

**PERCEIVED NEONATAL PAIN MANAGEMENT PRACTICES AMONG  
NURSES WORKING IN NEWBORN UNITS IN NYANZA AND WESTERN  
KENYA**

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Master of Science in Advanced Nursing Practice (Midwifery) of Masinde Muliro  
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### DECLARATION

This thesis is my own, done with only the sources and support listed, and has never been submitted to another university

Signature \_\_\_\_\_ Date \_\_\_\_\_

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### CERTIFICATION

The undersigned attests to having read the thesis, which they hereby suggest Masinde Muliro University of Science and Technology accept, **Perceived Neonatal Pain Management Practices among Nurses Working in Newborn Units in Nyanza and Western Kenya**".

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## **DEDICATION**

I dedicate this study to my spouse Mr. Nicholas Odondo my two sons Antony Ronald and Bravin Williams, my daughter Velvine Veronnah, and my daughter in-law Hyneth for their unwavering support throughout my study period. Dedication also goes to my two grandsons Russell and late Liam; and Baby Tessa. I will not forget my dear parents and my brothers for always encouraging me and praying for me.

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## ABSTRACT

Neonates in neonatal units (NBUs) are treated to several invasive and non-invasive procedures as part of their medical care. These treatments, which include blood draws, intubation, mechanical breathing, and operations, can result in substantial pain for the newborns. Previous research have revealed that untreated pain in newborns can lead to severe physiological and psychological effects, including increased pain sensitivity, behavioral difficulties, and delayed neurodevelopment. Despite the increased awareness of the need for efficient pain management, there is still a shortage of standardized pain assessment instruments and processes in many healthcare settings. This study intended to analyze the opinions and practices of nurses working in NBUs in Nyanza and Western Kenya towards newborn pain care. This was a descriptive cross-sectional study that used both qualitative and quantitative methodologies. The study targeted 89 nurses working in NBUs across multiple hospitals in Nyanza and Western Kenya. Data gathering methods included pre-tested self-administered questionnaires and in-depth interviews. Spearman Correlation was utilized to analyze the relationship between the variables and p value of  $\leq 0.05$  was regarded statistically significant. Qualitative data from the interviews were evaluated thematically to discover emergent patterns and themes. The study indicated a large gap between nurses' views and their actual behaviors in addressing newborn pain. Although 75% of nurses accepted that neonates experience pain, fewer than half (44.9%) perceived basic operations as painful. This disparity in perception was reflected in the utilization of pain management techniques; whereas a large proportion of nurses were aware of pharmacologic (41.6%) and non-pharmacologic (42.7%) interventions for controlling newborn pain, the practical application of these strategies was markedly absent. A substantial negative connection was established between nurses' understanding of pain treatment and the actual use of pain assessment tools ( $p = 0.01$ ). There was a notable gap between knowledge and practice; although nurses knew about both pharmacologic and non-pharmacologic therapies, they infrequently employed them in practice ( $p < 0.0001$  and  $p = 0.03$ , respectively). The findings of this study show a large disparity between the theoretical understanding and perceived neonatal pain treatment methods among nurses. To solve these concerns, it is advised that the national and county governments work to create standardized neonatal pain assessment instruments and organize frequent training sessions for nurses. Additionally, adding a module on

newborn pain management into the nursing curriculum and offering on-the-job training could boost nurses' proficiency and confidence in handling neonatal pain.

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## **LIST OF ABBREVIATIONS AND ACRONYMS**

|                |                                                                          |
|----------------|--------------------------------------------------------------------------|
| <b>AMA</b>     | American Medical Association                                             |
| <b>BPSN</b>    | Bernese Pain Scale for Neonates                                          |
| <b>CNS</b>     | Central Nervous System                                                   |
| <b>CRIES</b>   | Crying, Requires Oxygen Saturation, Increased vital signs,<br>Expression |
| <b>IJC</b>     | International Joint Commission of Standards                              |
| <b>KIIs</b>    | Key Informant Interviews                                                 |
| <b>mPHAT</b>   | Modified Pain Assessment Tool                                            |
| <b>NACOSTI</b> | National Commission of Science, Technology and Innovation                |
| <b>NBU</b>     | Newborn Unit                                                             |
| <b>NCM</b>     | Nursing Comfort Measures                                                 |
| <b>NFCS</b>    | Neonatal Facial Coding Scale                                             |
| <b>NICU</b>    | Neonatal Intensive Care Unit                                             |
| <b>NIPS</b>    | Newborn Infant Pain Score                                                |
| <b>N-PASS</b>  | Neonatal Pain Agitation Sedation Scale                                   |
| <b>PAA</b>     | Pediatric Association of Anesthetists                                    |
| <b>PAT</b>     | Pain Assessment Tool                                                     |
| <b>PIPP</b>    | Premature Infant Newborn Profile                                         |
| <b>PNS</b>     | Peripheral Nervous System Sleeplessness                                  |
| <b>SONMAPS</b> | School of Nursing, Midwifery and Paramedical Science                     |
| <b>SPSS</b>    | Statistical Package for Social Sciences                                  |

## OPERATIONALIZATION OF KEY TERMS

**Competency:** In this study, competency refers to the ability of nurses to effectively apply both pharmacological and non-pharmacological pain management strategies for neonates, as measured by self-reported skills in using these strategies. Competency was assessed through Likert-scale questions on comfort levels in implementing pain interventions.

