Factors Influencing Neonatal Pain Management

Several studies have identified both individual and organizational factors that influence HCPs' management of neonatal pain (Koskenvuori et al., 2019; Blomqvist et al., 2020; Kusi Amponsah et al., 2020; Neshat et al., 2023; Roga et al., 2023). Individual factors include the healthcare provider's professional role, the level of formal training in neonatal pain management, and their overall knowledge of pain management techniques. Organizational factors, on the other hand, encompass the availability of protocols, access to analgesics, and the presence of pain assessment scales within the healthcare setting.

2.4.1 Individual Factors

2.4.1.1 Knowledge

Several studies, both international and local, have highlighted limited knowledge HCPs often have regarding neonatal pain management (Mala, Foster and Kain, 2022; Ikechukwu, Angela and Augustine, 2023; Roga et al., 2023). According to Agakidou et al. (2021), this knowledge gap can significantly hinder the effective assessment and treatment of neonatal pain.

Therefore, assessing HCPs' knowledge in neonatal pain management is crucial, particularly in low- and middle-income countries (LMICs) like Botswana, where NICUs may rely on unspecialized nurses.

A study conducted in Poland by Popowicz et al. (2021) found that while most HCPs had knowledge on neonatal pain management, many believed that neonates, particularly preterm infants, were less susceptible to pain due to their underdeveloped immune system, indicating a knowledge gap. Moreover, despite the availability of pain assessment tools in the units, only a few centres used standardized tools. While these findings are valuable, they may not be directly applicable to Africa, given the regional and cultural differences. A study in Botswana could provide more relevant data, informing policymakers to develop region-specific interventions. In Iran, Parvizy et al. (2020) found that training had a positive effect on paediatric nurses' knowledge, attitudes, and self-efficacy regarding pain management. However, the study also revealed that these areas were still inadequate and needed further improvement through training workshops. It was recommended that pain management should be incorporated into nursing curricula and in-service training to enhance the skills of healthcare professionals.

Wari et al. (2021) in Addis Ababa, Ethiopia, found that 68.7% of nurses had adequate knowledge about neonatal pain management, while 31.3% had inadequate knowledge. A positive association between knowledge and practice was reported, whereby nurses who had adequate knowledge were 12.8 times (AOR=12.08; 95% CI, 2.48- 32.78) more likely to have good neonatal pain management practices than those who had inadequate knowledge. Similar findings were reported by Kebede et al. (2023) who found the odds of good neonatal pain management for HCPs with knowledge to be 1.51times (AOR=1.511; 95% CI, 0.88-2.59).

In Nigeria, a study revealed that 67.1% of doctors and 57.1% of nurses were aware of neonatal pain management (Ikechukwu, Angela and Augustine, 2023). This finding reflects a relatively low level of awareness and highlights existing shortcomings in pain management. This study, however, used descriptive statistics that did not explore associations between variables, limiting the ability to gauge the impact of specific factors on outcomes. The current study will examine the associations between neonatal pain management practices and factors influencing it. A study in Ghana found that 61.1% of healthcare providers demonstrated good knowledge of neonatal pain management while only 39.9% had poor knowledge (Wuni et al., 2020). This results recognise the importance of pain management in neonates in some lower and middle income African countries.

As an upper middle income country, Botswana should also be making efforts in this area, which is why this study is important. However, the Ghanaian study focused on paediatrics as a whole, rather than specifically on neonates who are particularly vulnerable due to their developmental challenges. Given that smaller and sicker neonates experience more pain, a more targeted study on neonatal pain management in Botswana would be valuable.

2.4.1.2 Formal training

A study conducted in Rio de Janeiro, Brazil, aimed at assessing barriers in the management, evaluation, and treatment of neonatal pain, found that 66.3% of healthcare professionals (HCPs) reported having received training on neonatal pain management during their vocational and undergraduate training (Christoffel et al., 2019). Despite this, HCPs indicated that they continued to rely more on management directives and guidance from colleagues. This suggests that while formal education is important, there remains a strong need for protocols, guidelines, and ongoing training to support effective neonatal pain management. The study focused on barriers alone, however, and did not explore other factors that could facilitate better practices, such as support systems or access to resources. A study focusing on the general factors that influence HCPs' management of neonatal pain might provide more comprehensive insights.

In Iran, studies emphasize the need for continuous education and empowerment in neonatal pain management both before and after staff members enter neonatal intensive care units (Mehrnoush et al., 2018; Neshat et al., 2023). Similarly, Wari et al., (2021) found that nurses who attended college or university and received training in neonatal pain management were nearly three times more likely to exhibit good practices compared to those without such training (AOR = 2.96; 95% CI, 1.21–7.22). This indicates that formal training in neonatal pain management is essential to building HCPs' knowledge and competencies. These results are consistent with studies conducted by Abebe et al. (2024) in Ethiopia, which reported that HCPs who received training in neonatal pain assessment and management were more than twice as likely to implement good pain management practices (AOR = 2.26; 95% CI, 1.259–4.07). Similarly, Kebede et al. (2023) found that HCPs trained in neonatal pain management were 2.12 times more likely to demonstrate good pain management practices (AOR = 2.21; 95% CI, 1.15–3.91).

Wuni et al. (2020) in Ghana found that healthcare providers without formal training had lower odds of practicing good pain management compared to those who had received training (AOR = 0.92; 95% CI, 0.48–1.75). Further reinforcing the importance of training, Roga et al. (2023) and Abebe et al. (2024) found that e-learning programs were more effective than no training at all, with 64.6% able to properly manage neonatal pain. This underscores the critical role of training in improving neonatal pain management. Similarly, a study in Rwanda by Muteteli et al. (2019) highlighted that the lack of training contributed to poor neonatal pain management. Proper training helps HCPs develop the understanding, skills, and confidence necessary for managing pain in neonates effectively. In Kenya, a study by Tagele, Tengera and Gowan (2023) indicated that neonatal pain management was more effectively practiced by nurses with advanced educational backgrounds and those who participated in in-service training. These findings emphasize that education levels and ongoing training significantly influence HCPs' attitudes and practices in neonatal pain management.

2.4.2 Organizational factors

Across the globe, healthcare accreditation bodies have expanded the focus of pain management from being an individual responsibility to an organizational issue, highlighting the importance of healthcare organizations in ensuring safe and effective care (Neshat et al., 2023). The role of organizations in enhancing the quality of neonatal pain management is crucial, as they create a context that enables the effective application of knowledge and best practices. This organizational support, including the implementation of policies, training, and resources, is essential for improving outcomes in neonatal pain management.

2.4.2.1 Protocols availability

Ulmer et al. (2022) in Germany explored the existence and application of Standard Operating Procedures (SOPs) for pain management in 76 German NICUs and found that only 71.1% of the NICUs reported the presence of written SOPs in their units. Even though these SOPs were present, the study revealed that they were not always used in neonatal pain management. Reluctance in implementation of SOPs could be due to lack of knowledge and training on how they are used. As this study was conducted in a more developed country, it becomes difficult to generalise the results to low resourced countries like Botswana where contexts may be different.

Therefore the current study sought to assess the situation in Botswana in order to come up with tailored recommendations. A study conducted in Brazil by Christoffel et al. (2019) showed that only 23.8% of technicians, 31.8% of nurses, and 5% of physicians reported the presence of pain management protocols, including neonatal pain scales. This discrepancy suggest that some healthcare professionals may not have been aware of the available protocols, which could lead to improper pain management. This lack of awareness could also be an issue in Botswana and that's why this study needs to be conducted. Popowicz et al. (2021) in Poland reported that 40.7% of respondents were aware of the pain management protocols and procedures in their departments. The majority of midwives and nurses also found the protocols to be clear and understandable. In cases where pharmaceutical methods were insufficient, medical professionals routinely incorporated non-pharmacological pain management techniques into their practice. This is a more reassuring result with regard to neonatal pain management. According to Popowicz et al. (2021), nurses and midwives most commonly used the following pain assessment tools, in order of frequency: Cry, Requires Increased Oxygen Administration, Increased Vital Signs, Expression, Sleeplessness (CRIES), Neonatal-Pain, Agitation and Sedation Scale (N-PASS), and Neonatal Infant Pain Scale (NIPS).

The use of pain assessment scales was linked to improved pain management. However, more than half of the study participants did not use the recommended instruments, which could lead to an underestimation or overestimation of neonatal pain and inappropriate management. A study conducted in Swedish hospitals found that, almost half (51%) of nurses used the Astrid Lindgren and Lund Children's Hospital Pain Scale (ALPS-neo), while in the same hospitals 8% of nurses reported unavailability of pain assessment scales in their units (Carlsen Misic, Kiperemero and Mukabana (2021). The discrepancy in responses among nurses working in the same units highlight the need for better education on neonatal pain management and clearer, more accessible protocols. In Tabriz, Iran, a study involving 31 healthcare professionals revealed that HCPs working in the NICU managed neonatal pain based on personal preferences due to the absence of protocols. The professionals in this study expressed the belief that the introduction of specific protocols could improve neonatal health outcomes and promote consistent performance among healthcare providers (Neshat et al., 2021).

A study conducted in Ghana found that nurses attributed poor pain assessment and management to the lack of pain assessment protocols (Kusi Amponsah et al., 2020). In a survey conducted with 240 consultant paediatricians and residents in Nigeria, only 13.3% of respondents reported having institutional protocols for pain assessment and management at their practice sites while a staggering 86.7 % denied the presence of protocols. This shortage of institutional protocols may hinder proper neonatal pain management. Many Sub-Saharan African countries, including Botswana may face similar challenges regarding the lack of healthcare institutional protocols for neonatal pain management due to financial constraints (Suleiman et al., 2019). A randomized clinical trial conducted by Napiórkowska-Orkisz et al. (2022) tested three non-pharmacological pain management strategies for term healthy newborns. The intensity of pain was assessed using the NIPS, which is one of the most widely used pain assessment tools for neonates.

In Ghana, Kusi Amponsah et al. (2020) reported a high rate of pain tool usage among neonatal nurses, which was linked to their experience levels. The availability of pain assessment tools in units was also associated with increased usage, further emphasizing the importance of such tools in neonatal care. However, in Nigeria, Ikechukwu, Angela and Augustine (2023) found moderate awareness of pain assessment tools among doctors but poor awareness among nurses. Similarly, a study in South Africa by Mabaso et al. (2022) found that while well-established pain assessment methods and treatment guidelines were in place, they were not widely used, leading to inadequate pain management. The researcher did not find any study focusing on protocols availability locally, hence this study.