**Knowledge:** Knowledge refers to the awareness and understanding nurses possess regarding neonatal pain management strategies, including both pharmacologic and non-pharmacologic interventions. This was measured using self-reported awareness of specific pain management methods and tools on a Likert scale.

**Modified Pain Assessment Tool (mPHAT):** The mPHAT is a multidimensional tool used in this study to assess and measure neonatal pain based on observable physiological and behavioral responses. The tool's use was assessed by nurses' reports of its availability and frequency of use in their practice.

**Neonate:** A neonate is defined as an infant less than 28 days old. The study focused on assessing pain management practices specifically for this age group, especially preterm neonates who are more vulnerable to pain from frequent medical interventions.

**Neonatal Pain Management Practices:** Neonatal pain management practices in this study refer to the specific interventions, both pharmacologic (e.g., opioids, anesthetics) and non-pharmacologic (e.g., swaddling, kangaroo care), used by nurses to alleviate pain in neonates. These practices were measured through self-reported use of pain management techniques, frequency of interventions, and perceived effectiveness, as gathered through the questionnaire and interviews.

**Newborn Units (NBUs):** Newborn units refer to specialized hospital wards where care is provided to neonates, especially those requiring intensive or specialized medical attention such as premature infants or those birth complications following delivery. This study focused on NBUs in several hospitals across Nyanza and Western Kenya, and the presence of specific pain management protocols and tools in these units was evaluated.

**Nurses:** Nurses, in the context of this study, refer to the trained healthcare professionals who have been trained using a nursing training curriculum working in newborn units (NBUs) who are responsible for the care and management of neonates, including pain assessment and intervention. The study included nurses who have



worked in the NBUs for at least six months, and data was collected from them regarding their perceptions, knowledge, and practices related to neonatal pain management.

**Nursing Comfort Measures (NCM):** NCMs are non-pharmacological strategies, such as swaddling, kangaroo care, or repositioning, used by nurses to alleviate pain in neonates. The study measured the frequency and types of NCMs used by nurses in newborn units, as self-reported in the questionnaire.

**Pain Assessment Tool (PAT):** PAT refers to any multidimensional scale or tool used to assess and quantify neonatal pain based on observable indicators such as crying, facial expressions, and physiological changes. Nurses' access to and use of these tools were measured through self-reported practices.

**Pain:** Pain, in the context of this study, is defined as the unpleasant sensory and emotional experience associated with actual or potential tissue damage in neonates. Nurses' perceptions of pain were measured based on their recognition of pain in neonates undergoing various procedures and how they rated its severity.

**Perceived competency:** This term refers to the nurses' self-assessment of their ability to effectively implement neonatal pain management interventions. It was operationalized by asking nurses to rate their comfort in managing neonatal pain using pharmacologic and non-pharmacologic strategies.

**Perceived knowledge:** Perceived knowledge refers to the nurses' self-reported awareness of pain management strategies, including their understanding of pain assessment tools, and both pharmacologic and non-pharmacologic interventions. The study used a Likert scale to measure the degree to which nurses believed they had sufficient knowledge.

**Perceptions:** Perceptions in this study refer to the beliefs, attitudes, and opinions held by nurses regarding neonatal pain and pain management practices. This was measured through their responses to statements about neonatal pain, interventions, and the effectiveness of pain management strategies.

**Sedation:** Sedation refers to the practice of administering medications, such as midazolam, to keep neonates calm or asleep during procedures. The study measured the use of sedation as part of pain management practices through self-reports of how often such interventions were used in NBUs.

**Strategies:** Strategies refer to the approaches and interventions, both pharmacologic and non-pharmacologic, employed by nurses to manage neonatal pain. In this study,

strategies were categorized into pharmacologic measures (e.g., use of analgesics, sedatives) and non-pharmacologic measures (e.g., repositioning, use of pacifiers, breastfeeding). The effectiveness and frequency of these strategies were assessed through self-reported nurse practices.

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Overview**

The chapter provides the backdrop of the study, problem statement, rationale of the investigation, objectives of the study, research questions, constraints of the study, and the conceptual framework.

#### **1.2 Background to the study**

Neonatal pain management is a vital feature of neonatal care, particularly in newborn units (NBUs). Historically, the pain experienced by neonates was typically underestimated or neglected, partly due to the idea that neonates had an immature neural system and thus a restricted capacity to sense pain (Anand & Hickey, 1987). This misperception remained until the late 20th century when research began to uncover the considerable influence of pain on newborns' immediate and long-term health.

Neonatal pain management has evolved dramatically during the past few decades. Historically, the medical profession primarily assumed that neonates, due to their immature neural systems, were incapable of experiencing pain. This notion lasted until research in the late 20th century, especially by Anand and Hickey (1987), proved that neonates indeed perceive pain and have substantial physiological and behavioral reactions. This revelation triggered a change towards understanding and alleviating newborn discomfort. In the 1980s and 1990s, further studies, such as those by Walco, Saarenmaa, Cassidy and others (Cassidy & Walco, 1996; Saarenmaa et al., 1996; Walco et al., 1994), highlighted the detrimental effects of untreated pain on neonates, including altered pain thresholds and potential neurodevelopmental issues. Despite the expanding body of research, pain management in newborns was variable due to a lack of established protocols and inadequate training among healthcare practitioners (Berry & Dahl, 2000; Rababa et al., 2021; Shen et al., 2021; Sinatra, 2010).

Over the past two decades, attempts to standardize and improve newborn pain care have intensified. The development and validation of pain assessment tools, such as the Premature Infant Pain Profile (PIPP), the Neonatal Pain, Agitation, and Sedation Scale (N-PASS), and the Neonatal Infant Pain Scale (NIPS), have been pivotal (da Motta et al., 2015; Gibbins et al., 2014; Hillman et al., 2015; Hummel et al., 2008; Stevens et al., 1996). These technologies enable more accurate assessment and better management of

pain in newborns. However, the use of these technologies remains patchy, particularly in low-resource settings where training and resources are limited.

Routine procedures in NBUs such as blood draws, heel sticks, intubation, mechanical ventilation, surgeries, lumbar punctures, intravenous line insertions, airway suctioning, and exposure to light and machines/noise expose neonates to pain (Carbajal et al., 2004; Cruz, 2024; Meyers et al., 2020; Skinner, 2010; Walter-Nicolet et al., 2010). Each of these treatments can cause severe agony and stress, underscoring the necessity for appropriate pain management techniques. Repeated exposure to pain can lead to undesirable effects, including altered pain sensitivity, increased vulnerability to chronic pain, and developmental difficulties impacting cognitive and behavioral functioning (Grunau & Craig, 1987).

Neonatal admissions at NBUs in Kenya are driven by high rates of preterm, respiratory distress, and congenital abnormalities (Murphy et al., 2018; Wainaina et al., 2023). Despite the recognition of the importance of neonatal pain management, there are several gaps which include lack of standardized pain assessment tools, insufficient training, inadequate protocols and guidelines, and resource constraints (Arabiat et al., 2023; Beltramini et al., 2017; Christoffel et al., 2019; Cong et al., 2013; Peng et al., 2021; Popowicz et al., 2021). The absence of defined techniques and methods means that newborn pain is often under-recognized and badly handled (Arabiat et al., 2023; Beltramini et al., 2017). Training limitations further hinder the ability of healthcare practitioners to successfully manage pain, as they may lack understanding of both pharmacologic and non-pharmacologic interventions (Christoffel et al., 2019; Peng et al., 2021). Additionally, resource restrictions limit access to critical medications and equipment, thus affecting pain treatment efforts (Kleiber et al., 2011; Neshat et al., 2023; O'Brien et al., 2019).

Nurses are at the vanguard of neonatal care, playing a critical role in diagnosing and controlling pain in neonates. Their perspectives, knowledge, and behaviors directly impact the quality of pain management delivered (Carlsen Misic et al., 2021; Cong et al., 2013; Pölkki et al., 2018). Understanding current methods and identifying gaps is critical for creating focused strategies to improve newborn pain management. This study seeks to analyze the views and practices of newborn pain care among nurses in Nyanza and Western Kenya to better understand the problems and areas for improvement.

### **1.3 Statement of the problem**

Neonates admitted to the NBUs experience many painful events due to invasive procedures such as blood draws, intubation, mechanical ventilation, and surgeries, but also by non-invasive procedures and underlying medical conditions like inflammation, infections, and congenital anomalies (Kaur & Mahajan, 2019). Nurses are at the forefront of managing newborn pain however there is a paucity of data on neonatal pain care methods by Nurses in NBUs in Nyanza and Western Kenya. This study intends to fill this gap by assessing the opinions and actions of nurses working in NBUs in Nyanza and Western Kenya regarding neonatal pain treatment.

### **1.4 Main Objective**

To evaluate the perceived neonatal pain management practices among nurses working in newborn units (NBUs) in Nyanza and Western Kenya.

#### **1.4.1 Specific Objectives**

- i. To assess nurses' perceived knowledge on neonatal pain management in newborn units in Nyanza and Western Kenya.
- ii. To assess nurses' perceived competency on neonatal pain management in NBU in Nyanza and Western Kenya
- iii. To determine the availability of assessment tools and strategies used by nurses in neonatal pain management in newborn units in Nyanza and Western Kenya.