2.4.2.2 Pain Relievers Availability

A mixed methods study conducted in Brazil indicated that non-pharmacological interventions were commonly used (98.1%) for neonatal pain relief, as compared to pharmacological interventions (Maciel et al., 2019). This could be influenced by availability of pain relievers in the NICUs or the organizational priorities in place. This can also be based on individual confidence with use of the methods for relieving pain in neonates. Although this study is insightful, it was conducted in settings different from African set up so results may not represent Botswana. A study in Greece identified the most effective non-pharmacological tactics, including breastfeeding, skin-to-skin contact, sucrose, glucose, and facilitated tucking (Koukou et al., 2022).

Popowicz et al. (2021) who conducted a study in Poland revealed that some HCPs felt inadequately trained by their employers in pain management, both in terms of prophylaxis and pain management techniques. Despite these challenges, the study found that the majority of participating centres effectively managed newborn pain, leading to better outcomes. Studies by Wari et al. (2021) and Abebe et al. (2024), revealed that over 50% of healthcare professionals used pharmacological and non-pharmacological methods for pain relief in neonates, suggesting effective pain management. However, there is a contrast between these results and those of Kebede et al. (2023), who revealed that more than 80% of healthcare professionals reported unavailability of pain relievers in their NICUs. Abebe et al. (2024) also reported more than 50% of respondents revealing the absence of analgesics in the neonatal Intensive care Units. A study conducted in South Africa by Mabaso et al. (2022) reported only 10% of neonates receiving appropriate analgesia for pyrexia or undocumented indications, stating that more than 59% of neonates do not receive any analgesia at all. These findings suggest that analgesia could be frequently administered for pyrexia, but not necessarily for managing pain in neonates. Research has shown that reducing multimodal stimulation such as dimming lights and reducing noise can also alleviate pain responses during uncomfortable and traumatic procedures (Hatfield et al., 2019).

2.5 Conclusion

Research consistently showed that many HCPs in different regions, especially in LMICs such as Botswana, have limited knowledge regarding neonatal pain management, which directly affects their practices. The lack of proper training, both during formal education and through in-service training, resulted in poor implementation of pain management strategies. Moreover, the inconsistent use of pain assessment tools, such as NIPS and CRIES, further exacerbated the problem, as pain is often underestimated or overlooked. Organizational barriers, including the absence of clear protocols and pain relievers have also been identified as key factors contributing to poor practices. In some cases, healthcare providers relied on personal judgment rather than standardized practices, leading to variability in pain management. This literature highlights the need for structured interventions, including better training programs, the introduction of institutional guidelines, and the consistent use of pain assessment tools. Most of studies reviewed were descriptive and qualitative in nature.

The current study is aimed to assess the state of neonatal pain management practices in Botswana, identify specific challenges faced by healthcare providers, and determine associations between different factors influencing neonatal pain management as well as offering evidence-based recommendations. By doing so, it will contribute to improving neonatal pain management practices in Botswana and similar settings by informing policies, training programs, and the development of context specific protocols.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter highlights the Research Methodology for this study and it consists of the following: study design, study setting, study population, sample size, sampling technique, inclusion and exclusion criteria, validity and reliability, data collection tools and techniques, ethical and cultural considerations.

3.2 Study Design

This study adopted a quantitative approach with a descriptive cross-sectional design to assess the neonatal pain management practices by healthcare professionals at the Neonatal Intensive Care Units of Nyangabgwe Referral Hospital and Princess Marina Hospital. A quantitative approach was chosen because it allowed for the collection of numerical data, which was essential for analyzing patterns and trends in pain management practices (Streefkerk, 2019). The chosen design was also cost-effective and efficient for gathering information within a limited timeframe while, the descriptive nature of the study detailed the characteristics of the population and the practices being observed, which helped in offering a clear understanding of the variables associated with neonatal pain management practice.

3.3 Study Setting

The study was conducted within the NICUs of Nyangabgwe Referral Hospital in Francistown and Princess Marina Hospital in Gaborone, Botswana between October and November 2024. These hospitals were chosen because they harbor level III NICUs with highly specialized equipment and personnel, and serve as teaching hospitals. At the moment, these hospitals are the only government referral hospitals in Botswana. Francistown is the second largest town situated in the Northern part of Botswana. It is the only 24-hour government referral hospital in Francistown today and it was established in 1989. Most of the health services offered at NRH include general wards, emergency departments, theatre services, obstetrics and gynecology, neonatal and pediatric wards, Human Immunodeficiency Virus (HIV) counseling, and testing services.

The NICU at NRH provides critical care services to preterm neonates, ventilator support, and neonates with medical or surgical conditions. It has a bed capacity of 28 with four cubicles, which are Intensive Care Unit (ICU) admitting neonates needing mechanical ventilation support, high care unit for critically ill neonates not needing mechanical ventilation, high care step down unit for neonates graduating from high care, and growers and feeders cubicle for preterm neonates awaiting weight gain and discharge.

Gaborone is the capital city of Botswana located in the southern part of the country. Princess Marina Hospital is a government referral hospital harbored in the capital city and operates 24 hours as well. The hospital offers the same services as NRH which include a wide range of general and specialist services. Neonatal Intensive care Unit at PMH has a bed capacity of 38 with five cubicles. There is one ICU or cubicle which admits neonates who are critically ill needing respiratory support or mechanical ventilation, there is also a cubicle for premature neonates not needing ventilator support, a unit for sick but stable term neonates, an isolation cubicle for neonates with infectious diseases like sepsis, and a grower cubicle where preterm neonates are kept while awaiting to gain criterion weight before discharge.

3.4 Target Population

All HCPs (specialized or not specialized nurses and doctors) working in NICUs of PMH and NRH, Botswana.

3.5 Study Population

HCPs working in NICUs of NRH and PMH, directly involved with neonatal care, and who are willing to participate in the study.

3.6 Accessible Population

HCPs working in NICUs of NRH and PMH, and available during the period of data collection.

3.7 Sample Size

The sample size was determined using Taro Yamane formula, considering the finite population (Obodoh, Ubani and Obodoh, 2021). The total number of HCPs at NRH was 58 while at PMH was 70 making a total of 128 respondents.

Calculation of the sample size using the Taro Yamane formula is as follows:

Where:

1. (n) Represents the required sample size.
2. (e) The margin of error (desired level of precision) expressed as 5% or 0.05.
3. (N) The total population size.

Population Size ((N)): NRH=58 and PMH=70 **N=128**

The margin of Error ((e)): Given as 5%, expressed as a decimal, (e= 0.05).

$$n = \frac{N}{1 + N (e)^2}$$

n = 128/1+ 128(0.05)2

n= 128/1+128 (0.0025)

n= 128/ 1+ 0.32

n= 128/1.32

n= 96.97

n= 97 HCPs

The minimum sample size for this study was 97 HCPs. With a small difference between the total population and the calculated sample size, census method was used to realize a sample of 110 respondents. From the eligible participants, a total of 51 HCPs from Nyangabgwe and 59 from Princess Marina hospitals participated in the study making a total sample of 110 respondents out of 128.

3.8 Sampling Technique

A census method was used because the study population was finite. So, the census was determined by the accessible population at the time of data collection from the two study sites.

3.9 Inclusion and Exclusion Criteria

3.9.1 Inclusion Criteria

a. HCPs who provided informed consent,
b. HCPs who completed their probation period of six months and
c. HCPs both permanently employed and on contractual basis were included in the study.

3.9.2 Exclusion Criteria

a. HCPs who participated in the pilot study
b. HCPs who were busy during the period of data collection

3.10 Data Collection Tool and Technique

3.10.1 Data Collection Tool

In this study, an online structured questionnaire was used for data collection after back to back translation was done. The CHERRIES (Checklist for Reporting Results of Internet E-Surveys) statement was followed to ensure the quality and transparency of the online survey process. The questionnaire was adapted from Kebede et al., (2023) and Akuma & Jordan (2012). Use of validated questionnaires ensured that the instrument measured what it was intended to measure by improving accuracy, efficiency, and by standardizing data collection processes. The questionnaire was structured into five (5) sections as follows: section A – Socio-demographic information of HCPs; section B – Practice, C- Protocols availability, D- Knowledge, E-Formal training, F-Pain relievers' availability. The questionnaire comprised of 'yes' or 'no' and ticking the correct answer questions. The choice of online questionnaire was based on its appropriateness for gathering primary data, cost-effectiveness as well as its ability to efficiently collect information from a large number of participants in a short period of time.

3.10.2 Data Collection Techniques

Data collection was carried out over a two-week period, from October 30th to November 12th, 2024, following permission from the Institutional Review Boards (IRB) of Nyangabgwe and Princess Marina Hospitals. The researcher opted for a self-administered questionnaire due to the time constraints in the Neonatal Intensive Care Units (NICUs), where staff are often occupied with health emergencies. This approach allowed healthcare professionals (HCPs) to complete the online questionnaires at their convenience, without the need for direct interviewer assistance. The researcher initially introduced herself to the hospital Superintendents and Matrons at Nyangabgwe Referral Hospital and Princess Marina Hospital. Afterward, she met with the heads of the NICUs at both hospitals to seek permission to begin data collection.

The online questionnaire was accompanied by an online consent form, ensuring that all participants were fully informed about the study's purpose, procedures, and their rights. The consent form outlined that participation was voluntary, participants could withdraw at any time without consequence, and their responses would remain confidential. By providing the consent form online, participants were able to review and agree to the terms before completing the questionnaire. Provision of consent ensured compliance with ethical guidelines and provided transparency throughout the data collection process. A total of two general nurses from the NICUs at Nyangabgwe Referral Hospital and Princess Marina Hospital were selected and trained by the researcher over two days. The training covered the study's objectives, the informed consent process, and confidentiality. Research assistants were involved in data collection process throughout the study by sharing the questionnaires with the participants through work WhatsApp groups. Participants who required further clarification on the questions were assisted through the same platform. Once the questionnaires were completed, they were uploaded to Kobo Toolbox, where the researcher reviewed them for completeness and provided feedback as necessary. Three incomplete questionnaires were excluded from data analysis and the respondents were considered not participated in the study. Collected data was securely stored, a strong password was used, and only authorised users had access to it.