### **1.5 Research Questions**

- i. What is the perceived knowledge on neonatal pain management among nurses working in the newborn units in Nyanza and Western Kenya?
- ii. What is the perceived competency on neonatal pain management among nurses working in the newborn units in Nyanza and Western Kenya?
- iii. What are the assessment tools and strategies used in neonatal pain management in the newborn units in Nyanza and Western Kenya?

### **1.6 Justification of the Study**

Untreated newborn pain is a major cause of clinical morbidity both in the short and long term worldwide (Cruz, 2024; Kebede et al., 2023; Krishnan, 2013). Another significant issue with care quality is insufficient pain management (Campbell-Yeo et al., 2022). To close the gaps in neonatal pain management, it may be necessary to comprehend the attitudes and behaviors of nurses regarding this treatment.

### **1.7 Limitations of the study**

Numerous issues with the research design, sample size, and sampling techniques were present in this study. The study's descriptive analytical cross-sectional approach assessed the beliefs and methods of NBU nurses in Western Kenya and Nyanza at a single point in time, making cause-and-effect analysis impossible. Data were gathered using a mixed-method approach (qualitative and quantitative), which combined both quantitative and qualitative data collection techniques. Together with quantitative surveys, in-depth interviews yielded specific information that contributed to a more thorough knowledge of the challenges.

The study's sample consisted of 89 nurses who worked in newborn units in several hospitals located in Western Kenya and Nyanza. The findings' potential for generalization may be limited by the very small sample size. All eligible nurses working in the chosen hospitals were included in the study using a census approach. By doing this, it was made sure that the sample was as representative as possible of the whole population of nurses employed in the research regions' newborn units. The results were further enhanced by qualitative information gleaned from in-depth interviews, which offered deep, contextual insights that supported and extended the quantitative findings.

Purposive sampling was employed in the sample techniques to choose the study locations and participants. Since this non-random sampling method depends on the researchers' judgment to choose volunteers who are thought to be competent about the study topic, it may induce bias. In order to reduce bias, certain inclusion criteria were devised, guaranteeing that every person who was chosen has pertinent experience and understanding regarding the management of pain in neonates. Pre-testing the data collection tools was also done to make sure the questions were relevant and clear, which improved the validity and dependability of the data that was gathered. Additionally, the research assistant received training on adhering to conventional data collection procedures, which lessened interviewer bias.

### **1.8 Conceptual framework**

- a. This study's conceptual framework was created after a thorough analysis of pertinent theories and research on the treatment of newborn pain. It offers an organized depiction of the major factors and how they interact, directing the goals and approach of the research. The paradigm draws from well-

established theories and empirical research in the fields of pain management and infant care.

Pain perception is thought to be influenced by neurological gates in the spinal cord that either permit or prohibit pain impulses from reaching the brain, according to the Gate Control Theory of Pain, which was developed by Melzack and Wall in 1965. The necessity for thorough pain assessment instruments that take behavioral and physiological indications into account is highlighted by this theory, which emphasizes the significance of both physiological and psychological components in pain perception and management (Melzack & Wall, 1965)... Engel (1977) developed the biopsychosocial model, which highlights the interaction of social, psychological, and biological elements in health and disease. Effective pain management solutions for neonates should take into account psychological and environmental elements that can affect the experience and consequences of pain in addition to the physical aspects of pain (Engel, 1977).

Nurse Perceptions of Neonatal Pain: Research (e.g., Axelin et al., 2010; Costa et al., 2017) has demonstrated that nurses' attitudes and perceptions of neonatal pain have a substantial impact on how they treat patients' pain. It is essential to comprehend nurses' perspectives in order to pinpoint areas of practice and knowledge gaps and create focused interventions that will enhance pain treatment.

Assessment tools and strategies: In newborn care, the literature emphasizes the necessity of using standardized instruments for pain evaluation. It is commonly advised to use instruments such as the Neonatal Pain, Agitation, and Sedation Scale (N-PASS) and the Premature Infant Pain Profile (PIPP) (Stevens et al., 2014; Hall & Anand, 2014). By combining behavioral and physiological markers, these instruments offer a thorough evaluation of newborn pain.

Pain management therapies: For pain management in neonates to be effective, both pharmacologic and non-pharmacologic interventions are necessary (AAP, 2017; Foster et al., 2013). Pain can be effectively reduced by non-pharmacologic methods including kangaroo care and non-nutritive sucking (Cong et al., 2014; Latimer et al., 2009). Analgesics and sucrose are two

examples of pharmacologic therapies that are essential parts of pain treatment regimens. The conceptual framework was constructed to show the correlations between the following important factors based on these ideas and empirical findings:

a. Unrelated variables:

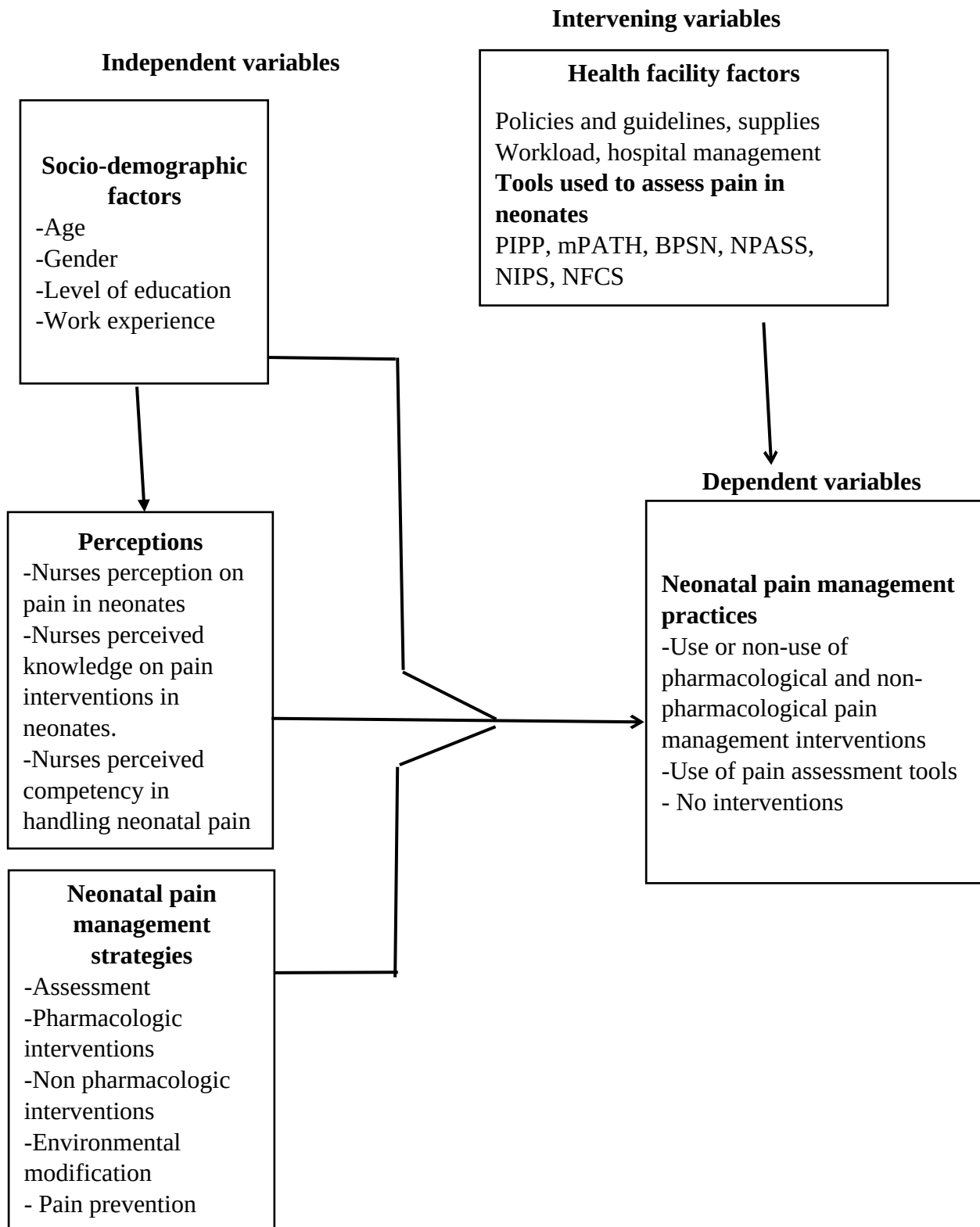
Sociodemographic factors: Age, gender, education level, work experience; ii. Nurse perceptions: attitudes toward pain assessment and management; use of standardized pain assessment instruments; familiarity with pain assessment protocols; interventions: application of pharmaceutical and non-pharmacologic pain management techniques.

b. Dependent variable: Neonatal pain management techniques: Stable physiological markers and less behavioral pain cues are indicative of effective neonatal pain management.

d. Intervening factors: Support from institutions: Resources, training courses, and assistance from medical facilities are all readily available.

d. Policy and Guidelines: National and municipal policies on the treatment of newborn pain are in place. The framework provides a visual representation of how nurses' attitudes and sociodemographic characteristics impact the use of interventions and evaluation tools, which in turn impacts the practices of managing pain in neonates. Effective pain treatment can be aided or hindered by intervening variables such as institutional support and policy guidelines.