3.11 Validity and reliability

3.11.1 Validity

To ensure validity in this study, several strategies were employed. Firstly, the research questions and objectives were clearly defined, providing a focused direction for the study. This helped to establish content validity, ensuring that the research measured what it intended to measure. The survey questionnaire was also carefully designed, with items derived from existing literature and expert reviews, to enhance face validity. Furthermore, pilot testing was conducted with a small group of participants to assess the questionnaire's clarity, relevance, and effectiveness in measuring the constructs of interest. This helped to refine the questionnaire enhancing its validity. Construct validity was ensured through a comprehensive literature review, which clarified the research problem and informed the design of the questionnaire. The review also deepened the researcher's understanding of neonatal pain, guiding the inclusion of relevant variables.

Validated questionnaires from previous studies were adapted, and the draft questionnaire was reviewed by experts, including one neonatologist, six neonatal nurses, and a paediatrician, to confirm that the items accurately represented the concept of neonatal pain. These measures ensured that the tool accurately reflected the phenomena being studied. External validity was established by clearly defining the target population, setting inclusion and exclusion criteria, and determining an appropriate sample size. Due to the small sample, a census method was used, ensuring that the findings were applicable to the specific group of healthcare professionals in government referral NICUs (Findley et al., 2021). Internal validity was maintained by restricting the sample to healthcare professionals working in NICUs of two government referral hospitals of the same level (III), which minimized the risk of confounding factors. The data collection tool underwent forward-backward translation into Setswana and English with the help of language experts and clinical personnel, ensuring that language differences did not affect the study's findings. This approach controlled for extraneous variables and ensured that the relationships between the study's variables were accurately measure. Conclusion validity is defined as the degree to which, in terms of statistical concerns, research study data can be regarded as reasonably indicating a relationship (or lack thereof) between independent and dependent variables. Use of census method to select the study participants also ensured adequate representation of the study population to which inferences were made.

3.11.2 Reliability

Several methods were implemented to assure the dependability of this study. First, the survey questionnaire was pilot-tested with a small number of participants to determine its dependability. The questionnaire was then refined based on the feedback received to improve its clarity and consistency. Additionally, Cronbach's alpha was calculated to assess the internal consistency of the questionnaire. The results showed that the questionnaire had a high level of internal consistency, with a Cronbach's alpha coefficient of 0.8. By employing these strategies, the research was able to establish a high level of reliability, ensuring that the findings were consistent and dependable.

In this study, the questionnaire consisted solely of closed ended questions, as a result there was no need for coding or interpretation by multiple raters and the data collected through the online questionnaire was automatically processed and analysed using STATA (Statistics and Data) version 18, thus eliminating the need for inter-rater reliability.

3.12 Pilot study

Pilot study was conducted at the same hospitals, Nyangabgwe Referral Hospital and Princess Marina Hospital from 17th to the 26th October 2024 with 10% (9 HCPs) of the sample size based on probability proportional to size (PPS) sampling. Participants who were involved in the pilot study were excluded from the actual study to avoid potential contamination with subsequent biasness. Therefore, 6 participants from Princess Marina Hospital and 3 participants from Nyangabgwe Referral Hospital were conveniently selected to make up the pilot study and were given hard copies of the questionnaires with attached consent forms by the researcher. The completed questionnaires were uploaded on kobo Toolbox, for review by the researcher, enhancing the validity and reliability of the tool. This process helped the researcher to detect ambiguous instructions and questions, as well as unclear wording within the data collection tool. Therefore, necessary adjustments were made accordingly before the final questionnaire distribution was done. The adjustments included further instructions, adding more questions, logical sequencing and proper wording.

3.13 Data Analysis

The collected data was meticulously processed to ensure its quality and reliability. Microsoft Excel served as the primary tool for data cleansing, followed by exportation to STATA version 18 software for comprehensive statistical analysis. Upon completion of data entry, the information was summarized, organized, and visually represented through frequency tables, charts, and contingency tables. These graphical representations offer a concise overview of the dataset, facilitating easy interpretation and identification of trends. The statistical significance of associations between dichotomous variables were analysed using Chi-square test and Fisher's exact test, depending on the dataset's requirements. Variables which were significantly associated with the dependent variable were included in the regression analysis. Analyses was conducted at a 95% confidence interval with a significance level of 5%.

For the dependent variable, good practice was determined by score of 80% and above on the practice questions while those with less than 80% score were classified as having poor practices in neonatal pain management. The model was tailored to classify practice as either 1 (good practice) or 0 (poor practice). Additionally, binary logistic regression was used to explore the relationship between the dependent and independent variables. The odds ratios were calculated to assess the strength of the association between each independent variable and neonatal pain management practices.This approach provided a deeper understanding of how these variables interact.

3.14 Ethical and Cultural Considerations

Ethical clearance was obtained from the University of Zambia Biomedical Research Ethics Committee (UNZABREC) (REF. No. 5630-2024) and Biomedical Health Research Development Committee (BHRDC) (REF. No. HPRD: 6/14/1). Researcher registration was obtained from National Health Research Authority (NHRA), registration number NHRAR-R-1493/15/04/2024. Authorization to conduct the study was secured from Princess Marina Institutional Review Board (REF: PMH 2/11A II (496), and Nyangabgwe Referral Hospital Institutional Review Board (NH/PF 1171) as well as the Hospital Superintendents of the two study sites. Emphasis was placed on voluntary participation, anonymity, and the confidentiality of the information and all study participants provided informed consent. Participants were further informed of their right to withdraw from the study at any time without penalty. They were also made aware of the study's duration, potential benefits and risks, and provided with the researcher's contact details for ease of communication. Throughout the study, the researcher adhered to ethical principles, including justice, non-maleficence, veracity, and respect for human dignity.

CHAPTER FOUR

PRESENTATION OF RESULTS

4.1 Introduction

This chapter presents information on how data collected from 110 HCPs was presented. The data were summarized, organized, and presented clearly through frequency tables and contingency tables. This approach provides a clear and concise summary of the results, making the findings more comprehensible. Frequency tables systematically break down responses, while contingency tables illustrate the relationships between variables. The chapter also presents the associations between categorical independent variables such as gender, age group, profession, knowledge, and level of education and practice.

4.2 Socio-demographic Characteristics of Respondents

The results of the socio-demographic characteristics of the respondents are shown in table 4.1.

Table 4.1: Socio-demographic Characteristics of Respondents (N=110)

VARIABLE	NUMBER	PERCENTAGE
SITE		
Nyangabgwe	51	46%
Princes Marina Hospital	59	54%
GENDER		
Female	92	84%
Male	18	16%
AGE GROUP		
18-25 years	19	17%
26-35 years	38	35%
36-45 years	37	34 %
46 years and above	16	15%
RELIGIONS		
Christian	108	98%
Muslim	1	1%

Botswana Traditional Religion	1	1%
PROFESSION		
Medical Officer	46	42%
Registered Nurse	52	47%
Pediatrician	12	11%
WORK EXPERIENCE		
5 years and above	57	52%
Between 2 and 5 years	18	16%
Between 1 -2 years	35	32%
EDUCATIONAL LEVEL		
Diploma	53	48%
Degree	40	36%
Masters	17	15%

(Source: Author's own analysis, 2025)

The results in table 4.1 indicate that most participants were from Princess Marina Hospital (54%) and predominantly female (84%). The largest age groups were 26 to 35 years (35%) and 36 to 45 years (34%). Nurses formed the majority of participants (47%), and over half (52%) had more than five years of work experience. In terms of education, most participants held diplomas (48%) or degrees (36%). These findings highlight a workforce with significant representation of nurses, experienced staff, and a relatively young age profile.

4.3 Pain Management Practices of the respondents

The results of pain management practices of respondents are presented in table 4.2

Table 4.2: Pain Management Practice of the Respondents (N=110)

Variable	**Number**	**Percentage**
I use a scale to assess pain in neonates		
No	41	37
Yes	69	63
Total	**110**	**100**
I record newborn pain scores on their medical chart.		
No	106	96
Yes	4	4
Total	**110**	**100**
I use more than one non-pharmacological management to relieve the pain of newborns.		
No	40	36
Yes	70	64
Total	**110**	**100**
I use pharmacological and non-pharmacological combined to relieve pain in newborns.		
No	3	3
Yes	107	97
Total	**110**	**100**
I read pain management guidelines		

No	46	42
Yes	64	58
Total	**110**	**100**
Total Score for Neonatal pain Management Practices		
Good practices	87	79
Poor practices	23	21
Total	**110**	**100**

(Source: Author's own analysis, 2025)

Table 4.2 shows that 63% of the respondents reported using a scale to assess pain in neonates, while 37%) indicated that they did not. Despite this, a vast majority (96 %,) acknowledged not recording newborn pain scores on their medical charts, with only 4% doing so. Furthermore, 64% reported using more than one non-pharmacological method to relieve neonatal pain, whereas 36% did not. Additionally, an overwhelming majority (97%) stated they combine both pharmacological and non-pharmacological methods to relieve neonatal pain, with only 3% relying on a single approach. Regarding familiarity with guidelines, 58% of the respondents stated they read pain management guidelines, while 42% did not. Overall, 79% of the respondents demonstrated good practices in neonatal pain management, indicating general adherence to recommended standards, while 21% exhibited poor practices. This highlights the need for improvement, particularly in documenting pain scores and enhancing familiarity with pain management guidelines.

4.4 Protocols of Pain Management Availability

Responses on the availability of neonatal pain management protocols are shown in table 4.3.

Table 4.3: Protocols of pain Assessment and Management Availability (N=110)

Variables	**Number**	**Percentage**
Availability of pain management protocols and guidelines		
No	7	6
Yes	103	94
Total	**110**	**100**

(Source: Author's own analysis, 2025)

Table 4.3 highlights the widespread availability of neonatal pain management protocols among respondents, with the majority (94%) indicating that such protocols were in place. Only 5% respondents denied the presence of pain management protocols in the NICUs. This high percentage suggests that most healthcare units recognize the importance of structured approaches to managing neonatal pain, which is crucial for ensuring consistent and effective care. The availability of these protocols reflects a commitment to evidence-based practices and the prioritization of neonatal pain management in healthcare settings.

4.5 Type of Pain Assessment Scales Available

Responses on pain assessment scales availability are shown in table 4.4.