**Figure 1.1 Conceptual Framework: Adapted from Priscah, and Martina (2018) and modified**

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Overview**

An overview of the relevant literature review is provided in this chapter. An overview of common reasons for neonatal admissions, pain, the burden of neonatal pain, the physiology of neonatal pain, tools used by NBU nurses to diagnose neonatal pain, common conditions and interventions that may cause neonatal pain, the perceptions of NBU nurses regarding neonatal pain, and the neonatal pain management strategies implemented in NBUs are provided.

#### **2.2 Common causes of admissions in neonates**

Prematurity is only one of the many reasons why newborns are frequently brought to the NBU. Many NBU hospitalizations are the result of preterm births, defined as births occurring before 37 weeks of gestation. Because of their undeveloped organs, premature babies frequently need specialist care and many invasive operations (Sedighie et al., 2020). Respiratory Distress Syndrome (RDS), which is prevalent in preterm newborns, is one of the other reasons for hospitalization. Breathing problems are brought on by low surfactant levels in the lungs, which is the cause of RDS. Nasogastric cannulas and other devices are used to provide oxygen to newborns in order to aid in breathing (Raha et al., 2021). newborn sepsis, pneumonia, and meningitis are among the frequent illnesses that need hospitalization to a newborn intensive care unit (NBU) (Budhathoki et al., 2020). Additional reasons include low birth weight (LBW) (Alene et al., 2022; Miyazawa et al., 2023); congenital malformations (Anane-Fenin et al., 2023; Chimah et al., 2022); and birth asphyxia (Lemma et al., 2022).

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#### **2.3 Neonatal pain**

For all animals to survive, pain is essential. It serves as a warning indicator for possible tissue injury and prompts a variety of responses to stop or minimize additional harm (Eccleston et al., 2021). Diverse definitions exist for pain. The 2020 update of the International Association for the Study of Pain (IASP) defines pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage, whereas the medical dictionary by Farlex defines it as an unpleasant feeling that is relayed by sensory neurons to the brain to communicate the presence of actual or

potential harm to a body part (Raja et al., 2021). The World Health Organization (WHO), researchers, non-governmental organizations, and health care professionals all throughout the world now recognize the definition provided by IASP.

Tissue injury is the cause of pain. It frequently occurs as a sign of an illness or in conjunction with an acute injury. According to physiological theory, pain is produced when noxious or painful stimuli come into touch with pain receptors (Marchant, 2014). The next nerve impulse leaves the sensory nerve terminal and passes via the spinal cord and brainstem's nerve tracts before swiftly being transferred to the brain. After processing the pain experience, the brain swiftly stops the action that is generating the pain by triggering a motor reaction.

Neonates feel pain, just like other human populations do. Neonatal discomfort was denied and contested before to the 1980s. But as scientific study has grown, it has become clear that newborns feel pain (Gursul et al., 2019; Williams & Lascelles, 2020). More proof (Witt et al., 2016; Walker, 2019) suggests that newborns and infants feel pain just as much as adults and older kids do. Neonates experience pain as a result of physiological and behavioral changes. Sometimes the baby's growing nerve system is the source of the pain.

Pain in hospitalized newborns can be caused by a disease process, therapeutic or diagnostic procedures, or both. Clinically necessary treatments including venipuncture, heel prick inflammation, surgeries, and other intrusive procedures are typically the cause of the pain (Maxwell et al., 2019). Regretfully, assessing pain in neonates is particularly challenging because there is currently no direct biological marker for pain; instead, behavioral and stress-related physiological correlates such as facial grimacing, motor responses, and autonomic activity are known to exist (Gursul et al., 2019). As a result, pain in newborns is frequently ignored and mistreated. Therefore, it is crucial to identify neonatal discomfort and implement strategies to manage it. In order to assess and treat infant pain, nurses must take all essential measures.

#### **2.4 The Burden of neonatal pain**

A growing body of research (Anand et al., 2007; Balice-bourgeois et al., 2020; Shiff et al., 2021) has demonstrated that newborns undergo a number of traumatic operations while they are in the hospital. Over 460 000 newborns in the USA are thought to experience severe discomfort each year (Cong et al., 2014). According to further

research (Olsson et al., 2021), newborns in NICUs may endure ten or more uncomfortable treatments per day. Most often, intrusive treatments including venipunctures, surgeries, inflammation, and other clinically necessary procedures cause the discomfort. In summary, the several invasive procedures that newborns endure cause neonatal discomfort in ninety percent (90%) of normal neonates. Pain in newborns might have negative effects if it is not managed.

According to Eccleston et al. (2021) pain serves as an organism's principal means of protection against prospective injury, aiding in escaping from immediate danger, preventing harm, and alerting others to possible risk. Even while pain often has an adaptive purpose, it can nevertheless negatively impact an individual's ability to perform as well as their social and psychological well-being. One of the worst effects of exposing newborns to pain on a constant basis is altered pain sensitivity. Since most practitioners are unable to measure the pain's cost on the newborns, this discomfort frequently remains unnoticed and unrelieved (Riddell et al., 2020). Years of study (Hatfield, 2014; Walker, 2019; Williams & Lascelles, 2020; Shiff et al., 2021) have shown evidence that pain that is left untreated can have both immediate and long-term consequences that impact the brain, neurodevelopment, and pain reactivity throughout adulthood. Furthermore, poorly controlled acute pain has been linked to detrimental short- and long-term outcomes.

Pain that is not eased can alter physiology and have detrimental consequences on the immunological, gastrointestinal, cardiovascular, and endocrine systems. Scar-related changes in sensorimotor function were found in an observational research (Walker et al., 2018) evaluating the long-term impact of therapeutic treatments on preterm neonates. These changes continued until early adulthood. Neonates experiencing pain may experience immediate repercussions such as altered heart rhythm, altered behavior, interrupted feeding, disturbed sleep, and increased energy expenditure (Olsson et al., 2021). According to research (Riddell et al., 2020), newborns who experience prolonged pain episodes go into a passivity that is characterized by little to no movement of the body, an expressionless face, a decrease in heart rate and respiratory variability, and a decrease in oxygen consumption—all of which point to a marked energy conservation. These might result in consequences and the need for more intensive and longer treatment if the pain is not eased.

Research has indicated that children with poor cognitive, motor, and neurodevelopmental outcomes have been identified as those exposed to a large volume

of tissue breaking operations in the NICU (Victoria & Murphy, 2017; Walker, 2019). Additional evidence (Eccleston et al., 2021) found that long-term alterations in connection and structure were detected using neuroimaging. These alterations are correlated with the level of acute pain experienced by neonates in critical care as well as with their later-life cognitive, behavioral, and somatosensory results. Additional long-term effects include altered pain sensitivity, a higher chance of developing chronic pain, a slower pace of wound healing, an elevated risk of infection, and an elevated metabolic rate following traumatic events (Victoria & Murphy, 2017). Deficits in cognition and emotional control, along with delays in brain and motor development, are among the long-term effects (Waxman et al., 2016). In order to lessen these symptoms and avoid thrombo-embolic consequences, aggressive pain management may be required.

## **2.5 Physiology of pain in neonates**

Neonates' physiology of pain is influenced by the type of procedures performed and the methods used for pain management. The fetal Peripheral Nervous System (PNS), which contains every variety and quantity of peripheral nociceptors, is completely developed by the 20th week of pregnancy. The lack of complete myelination in the A-delta and C fibers connecting to the spinal cord slows down the conduction of nerve transmission to the central nervous system (CNS) (Foster et al., 2013).

According to physiological theory, pain is the result of unpleasant or toxic stimuli reaching sensory nerve terminals. Neonates experience pain due to a variety of unpleasant stimuli. A series of actions take place after intrusive operations like venipuncture cause tissue damage (Marchand, 2008). The nociceptors of A-delta and C afferent fibers are activated by the synthesis of biochemicals such as prostaglandins and bradykinin (Gursul et al., 2019). A pain impulse is produced when the nociceptors are activated. The stimulation travels from the spinal cord's dorsal horn to the anterior horn cells, where it is interpreted and the proper reflex reaction, such pulling back the arm, takes place (Hall et al., 2005). The interpretation of painful stimuli, transmission to supraspinal areas, and ultimately the transmission of descending impulses are all critically dependent on the spinal cord. It contributes to the modulation of pain as well. This entails the release of neurotransmitters that prevent the spinal cord from processing pain, including adrenaline, dopamine, and serotonin. However, because their levels of the neurotransmitters serotonin, dopamine, and adrenaline are low,

preterm neonates are unable to regulate their pain. Up until around 36 weeks of pregnancy, these neurotransmitters seem to be present at low levels (Hall et al., 2005; Foster et al., 2013).

## **2.6 Common conditions and interventions that may cause pain in neonates**

Significant postoperative discomfort is frequently experienced by patients who need surgery to repair congenital defects (Bandyopadhyay & Paul, 2016). Neonates frequently experience discomfort after lumbar punctures, IV cannulations, frequent blood draws, and catheter insertions (Ali et al., 2016; Anand & discomfort, 2001; Keels et al., 2016). Neonatal pain is significantly increased by intubation, infection, and invasive respiratory assistance (Ancora et al., 2019; Mohsen et al., 2022). As unpleasant as the insertion of central venous lines for the delivery of medicine or nourishment is, so too is the chest tube insertion procedure used to treat pneumothorax or pleural effusions (Kegler et al., 2016; Pereira Ferreira et al., 2020; Zolfaghari & Lee, 2024)

## **2.7 Diagnosis of pain in neonates**

To provide appropriate management and high-quality healthcare, accurate pain assessment and diagnosis are crucial. However, the assessment of neonatal pain is a complicated and difficult topic that is influenced by a variety of factors that may have an impact on the reaction to pain in the newborn, which in turn may influence the best assessment techniques (Tenge-Kuremu et al., 2017). Because they are unable to express their pain, newborns rely on others to identify, evaluate, and treat their discomfort. Sick neonates react differently to unpleasant stimuli depending on whether they are stressed or not. A newborn experiencing discomfort will cry and be agitated when they are awake (Bishop & Bishop, 2020). They will also have a disturbed sleep pattern, poor feeding, a scared expression on their face, and a distrusting behavior toward the caregiver (AAP, 2017).