Table 4.4: Pain Assessment Scales Availability (N=110)

Variables	Number	Percentage
Neonatal Pain, Agitation, and Sedation Scale (N-PASS)		
No	43	39
Yes	67	61
Total	**110**	**100**
Cry, Requires increased oxygen, Increased vital signs, Expression, Sleepless (CRIES)		
No	103	94
Yes	7	6
Total	**110**	**100**
Neonatal Facial Coding Systems (NFCS)		
No	106	96
Yes	4	4
Total	**110**	**100**
Face, Legs. Activity, Cry, Consolability (FLACCS)		
No	106	96
Yes	4	4
Total	**110**	**100**

(Source: Author's own analysis, 2025)

The results in table 4.4 revealed that the Neonatal Pain, Agitation, and Sedation Scale (N-PASS) was the most commonly used tool, with 61% of participants reporting its use. In contrast, the CRIES scale was used by only 6% of participants, while both the Neonatal Facial Coding Systems (NFCS) and FLACC scale were utilized by just 4% each. These findings suggest that while N-PASS is the preferred tool for assessing neonatal pain, the adoption of other pain assessment tools remains very limited.

4.6 Knowledge of Respondents

Responses on knowledge of respondent are presented in table 4.5

Table 4.5: Knowledge of Respondents on Neonatal Pain Management (N=110)

Variables	**Number**	**Percentage**
Do Neonates feel pain?		
No	6	5
Yes	104	95
Total	**110**	**100**
Is Pain considered a vital sign?		
No	15	23
Yes	85	77
Total	**110**	**100**
Can pain affect a newborn's heart rate, blood pressure, respiratory rate, temperature, oxygen saturation, and intracranial pressure?		
No	2	2
Yes	108	98
Total	**110**	**100**
Can light and noise affect a newborn's reaction to pain?		
No	20	18
Yes	90	82
Total	**110**	**100**
Is use of scales for pain assessment important to the practice?		
No	12	11
Yes	98	89

Total	**110**	**100**
Doe pain management in neonates depend on its assessment?		
No	21	19
Yes	89	81
Total	**110**	**100**
Do you think newborns subjected to repeated painful procedures may have harmful effects on their development?		
No	35	32
Yes	75	68
Total	**110**	**100**
Do you feel analgesics may be too dangerous for neonates?		
No	61	55
Yes	49	45
Total	**110**	**100**
Do you feel confident in providing pain management in the NICU?		
No	42	38
Yes	68	62
Total	**110**	**100**
Total Score of the Level of Knowledge		
Knowledgeable	85	77
Not knowledgeable	25	33
Total	**110**	**100**

(Source: Author's own analysis, 2025)

Table 4.5 highlights that the majority of respondents (95%) recognized that neonates feel pain, with 5% disagreeing. On whether pain is considered a vital sign, 77% responded affirmatively, while 23% disagreed. Regarding whether pain has impact on a newborn's heart rate, blood pressure, respiratory rate, temperature, oxygen saturation, and intracranial pressure, nearly all respondents (98%) agreed, and 2% disagreed. A significant 82% of respondents acknowledged that light and noise affect a newborn's reaction to pain, while 18% disagreed. On the importance of using scales for pain assessment, 89% of participants affirmed its significance, while 11% did not. Overall, 77% of participants were classified as knowledgeable about neonatal pain management, while 23% were classified as not knowledgeable. These findings indicate a generally high level of awareness among participants regarding neonatal pain and its management.

4.7 Formal Training status of Respondents

Responses on formal training status of the respondents are presented in table 4.6.

Table 4.6: Formal Training of Respondents (N=110)

Variables	**Number**	**Percentage**
Formal training of respondents		
No	72	65
Yes	38	35
Total	**110**	**100**

(Source: Author's own analysis, 2025)

Table 4.6 reveals that while few (35%) respondents have received formal training on neonatal pain management, majority (65%) have not, indicating a gap in knowledge or skills among some healthcare professionals.

4.8 Pain Relievers Availability

4.8.1 Pharmacological Pain Relievers

Responses on pharmacological pain relievers' availability are shown on table 4.7

Table 4.7: Pharmacological Pain Relievers Availability (N=110)

Variables	**Number**	**Percentage**
Pharmacological interventions		
Morphine		
No	53	48
Yes	57	52
Total	**110**	**100**
Fentanyl		
No	82	74
Yes	28	25
Total	**110**	**100**
Acetaminophen		
No	42	38
Yes	68	62
Total	**110**	**100**
Brufen		
No	109	99
Yes	1	1
Total	**110**	**100**

(Source: Author's own analysis, 2025)

Data in table 4.7 revealed the distribution of pharmacological pain relievers used in neonatal pain management. Morphine was used by 52% of the respondents, while 48% did not use it. Fentanyl was used by only 25%, with 74% not using it. Acetaminophen was more commonly used, with 62% of participants reporting its use, while 38% did not. Brufen was rarely used, with only 1% of participants indicating its use, while 99% did not. These findings suggest a preference for acetaminophen and morphine over other pharmacological options for managing neonatal pain.

4.8.2 Non-Pharmacological Pain Relievers Availability

Responses on non-pharmacological pain relievers availability is shown on table 4.8

Table 4.8: Non-Pharmacological Pain Relievers Availability (N=110)

Variables	**Number**	**Percentage**
Non-pharmacological interventions		
Breastfeeding		
No	30	27
Yes	80	73
Total	**110**	**100**
Sucrose		
No	95	86
Yes	15	14
Total	**110**	**100**
Facilitated tucking		
No	59	54
Yes	51	46

Total	**110**	**100**
Rocking		
No	108	98
Yes	2	2
Total	**110**	**100**
Change position		
No	106	96
Yes	4	4
Total	**110**	**100**

(Source: Author's own analysis, 2025)

Table 4.8 on non-pharmacological pain relief interventions shows that breastfeeding was commonly used, with 73% of participants reporting its use. In contrast, sucrose was used by only 14%, while 86% did not use it. Facilitated tucking was employed by 46% of participants, while 54% did not use this technique. Rocking and position changes were rarely used, with 98% and 96% of participants, respectively, not using these methods. These results indicated a strong preference for breastfeeding as a non-pharmacological intervention, with other methods like sucrose and facilitated tucking being less commonly utilized.

4.9 Neonatal Pain Management Practices vs Socio-demographic Characteristics of Respondents

Table 4.9 presents the results of the chi-square test, examining the associations between neonatal pain management practice and socio-demographic characteristics of respondents.

Table 4.9: Pain Management Practices vs Socio-demographic Characteristics (N=110)

Variables	Neonatal pain management Practices				P-value*
	Poor		Good		
	(No)	(%)	(No)	(%)	
Gender					0.955[FE]
Female	21	19	71	65	
Male	4	4	14	13	
Age group					0.797 X^2
18 to 25 years	3	3	16	15	
26 to 35 years	8	7	30	27	
36 to 45 years	10	9	27	25	
46 years and above	4	4	12	11	
Religions					0.008[FE]
Christian	23	21	85	77	
Other	2	2	0	0	
Professional Experience					0.234 X^2
Medical Officer	11	10	35	32	

Nurse	14	13	38	35	
Pediatrician	2	2	10	9	
Work Experience					0.014 X^2
5 years and above	18	16	39	35	
between 1 and 2 years	2	2	33	30	
between 2 and 5 years	5	5	13	12	

(Source: Author's own analysis, 2025) FE= Fisher`s Exact test

*Indicates significant p-value at $p < 0.05$ P-value: Probability value $X^{2:}$ Pearson's Chi- Squared Test

Table 4.9 shows that there was statistically significant association between neonatal pain management practices and religion of the HCPs ($p = .008$). However, there was no statistically significant association between neonatal pain management practices and gender of the HCPs ($p = .955$), age group ($P = .797$), and professional experience ($P = .234$). Although there was a statistically significant association between neonatal pain management practices and work experience of the HCPs ($p = .014$), the data failed the X^2 test of association.

4.10 Neonatal Pain Management Practices vs Independent variables

Table 4.10 presents the results of the chi-square test, examining the associations between neonatal pain management practices and the independent variables.

Table 4.10: Pain Management Practices vs Independent Variables (N=110)

Variables	Neonatal pain management Practices				P-value*
	Poor		Good		
	(No)	(%)	(No)	(%)	
Pharmacological interventions					0.599[FE]
No	3	3	7	6	
Yes Total	22	20	78	71	
Total	25	23	85	77	
Nonpharmacological interventions					*0.047[FE]
No	0	0	12	11	
Yes	25	23	73	66	
Total	25	23	85	77	
Knowledge					*0.043[FE]
Not knowledgeable	25	23	2	2	
Knowledgeable	0	0	83	75	
Total	25	23	85	77	
Formal training					*0.025[FE]
No	14	13	58	53	
Yes	11	10	27	25	
Total	25	23	85	78	
Protocols					*0.042[FE]
No	1	1	6	5	
Yes	24	22	79	72	
Total	25	23	85	77	

*(Source: Author's own analysis, 2025) * Indicates significant p-value at p < 0.05 Fisher's Exact Test*

The results in table 4.10 shows significant differences in neonatal pain management practices based on the use of non-pharmacological interventions (p = .047), knowledge (p = .043), formal training (p = .025), and access to protocols and guidelines (p = .042), with those who used these resources demonstrating better practices. However, pharmacological interventions did not have significant association with neonatal pain management practices (p = .599).

4.11 Factors Associated with Practice of Respondents

Univariable and multivariable logistic regression of factors associated with neonatal pain management practices of the respondents are presented in table 4.11.

Table 4.11: Univariable and Multivariable logistic regression model determining factors associated with neonatal pain management practices of the respondents (N=110)

Variable	COR	CI (95%)	P-Value	AOR	CI (95%)	P-Value
Religion						
Christian (Ref)	1			1		
Other	0.195	0.05–1.12	0.034*	0.231	0.98–1.25	0.002*
Non-Pharmacological Interventions						
No (Ref)	1			1		
Yes	5.912	0.22–39.1	0.192	6.863	0.01–63.2	0.207
Knowledge						
Not Knowledgeable (Ref)	1			1		
Knowledgeable	9.211	2.10–30.2	0.001*	6.34	0.10–22.7	0.001*
Formal Training						
No (Ref)	1			1		
Yes	2.813	1.22–6.51	0.038*	3.974	0.37–1.82	0.046*
Protocols						
No (Ref)	1			1		
Yes	1.926	1.05–4.11	0.019*	1.132	0.12–1.02	0.012*

(Source: Author's own analysis, 2025)

AOR=Adjusted odd ratio, CI=Confidence interval, * Indicates significant value at *p-value* <0.05
Ref=Reference value *P-value*=Probability value

Adjusting for other variables, regression analysis in Table 4.11 identified several significant factors influencing neonatal pain management practices.

Non-Christian participants had reduced odds (23%) of having good neonatal pain management practices, while Christians had higher (76.9%) odds of having good neonatal pain management practices (AOR=0.231, 95%, CI: 0.98-1.25, p = .002). Participants categorized as knowledgeable had more than 6 times odds of practicing good neonatal pain management practices compared to the not knowledgeable ones (AOR = 6.34; 95% CI: 0.10-22.7, $p < .001$). Those who received formal training in neonatal pain management had about 4 times odds of having good neonatal pain management practices compared to those who did not receive training (AOR = 3.974, 95%, CI: 0.37-1.82, p = .046). Health Care Professionals who reported the presence of protocols in the Neonatal Intensive Care Units (NICUs) also had more than 1 times odds of having good neonatal pain management practices (AOR = 1.132, 95% CI: 0.12-1.02, p = .012). Non-pharmacological interventions also mattered with respondents using non-pharmacological interventions to manage pain in neonates having better practices than those not using them (AOR 6.863, 95%, CI: 0.001-63.2, p= 0.27). These findings emphasize the importance of knowledge, training, and protocols in improving neonatal pain management.

4.12 Conclusion

This study highlighted that a substantial (79%) of HCPs demonstrated good neonatal pain management practices, while a smaller proportion (21%) exhibited poor neonatal pain management practices. Neonatal pain management practices by HCPs were influenced by three key factors: knowledge, formal training, and the use of pain management protocols. HCPs who were knowledgeable on neonatal pain management had over 6 times odds of having good neonatal pain management practices compared to those who were not knowledgeable. Receiving formal training increased the odds of good neonatal pain management practices by nearly 4 times, while the use of pain management protocols enhanced the odds of good neonatal pain management practices by more than one fold. These results underscore the importance of equipping HCPs with adequate knowledge and professional training and promoting the use of standardized pain assessment tools to improve neonatal pain management practices.

Efforts should focus on integrating structured training on neonatal pain management into nursing education, encouraging the routine use of pain assessment tools in clinical practice, and organizing workshops or continuous professional development programs to address gaps in knowledge and skills. Further research should explore additional contextual and systemic factors that influence neonatal pain management practices.

CHAPTER FIVE

DISCUSSION OF RESULTS

5.1 Introduction

Neonatal pain management faces significant challenges worldwide, particularly in sub-Saharan Africa due to limited resources, insufficient knowledge, and a lack of clear guidelines, leading to inadequate pain relief despite its critical importance. Effective management requires evidence-based guidelines, proper training, and validated assessment tools, alongside improved education for healthcare providers to prevent long-term developmental effects. At NRH and PMH in Botswana, pain management is often insufficient, with no specialized training and the absence of pain assessment guidelines. Despite high neonatal admissions, pain assessment scores are frequently missing, emphasizing the need for research to address these gaps. Literature highlights the ongoing disparity between theory and practice, especially in low- and middle-income countries (LMICs), like Botswana. This study aimed to assess healthcare professionals' practices in neonatal pain management at NRH and PMH to establish data to inform targeted interventions to improve care. The results revealed critical gaps in knowledge, training, and the availability of protocols, with variations in adherence to evidence-based practices. This chapter provides a critical discussion of the results and the implications of the results, addressing any unexpected outcomes and their possible causes.

5.2 Socio-Demographic Characteristics of the Respondents

The current study revealed that a significant proportion of the respondents (54%) worked at Princess Marina Hospital, while 46% worked from Nyangabgwe Referral Hospital. Majority of the respondents (84%) were female while 16% were males. The predominance of female respondents aligns with global trends in neonatal care, as observed in Ethiopia Wari et al. (2021), Abebe et al. (2024) and at Poland by Popowicz et al. (2021), where women were found to dominate neonatal intensive care units. However, these results are in contrast with those of studies conducted in Ghana and Ethiopia (Wuni et al., 2020; Kebede et al., 2023) who reported a more balanced gender distribution in neonatal intensive care units. Tagele et al. (2023) who also conducted a study in Ethiopia reported that males constituted majority of the sample. This highlights the gendered nature of caregiving professions, which continues to influence staffing patterns in healthcare in Botswana, and could be influenced by preferences.

As majority of the respondents in the current study were nurses who were predominantly female (staff register, NRH and PMH), this would not be a surprise to the differences in gender across regions. As previously indicated, the study revealed that majority of the HCPs were nurses, almost half (47%) of the sample size. The result agrees with those reported in Rwanda, Nigeria, and Iran by Muteteli, Tengera and Gowan (2019), Ikechukwu, Angela and Augustine, (2023) and Mehrnoush et al. (2018), indicating that nurses constituted the majority of neonatal care providers. However, contrasting evidence by Suleiman et al. (2019) in Nigeria revealed a greater representation of pediatricians in neonatal units, which identified with rare occurrence. These results shed light on the workforce dynamics in neonatal care units, and their potential implications on service delivery and resource allocation. Systemic differences and prioritisation of professions play a role in shaping workforce demographics, contrasting points to the importance of understanding contexts when addressing workforce issues in neonatal care.

It was also revealed that almost half (52%) of study respondents were more experienced, with more than five years of work experience. This almost aligns with results by Okiri, Kiperemero and Mukabana (2023) in Kenya and Popowicz et al. (2021) in Poland where HCPs had more or equal to 10 years of work experience. However, contrasting evidence was revealed by Wuni et al. (2020) in Ghana and Abebe et al. (2024) and Tagele et al. (2023), where majority of the respondents fell within 3 to 5 years of experience category. Findings of this study therefore reflect a workforce with a wealth of practical knowledge at the study site, indicating a level of maturity and stability in their professional practice. This could be as a result of stable government jobs zeroing in to longer tenures and fewer new entrants into the workforce as compared to other countries.

This is a suggestion that Botswana NICUs are composed of highly experienced healthcare professionals who have had sufficient exposure to neonatal care. Experienced healthcare professionals are more likely to have developed a sense of expertise and confidence in their practice, contributing to the overall good practice revealed in the study. Although there was a statistically significant association between neonatal pain management practices and work experience of the HCPs ($p = .014$), the data failed the X^2 test of association. This result suggests that experience may play a critical role in shaping health care professionals' practices towards neonatal pain management.

Moreover, a predominant trend showed that almost half (48%) of the respondents held a diploma, only 36% held a Bachelor's Degree while the smallest proportion (15%) held a Master's Degree qualification. This is in line with results of studies conducted in Ghana and Kenya by Wuni et al. (2020), Okiri, Kiperemero and Mukabana (2023), who reported that many HCPs were diploma holders. Contradictory to this finding, Mehrnoush et al. (2018), Abebe et al. (2024), Tagele et al. (2023), Kebede et al., (2023) reported an overwhelming majority of HCPs with a Bachelor's Degree. This is not surprising considering the different contexts and institutional priorities. This finding highlight that most of the study respondents had the lowest qualification in the field. The high prevalence of Diploma holders at NRH and PMH may be attributed to shorter training durations for nursing diploma programs (3 years) compared to degree programs (4 years), enabling quicker entry into the workforce. Additionally, diploma programs are more accessible and affordable for individuals seeking to start their healthcare careers without extensive education.

These results suggest the need for targeted strategies to enhance the capacity of nurses and female healthcare professionals, who form the backbone of neonatal care in Botswana and similar contexts. Training initiatives tailored to their roles, alongside efforts to address misconceptions and build confidence in neonatal pain management, could significantly improve care outcomes. Additionally, the observed disparities in workforce distribution between the two study sites highlight the importance of equitable resource allocation. Strategies such as staff rotation, enhanced recruitment of specialized professionals, and interdisciplinary collaboration can help mitigate these disparities, ensuring consistent and high-quality neonatal care across facilities.

5.3 Neonatal Pain Management by Respondents

5.3.1 Neonatal Pain Management Practices

The study revealed that the majority of participants (79%) had good neonatal pain management practices, while few (21%) had poor neonatal pain management practices. This corresponds with a study by Sarkaria and Gruszfeld (2022) in Europe, which indicated the prevalence of pain evaluation in French, Dutch, and Belgium at 100%, 80%, and 75% respectively.

Similarly, Wuni et al. (2020) in Ghana and Kebede et al. (2023) in Ethiopia reported over 50% of healthcare professionals with good practices in neonatal pain management. Results from Botswana are higher than majority of results in literature reviewed. Agakidou et al.(2021) in Greece and Muteteli, Tengera and Gowan (2019) in Rwanda revealed suboptimal pain management practices among HCPs, a trend also reported by Abebe et al. (2024) in Ethiopia, Wari et al. (2021) in Ghana, Neshat et al. (2023) in Iran, and Mabaso et al. (2022) in South Africa. The different levels of neonatal pain management practices may be a result of varying knowledge, attitudes and availability of protocols and pain assessment tools which could influence neonatal pain management practices (Llerena et al., 2023; Kebede et al., 2023). Research has also found that opportunities for development are associated with good practices in neonatal pain management in Neonatal Intensive Care Units (Wari et al., 2021).

Results of the current study suggest that while the respondents had good neonatal pain management practices as a strength, gaps still persist. These gaps can compromise care quality, hinder communication among healthcare providers, and limit opportunities for improvement. To address these issues, it is crucial to integrate validated pain scales into routine neonatal care. Training programs should emphasize the importance of objective pain assessment and equip healthcare professionals with the skills to use these tools effectively. Additionally, fostering a culture of thorough documentation is essential to ensure continuity of care, accountability, and the ability to evaluate pain management effectiveness. Institutions should prioritize the development and implementation of evidence-based guidelines that incorporate pain scales into daily practice, supported by regular audits and feedback to encourage adherence and identify areas for improvement. By addressing these gaps, healthcare systems can enhance neonatal pain management, improve health outcomes, and promote continuous professional development among healthcare providers.

5.3.2 Protocols for pain management availability

The study revealed that majority (94%) of respondents reported availability of pain management protocols in the NICUs, while minority (6%) denied presence of pain management protocols in the units. This result is consistent with studies that were conducted in South Africa, Ghana and France where well-established pain assessment methods and treatment protocols were available (Mabaso et al., 2022; Kusi Amponsah et al., 2020; Sarkaria and Gruszfeld, 2022).

Carlsen Misic et al. (2021) in Sweden also reported availability of protocols for neonatal pain management by the majority (75%) of the respondents. Moreover, a study conducted in Ethiopia reported that more than half (57.4%) of the respondents had protocols for neonatal pain management in NICU (Abebe et al., 2024). On the other hand, Agakidou et al., (2021) in Greece revealed the absence of standardized protocols in NICU. Christoffel et al. (2019) in Brazil reported less than 40% of respondents affirming the availability of neonatal pain management protocols in the neonatal units. Another study that was conducted in Ethiopia reported that more than 50% of the respondents denied the presence of protocols of neonatal pain management (Kebede et al., 2023). This result implicate the role of organizations in availing resources in order to positively influence neonatal pain management practices, which could be due to differences in the availability and accessibility of neonatal pain management protocols in the NICUs. More than 90% availability of neonatal pain management protocols at NRH and PMH suggest practice hinged on evidence-based information, highlighting good systemic support in neonatal pain management.

Most Sub-Saharan African countries lack healthcare institutional protocols for neonatal pain management, with limited availability of pain assessment tools, especially in low-income settings (Suleiman et al., 2019; Ikechukwu, Angela and Augustine, 2023). In Botswana, the high levels of knowledge at NRH and PMH and the awareness of neonatal pain and its consequences could have contributed to adapting protocol guidelines to local contexts, despite financial constraints. This highlights the need for strong institutional support, clear and accessible guidelines, and comprehensive training for healthcare workers so that they can effectively implement these protocols effectively. Global collaborations and increased awareness of neonatal pain are crucial for improving practices, especially in resource-limited settings.

5.3.3 Knowledge of Neonatal Pain Management

This study revealed that majority (77%) of the respondents were knowledgeable about neonatal pain management, while few (23%) were not knowledgeable. These results align with trends observed in other LMICs. Wari et al. (2021) and Abebe et al. (2024) in Ethiopia, reported that more than 60% of HCPs in Ethiopia had adequate knowledge, similar finding by Wuni et al. (2020) in Ghana.

However, studies by Christoffel et al. (2019) in Brazil, Parvizy et al. (2020) in Iran, Jember et al. (2024) in Ethiopia, and Tagele et al. (2023) in Kenya highlighted insufficient knowledge less than 50% among HCPs. These comparisons in knowledge levels highlight the importance of contextual factors in shaping knowledge such as resource availability as in protocols as revealed in this study, availability of pain relievers, and overall institutional support in shaping knowledge (Wuni et al., 2020; Wari et al., 2021). While knowledge may be adequate at NRH and PMH, its translation into effective care is often hindered by systemic barriers such as resource availability, training quality, and institutional support.

The results underline the need for ongoing education and the integration of neonatal pain management into continuing professional development programs. Training should address common misconceptions, particularly regarding the safety of analgesics, and promote evidence-based practices that enable HCPs to make informed decisions. Additionally, ensuring access to comprehensive, user-friendly protocol guidelines tailored to the local context can bridge the gap between knowledge and practice. Institutions should consider adopting multidisciplinary training approaches that include nurses, doctors, and other HCPs involved in neonatal care. This collaborative approach can foster a shared understanding of neonatal pain management and improve care coordination. Moreover, leveraging technology, such as e-learning platforms and mobile applications, can enhance access to training resources, particularly in resource-constrained settings. Ultimately, these efforts can ensure consistency in care delivery, empowering HCPs to manage neonatal pain effectively and safeguard the long-term developmental outcomes of neonates. By addressing misconceptions and strengthening institutional support, healthcare systems can advance the quality of neonatal pain management and contribute to better health outcomes for this vulnerable population.

5.3.4 Formal Training of Respondents

The results of this study revealed that only 35% of the respondents had received formal training in neonatal pain management, leaving a significant majority (65%) untrained. This is consistent with studies by Wuni et al. (2020) in Ghana, Tagele et al. (2023), Abebe et al. (2024), Kebede et al. (2023), Roga et al. (2023) in Ethiopia and Popowicz et al. (2021) in Poland who similarly reported levels of training less than 40%.

This results are lower than those reported by Christoffel et al. (2019) where majority (66.3%) of healthcare professionals in Rio de Janeiro, Brazil, had received formal training, Similarly, Wari et al. (2021), in Ethiopia reported more than 50% of healthcare professionals received training during their Bachelor's degree and in-service programs. This highlight a critical gap in the preparation of healthcare professionals working in neonatal intensive care units, underscoring the pivotal role of professional training in enhancing competence and adherence to best practices. Lack of incorporation of neonatal pain management modules into nursing and medical curricula could be the major cause of low training levels. Shockingly, despite the availability of training and protocols that was reported in Poland, it was found that only a few centres effectively implemented standardized pain management tools, contrasting to the point that, while training is essential, its effectiveness also depends on systemic support and the integration of evidence-based practice (Popowicz et al., 2021).

The results of this study have important implications for neonatal healthcare in Botswana and similar settings. The significant gap in professional training underscores an urgent need for capacity building among healthcare professionals. Tailored in-service training programs that focus on both the theoretical and practical aspects of neonatal pain management, including the use of validated pain assessment tools and interventions, are essential. Additionally, integrating neonatal pain management into undergraduate and postgraduate healthcare curricula will ensure that all healthcare professionals are equipped with the necessary knowledge and skills to manage neonatal pain effectively. The study also reveals broader organizational and policy deficiencies. Healthcare institutions must prioritize the provision of structured training opportunities and ensure the availability of resources such as guidelines, protocols, and pain assessment tools. Policymakers should consider mandating training as a prerequisite for healthcare professionals working in NICUs. Finally, the results point to the need for further research to explore the barriers to professional training and the factors influencing its implementation. Future studies should also investigate the long-term impact of training on neonatal health outcomes to strengthen the evidence base for policy and practice improvements.

5.3.5 Pain relievers availability

Results of this study revealed that all the respondents had access to different pharmacological and non-pharmacological modalities for neonatal pain management. An overwhelming majority (97%) of the respondents reported to be employing a combination of pharmacological and non-pharmacological interventions to manage pain in neonates. This is consistent with results of studies by Wari et al. (2021), and Abebe et al. (2024) in Ethiopia, where over half of healthcare professionals had access to both pharmacological and non-pharmacological methods for pain relief in neonates. However, Kebede et al. (2023) revealed that more than 80% of healthcare professionals reported unavailability of pain relievers in their NICUs. Abebe et al. (2024) also reported that more than 50% of respondents reported absence of analgesics in the unit. Two studies conducted in Brazil indicated that non-pharmacological interventions were commonly used by HCPs for neonatal pain relief, as compared to pharmacological interventions (Maciel et al., 2019; Rocha et al., 2021). Contrast in the results for pain relievers availability and choice across countries are particularly shocking given the essential nature of neonatal pain and its consequences and could be due to variations in economic status of the countries and prioritization of resources, as well as contextual protocols and policies.

Ikechukwu, Angela and Augustine (2023) revealed that financial constraints are often a significant barrier, particularly in low- and middle-income countries (LMICs), where healthcare budgets are stretched thin, and essential medications may not be readily available. Additionally, knowledge deficits and limited formal training may contribute to healthcare providers' hesitancy in managing pain in neonate, as observed in other studies from regions like Kenya (Wuni et al., 2020). Although there was no statistically significant relationship between availability of both pharmacological and non-pharmacological pain relievers in the current study, Kebede et al. (2023) revealed that accessibility to analgesics increased odds of HCPs engaging in good neonatal pain management by four folds. Despite the positive results, it remains clear that achieving universal access to pain management resources alongside effective, evidence-based practices requires addressing not only resource availability but also institutional and systemic barriers, such as poor training and insufficient support for healthcare workers. Results of this study highlight the need for continued improvements in neonatal pain management, focusing on both pharmacological and non-pharmacological strategies.

Key areas for improvement include strengthening healthcare systems, ensuring consistent supply chains for analgesics, and fostering a balanced approach in the use of both types of interventions. Additionally, continuous professional development for healthcare providers is essential to advance practices. Challenges such as resource availability, staff training, and contextual factors must be addressed to improve the adoption of best practices in neonatal pain management, particularly in low-resource settings.

5.4 Factors Influencing Neonatal Pain Management Practices among the Respondents

5.4.1 Religion

The study revealed a significant association between religion and neonatal pain management practices with *p*-value .002, whereby non-Christian respondents exhibited significantly lower odds (23.1%) of engaging in good neonatal pain management practices compared to Christians (AOR = 0.231; 95% CI, 0.98–1.25; $p = 0.002$). Christian respondents had higher odds (76.9%) of having good neonatal pain management practices. The observed association between religion and neonatal pain management aligns somewhat with the findings of Christoffel et al. (2019) who identified institutional culture as a barrier to effective neonatal pain management. Nyaloko et al. (2023) in South Africa also found that HCPs' practices can be shaped by spirituality and intergenerational traditions. However a study by Jember et al. (2024) in Ethiopia did not find any association between religious affiliation and good neonatal pain management practices.

These results emphasize the importance of fostering a positive institutional culture that prioritizes effective pain management for neonates. A culture that acknowledges the importance of pain relief and encourages the adoption of best practices could contribute to better neonatal care. Additionally, the study highlights the need to invest in knowledge and training for healthcare providers to ensure that religious views do not negatively impact clinical decision-making regarding neonatal pain management. This could be attributed to various organizational factors, including beliefs, norms, teachings, and religious views on suffering, which may shape healthcare providers' attitudes toward pain management. There was a paucity of research specifically evaluating the direct association between religion and neonatal pain management practices, warranting further investigation.

5.4.2 Protocols of Pain Management Availability

The study revealed that the presence of protocols increased the odds of good neonatal pain management practices by more than 1 fold (AOR= 1.132, 95% CI: 0.12–1.02; p = 0.012), indicating a significant relationship. This result is consistent with previous studies, such as Kebede et al. (2023) who found that the presence of protocols in neonatal intensive care units (NICUs) increased the likelihood of healthcare providers adhering to good neonatal pain management practices by nearly three times (AOR = 2.94). Similarly, Abebe et al. (2024) and Jember et al (2024) in Ethiopia found that healthcare providers with access to pain assessment tools in the NICU were three times and almost 4 times more likely to have good neonatal pain management practices respectively. The results also align with the broader literature, including Kusi Amponsah et al. (2020) in Ghana and Qiao etal. (2019) in China who highlighted the critical role of protocols in improving clinical practices. Kusi Amponsah et al. (2020) further revealed that healthcare providers' experience levels are linked to higher usage of pain assessment tools, a trend observed in the current study as well. However, Ulmer et al. (2022) in Germany found that the presence of standard operating procedures (SOPs) does not always guarantee its application to daily practice in neonatal care.

Most of the literature reviewed have revealed that presence of protocols for neonatal pain management positively influence neonatal pain management practices. This suggests that neonatal units with well-established pain management protocols are more likely to have healthcare providers who effectively implement them. This consistency in findings across different studies further supports the effectiveness of protocol implementation. These results suggest that neonatal units should prioritize developing, implementing, and ensuring the active use of protocols to enhance neonatal pain management. Such protocols not only improve healthcare provider decision-making but also reflect a healthcare facility's commitment to high-quality neonatal care.

5.4.3 Knowledge of Respondents

The study revealed a significant association between knowledge and neonatal pain management practices, with participants who were knowledgeable being 6.34 times more likely to have good neonatal pain management practices compared to those who were not knowledgeable, (AOR = 6.34, 95% CI: 0.10–22.7; $p < .001$).

A similar positive association was observed in studies conducted by Wari et al. (2021), and Kebede et al. (2023) in Ethiopia who reported that nurses who had adequate knowledge were respectively 12.8 times (AOR=12.08, 95% CI: 2.48- 32.78) and 1.51times (AOR=1.511, 95% CI: 0.88-2.59) more likely to have good neonatal pain management practices than those who had inadequate knowledge. Another study by Jember et al. (2024) also revealed an association whereby good knowledge increased the odds of good neonatal pain management practices by more than 3 times. The researcher did not find any contrasting results, suggesting a significant positive relationship between knowledge and good neonatal pain management practices.

The positive relationship between knowledge and good neonatal pain management practices can be attributed to healthcare providers being better equipped to understand and apply evidence-based protocols, leading to more confident and accurate decision-making. Knowledgeable providers are also more likely to recognize signs of pain, adhere to standardized protocols, and stay updated on best practices through continuous learning. Their expertise could be fostering better patient outcomes and contributing to a culture of knowledge-sharing within healthcare teams, resulting in more consistent and effective pain management for neonates. Therefore, the current study underscores the critical role of education and training in improving neonatal pain management, with potential for widespread improvements in clinical outcomes and healthcare practice through better-informed providers.

5.4.4 Formal training

Neonatal pain management was nearly four times more likely to be practiced by healthcare providers who had received formal training in neonatal pain management compared to those who had not (AOR = 3.974; 95% CI: 0.37–1.82; p = .046). These results are consistent with studies conducted by Abebe et al. (2024) in Ethiopia, which reported that healthcare providers who received training in neonatal pain assessment and management were twice as likely to implement good neonatal pain management practices (AOR = 2.26; 95%, CI: 1.259–4.07) compared to the untrained ones. Similarly, Kebede et al. (2023) found that healthcare providers trained in neonatal pain management were 2.12 times more likely to demonstrate good neonatal pain management practices (AOR = 2.21, 95% CI: 1.15–3.91).

In Ghana, Wuni et al. (2020) found that healthcare providers without formal training had lower odds (8%) of practicing good pain management compared to those who had received training (AOR = 0.92; 95%, CI: 0.48–1.75). Additionally, (Wari et al. 2021), reported that nurses trained in neonatal pain management were nearly three times more likely to exhibit good practices compared to those without such training (AOR = 2.96, 95% CI: 1.21–7.22). No contrary studies were identified by the researcher, further supporting the positive impact of formal training on neonatal pain management. The current study strongly suggests that healthcare providers who undergo formal training in neonatal pain management are significantly more likely to adhere to best practices, thereby improving the care provided to neonates in pain. This may be attributed to the fact that trained healthcare providers are most likely to be familiar with national and international guidelines and best practices. As a result, they are more likely to follow these guidelines, ensuring a more consistent and standardized approach to pain management. These findings highlight the importance of investing in formal training programs for healthcare providers as a crucial step toward improving neonatal pain management.

5.5 Conclusion

The study highlighted that a substantial 94% of respondents reported having neonatal pain management protocols in place within their NICUs. Additionally, although 77% of healthcare professionals were knowledgeable, persistent misconceptions regarding the safety of analgesics remained, posing a barrier to optimal care. Alarmingly, only 35% had received formal training in neonatal pain management, underscoring a significant gap in professional education. This finding points to a pressing need for comprehensive, targeted educational programs and the integration of pain management training into healthcare curricula. Furthermore, the study revealed that the presence of established protocols, along with robust knowledge and formal training, significantly enhanced the likelihood of delivering effective pain management to neonates, emphasizing the critical role of these factors in improving clinical outcomes.

5.6 Limitations of the Study

The study had several limitations that warrant acknowledgement. Firstly, it utilized a cross-sectional design, providing a snapshot of the current state of neonatal pain management in the participating NICUs. While this design limits the ability to draw conclusions about long-term trends or causal relationships, data was collected from two NICUs in different geographical locations to capture variability in practices, thereby enhancing external validity and increasing the sample size. Additionally, regression analysis was employed to identify relationships between the study's variables. Furthermore, the study relied on self-reported data from healthcare professionals, which can introduce bias. To mitigate this, anonymity was ensured in surveys, reducing social desirability bias and encouraging more honest responses. Additionally, the use of standardized, validated questionnaire helped improve the reliability of the data. A longitudinal study would be more effective to draw conclusions about long-term trends or causal relationships between variables.

5.7 Implications of the study Results to the Healthcare System

This section delves into the broader significance of the study's results, offering key takeaways that can inform healthcare improvements, foster evidence-based decision-making, and promote better outcomes for neonates worldwide. These implications will be based on the main variables that have shown to have a positive association with neonatal pain management practices at NRH and PMH.

5.7.1 Nursing Practice

The results emphasise the critical role of nurses in neonatal pain management. Nurses must be proactive in using evidence based tools and documenting pain assessment and management in neonates. Practice should include the consistent application of multimodal pain management strategies, coupled with thorough monitoring and evaluation. Nurses must also advocate for better training opportunities and resources to enhance care delivery.

5.7.2 Nursing Administration

The results of this study have clear implications for nursing administration in improving neonatal pain management practices. First, as the study highlighted a strong link between knowledge and practice emphasizes the critical role of nursing administrators in ensuring that there is access to ongoing, comprehensive education in the workplace. The results highlight the

need for administrators to prioritise capacity building initiatives, such as organising workshops, seminars, and in-service training sessions Moreover, interventions to alleviate neonatal pain should include a focus on both pharmacological and non-pharmacological interventions. Furthermore, nursing administrators must ensure that neonatal units are adequately resourced with appropriate pain relievers, and accessible protocol to support effective pain management. The study also revealed that more experienced nurses were more likely to engage in good pain management practices. It should be upon these experienced nurses to mentor less experienced colleagues, promoting transfer of knowledge and best practices which can only be achieved when the experienced nurses are hands on. By addressing these key areas, nursing administrators can significantly improve neonatal pain management practices and enhance the quality of care provided to neonates in their institutions.

5.7.3 Nursing Education

The results of this study underscore the urgent need to enhance nursing education in neonatal pain management to address the gaps in practice revealed by the research. Therefore, it is crucial to integrate neonatal pain management into both undergraduate nursing curricula and ongoing in-service training. This will ensure that all nurses, regardless of their experience level, are equipped with the necessary knowledge and skills to provide consistent, evidence-based care. Inconsistent training and limited resources were found to hinder the application of best practices, suggesting that nursing education should be structured to offer more comprehensive, accessible, and practical learning opportunities that bridge this gap.

Furthermore, the study highlighted the importance of having adequate pain management resources and protocols available for nurses to utilize. Nursing education should not only teach theoretical knowledge but also focus on equipping nurses with the practical skills to effectively use pain assessment tools and non-pharmacological interventions, such as comforting techniques, in daily practice. The study also revealed that more experienced nurses were more likely to engage in effective pain management, indicating that educational programs should foster mentorship and knowledge transfer. Experienced nurses should be encouraged to take on mentoring roles, helping less experienced staff to develop their skills in pain management. Additionally, the study found that formal training was linked to improved practice, reinforcing the need for targeted education on neonatal pain management.

5.7.4 Nursing Research

Literature review showed paucity of research in Botswana, particularly in neonatal pain management. Researchers therefore need to explore more on different aspects of neonatal pain management and make recommendations on how to improve the practice in the health institutions of Botswana.

5.8 Recommendations

Based on the results of this study, several key recommendations were made to improve neonatal pain management practices. These suggestions aim to address the identified gaps, enhance the implementation of effective pain relief strategies. The following recommendations are intended to guide health care professionals, policymakers, and institutions in adopting evidence-based practices that can lead to better outcomes for neonates and improved care across various healthcare settings.

5.8.1 Ministry of Health Recommendations

Based on the results of this study, several recommendations were made to the Ministry of Health to improve neonatal pain management and support nurses in providing optimal care. First, it is essential to enhance training opportunities for nurses by integrating comprehensive neonatal pain management education into both undergraduate nursing curricula and ongoing in-service training programs. This would ensure that nurses are equipped with the necessary knowledge and skills to apply both pharmacological and non-pharmacological interventions effectively, thereby addressing the gaps in practice identified in the study. In addition, the Ministry of Health should prioritize the availability of essential pain management resources, including pain assessment tools, comfort measures, and established protocols, in all neonatal units. Ensuring the accessibility of these resources will support nurses in delivering evidence-based care and improve pain management outcomes. Furthermore, the retention of experienced nurses in neonatal units is crucial, as their expertise plays a vital role in promoting best practices and mentoring less experienced staff. The Ministry should focus on strategies to retain skilled nurses and foster a culture of mentorship within neonatal care units. Lastly, the Ministry should recognize the importance of religious beliefs in neonatal pain management and ensure that nurses are trained to understand and respect the diverse beliefs and values that may influence pain management decisions.

5.8.2 Nyangabgwe and Princess Marina Hospitals Recommendation

Training as a positive influencer to good neonatal pain management practice should be incorporated into ongoing in-service education and workshops, keeping nursing staff continuously updated on the latest evidence-based practices. Furthermore, both hospitals must implement clear, standardized protocols for neonatal pain management, which should include the use of validated pain assessment tools. These protocols will serve as a guide for nurses, ensuring consistent and high-quality care across all neonatal units. In addition, it is essential to encourage and avail non-pharmacological pain management strategies, such as breastfeeding, positioning, swaddling, and soothing techniques, to provide a more holistic approach to pain management. Both hospitals should create more opportunities for nurses to gain hands-on experience in neonatal care settings, particularly in units with established practices where they can learn from seasoned professionals. This practical exposure will bridge the gap between theory and practice, empowering nurses to apply their skills effectively. Recognizing the diverse cultural and religious beliefs that influence pain management, the hospitals must prioritize cultural competence training. By implementing these recommendations, Nyangabgwe and Princess Marina Hospitals will ensure that neonates receive the highest standard of care, ultimately improving patient outcomes and advancing the quality of neonatal care in Botswana.

5.9 Future Research

There is need for replication of this study using mixed methods or qualitative research design, incorporating interviews and observational checklists to provide deeper insights into healthcare professionals' experiences, challenges, and the factors influencing pain management practices. Additionally, longitudinal studies are needed to track trends in neonatal pain management over time and assess the long-term impact of interventions and training programs. Comparative studies across different healthcare settings, such as private hospitals, government hospitals, and lower-level facilities, would offer valuable insights into how varying resources and training opportunities influence pain management practices and outcomes. Future research should also assess the long term outcomes of improved pain management practices on neonatal development.

5.10 Dissemination and Utilization of Results

A printed copy of the research report will be submitted to Nyangabgwe Referral Hospital and Princess Marina Hospital, where the study was conducted, to assist in implementing evidence-based practices for neonatal care. Additional copies will be provided to the University Of Zambia School of Nursing Sciences, the University of Zambia Medical Library, the Ministry of Health, the University of Botswana Library, and the researcher. The results will also be presented to relevant stakeholders involved in neonatal care through workshops and conferences. To maximize the global impact, the study's results will be published in the Journal of African Neonatology, contributing to the growing body of knowledge on neonatal pain management.

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APPENDICES

Appendix A: Participant Information Sheet

Title of the study: Neonatal pain management practices by Health care professionals at Nyangabgwe and Princess Marina Hospitals, Francistown and Gaborone: Botswana.

Investigator:

Barulaganye Difsele, researcher. School of Nursing Sciences.
Phone: +260 765452953/+267 77422614/ +267 75635139.
Email: bdifsele@gmail.com

Background and rationale for the study:

Pain management in neonates has been a topic of concern for many years and studies have indicated great disparity between HCPs practices in managing this pain and theory globally. The researcher did not find any study from Botswana specifically on pain management in neonates. In sub Saharan Africa, it is indicated that awareness of neonatal pain assessment and management has been increasing with little corresponding improvement in clinical practice.

Purpose:

This study aims to investigate on the factors contributing to the pain management practices by Health Care Professionals at the two referral hospitals in Botswana. This study is important as it will help identify the opportunities and challenges the HCPs face in caring for the neonates. These two sites have been chosen looking at the number of neonates who get admitted and the level of care provided.

Procedures:

If you consent to participate, you will be invited to take part in a questionnaire. The questionnaire will be administered by the researcher and the research assistants.

You will be allowed to answer the questionnaire from the comfort of your home and where you don't understand you are free to contact the researcher for clarifications.

This will take approximately two weeks and answering the questions is expected not to last more than 30 minutes.

Who will participate in the study?

Health care professionals including nurses and doctors working in the neonatal intensive care unit will participate in the study. HCPs should not be in probation and should be actively involved with neonatal care. The expected number of participants is 128, constituting 58 from NRH and 70 HCPs from Princess Marina referral hospitals and are expected to be active until the end of the study.

Risks/Discomforts:

This study carries no major risks or discomforts except for the time and energy needed to answer the questions. However, the researcher will ensure that the questionnaire is kept precise. The study does not involve any experimentation.

Benefits:

The study comes with no material benefits to the participants nor the hospital. However, the information collected through this study will enable HCPs to properly manage pain in neonates to prevent short and long term consequences. This study will also form a baseline for neonatal pain management in neonates from the context of referral hospitals in Botswana.

Alternatives:

Please note that your decision to participate in this study is voluntary and you are free to decline participation or to withdraw from the study at any point. You will not be subjected to any form of victimization

Cost:

The participants will not incur any costs during the conduct of the study.

Compensation for participation in the study:

This study will not provide any direct benefits to you as a participant. However, the findings will be used to inform recommendations for improving neonatal pain management at PMH potentially leading to better neonatal outcomes.

Reimbursement:

You will not incur any costs during the conduct of the study. The answered questionnaires will be collected from your place of work.

Questions:

Participants who have study related questions can reach investigators to answer such questions through the phone numbers and E-mail addresses provided on the consent form provided.

Questions about participants rights:

Participants who have questions about their rights can have their queries addressed by contacting the personnel indicated in the consent.

Statement of voluntariness:

Participation in this study is voluntary and you may join on your free will. Your decision will not affect your job. If you decide to participate, you are free to withdraw at any time without penalty. Any refusal to meet appointments agreed upon with the central investigator will be considered as implicit withdrawal and therefore will terminate the subject's participation in the study without his/ her prior request. In the event of incapacity to fulfil the duties agreed upon the subject's participation in this study will be terminated without his/her consent.

Confidentiality:

The results of this study will be kept strictly confidential, and used only for research purposes. My identity will be concealed in as far as the law allows. My name will not appear anywhere on the coded forms with the information. Paper and computer records will be kept under lock and key and with password protection respectively.

The interviewer has discussed this information with me and offered to answer my questions.

For any further questions, I may contact the Chairperson, UNZABREC on the following details:

The Chairperson, University of Zambia, Biomedical Research Ethics Committee

P.O Box 50110, Lusaka.

Phone number: +260-1-256067 Email: s.munsaka@unza.zm

Appendix B: Informed Consent Form

I confirm that I have read/had the study explained to me and understand the information contained in the information sheet and understand what is expected of me in this study. I understand that my decision to participate in this study is voluntary and that I am free to withdraw from the study at any time without penalty. During the study, my identity will be concealed. I understand that by signing this form, I do not waive any of my legal rights but merely indicate that I have been informed about the research study in which I am voluntarily agreeing to participate. I confirm that I have been given the opportunity to ask questions about the study and answers have been given to my satisfaction. A copy of this form will be provided to me.

Name: ……. Signature of participant …….. Age..……

Date (DD/MM/YY)……

Name of Witness…….. Signature of Witness……

Date (DD/MM/YY)…….

Name……Signature of parent or guardian for minors ……

Date (DD/MM/YY)……

Name……..Signature of Interviewer ……Date (DD/MM/YY)……...

If you have any further questions please contact the University of Zambia Biomedical Research Ethics Committee

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Appendix C: Questionnaire

TOPIC: Neonatal pain management practices by Health Care Professionals at Nyangabgwe and Princess Marina Hospitals, Francistown and Gaborone: Botswana

HOSPITAL: NYANGABGWE REFERRAL HOSPITAL

INSTRUCTIONS:

1. This questionnaire is composed of three sections (A, B & C). Respondents are expected to complete answering this questionnaire in 30 minutes.
2. You are not supposed to write your name on the questionnaire.
3. All the questions must be answered in the order they are arranged.
4. For all questions provided with alternatives, tick [✓] to indicate the most appropriate response.

   You are assured that all information will be held confidential and will be used for the purpose it is intended for.

SECTION A: SOCIO-DEMOGRAPHIC FACTORS

1. Sex:

a. Male [ ]

b. Female [ ]

2. Age Group

a. ≤ 30 years [ ]

b. 30 years [ ]

3. What is your Profession? .....

4. How many years of work experience do you have?

a. ≥ 5 Years [ ]

b. < 5 Years [ ]

5. Educational Level:

a. Diploma [ ]

b. Other higher qualification [ ] Specify: ……..

SECTION B: PRACTICE

6. I use a scale to assess pain in neonates. YES [ ] NO [ ]

7. I record newborn pain scores on their medical chart. YES [ ] NO [ ]

8. I use more than one non-pharmacological management to relieve the pain of newborns. YES [ ] NO [ ]

9. I use pharmacological and non-pharmacological combined to relieve pain in newborns. YES [ ] NO [ ]

10. I read pain management guidelines. YES [ ] NO [ ]

SECTION C: PROTOCOLS AVAILABILITY

11. Do you have neonatal pain management protocols or guidelines in your unit? Tick YES [ ] NO [ ]

12. Which pain assessment scale (s) do you use in your unit?

a. Neonatal Pain, Agitation, and Sedation Scale (N-PASS) [ ]

b. Neonatal/Infant Pain Scale (NIPS) [ ]

c. CRIES

d. Neonatal Facial Coding Systems (NFCS)

e. Others, mention……

SECTION D: KNOWLEDGE

13. Neonates feel pain. YES [ ] NO [ ]

14. Pain is considered a vital sign YES [ ] NO [ ]

15. Pain can affect a newborn's heart rate, blood pressure, respiratory rate, temperature, oxygen saturation, and intracranial pressure YES [ ] NO [ ]

16. Light and noise may affect a newborn's reaction to pain. YES [ ] NO [ ]

17. The use of scales for pain assessment is important to the practice. YES [ ] NO [ ]

18. Pain management in neonates depends on its assessment. YES [ ] NO [ ]

19. Newborns subjected to repeated painful procedures may have harmful effects on their development. YES [ ] NO [ ]

20. Analgesics are too dangerous for neonates. YES [ ] NO [ ]

21. Do you feel confident in providing pain management in the NICU? YES [ ] NO [ ]

SECTION E: FORMAL TRAINING

22. Have you received formal training on neonatal pain assessment and management? Tick YES [ ] NO [ ]

23. If yes, when did you receive the training?

a. During professional training per [ ]

b. Through in-service training [ ]

c. Other. Specify……

SECTION F: PAIN RELIEVERS AVAILABILITY

24. Which pharmacological interventions do you commonly use for neonatal pain management in your unit?

a. Morphine [ ]
b. Fentanyl [ ]
c. Acetaminophen [ ]
d. Others. Specify…….....
e. None [ ]

25. Which non-pharmacological interventions do you use in NICU?

a. Breastfeeding [ ]
b. Sucrose [ ]
c. Facilitated tucking [ ]
d. Others. Specify…….
e. None [ ]

THANK YOU FOR YOUR PARTICIPATION