Nursing practice currently mandates that all healthcare institutions use procedures that are suitable for managing a baby's discomfort as well as a pain evaluation tool. Nurses primarily employ behavioral, physiological, and subjective evaluation criteria to evaluate newborn pain (Tenge-Kuremu et al., 2017;Wari, 2021). In addition to physiological data, cries accompanied by certain facial expressions, the infant's posture, and movements are all valid markers of discomfort (Balice-bourgois et al., 2020).

## **2.8 Tools used to assess pain in neonates.**

To evaluate newborn pain, a variety of instruments are available. The instruments might be multidimensional (monitoring physiologic, behavioral, or other factors) or unidimensional (measuring one parameter) (Twycross, 2017).

The multidimensional assessment instruments employed in NBU exhibit clinical utility, validity, and reliability. Neonatal pain evaluation methods consist of one or more observable indications, as stated by McPherson et al. (2020). The instruments assess physiological changes in blood pressure, oxygen saturation, heart rate, breathing pattern, or other pain markers (Abu-Saad et al., 1998; Fitri et al., 2019; Pereira et al., 1999). Crying, changes in facial expressions, and monitored body movements are examples of other behavioral signs. Contextual factors include, but are not limited to, reactivity to painful stimuli and gestational age.

A wide range of instruments have been tested for NICU pain evaluation. These include the BPSN (Bernese Pain Scale for Neonates), the CRIES scale (crying, requires

oxygen saturation, increased vital signs, expression, and sleeplessness), the Neonatal Infant Pain Scale (NIPS), the Neonatal Facial Coding Scale (NFCS), and the Premature Infant Pain Profile (PIPP). Every instrument measures many parameters.

### **2.8.1 Premature Infant Pain Scale (PIPP)**

The PIPP is a validated seven-item, multidimensional test that is frequently used to quantify pain in preterm infants. Three behavioral, two physiological, and two contextual elements make up the PIPP's composition (B. J. Stevens et al., 2014). The seven items are assessed on a 4-point scale based on actual data, with each item being numerically scaled (0, 1, 2, 3). The increasing variations in each variable from the baseline values are reflected in the four-point scale. A total pain intensity score is then calculated by adding the ratings for each of the seven items. For preterm infants under 28 weeks GA, the maximum possible PIPP score is 21, while for full-term infants, it is 18. The following are the three categories of clinical management:

- i. A score of 0 to 6 usually means the baby is in minimal or no discomfort, thus they are not acting.
- ii. A score of 7 to 12 denotes mild to moderate discomfort. Use comfort measures to get this score.
- iii. A score higher than 12 can suggest extreme pain: It is advised to use pharmaceutical intervention

A number of 0 denotes no discomfort, while a score of 21 denotes excruciating pain.

### **2.8.2 Neonatal Pain Agitation and Sedation Scale (N-PASS)**

The American Medical Association (AMA) states that N-PASS is a practical and psychometrically sound tool for assessing pain and sedation in the majority of newborn populations as of 2019. Five indicators are intended to be measured by the N-PASS. This technique measures sobbing, irritation, facial expressions, extremities tone, and vital signs as pain markers. Sedation is rated as 0, -1 or -2, whereas pain and agitation are rated as 0, 1, and 2. The sum of the scores for each indication is used to get the overall score.

### **2.8.3 The NIPS (Neonatal Infant Pain Scale)**

Due to its great clinical usefulness and reproducibility, the NIPS scale is advised for heel prick procedures in children under one year old and preterm newborns (Xie et al.,



2021). The behavior that nurses have identified as suggestive of pain or distress in infants is used by the instrument. It consists of six (6) behavioral indicators, all of which are scored as 0 or 1, with the exception of "cry," which has three alternative descriptions and may be rated as 0 or 2 (Bishop & Bishop, 2020). Any score higher than three indicates discomfort. It takes one minute to thoroughly evaluate each signal in infants. The NIPS instrument measures the following pain indicators: level of arousal, breathing patterns, posture of the arms and legs, facial expression, and crying. Neonatal Facial Coding Scale (NFCS), version 2.8.4

Physiological markers are helpful in assessing and measuring pain. Nevertheless, research indicates that these physiological markers may not be directly linked to pain, necessitating the use of substitute instruments to assess other factors. Olsson et al., 2021; Pinheiro et al., 2015). The NFCS scale uses eight facial movements to assess the presence or absence of pain. According to Grunau and Craig (1987), they include the following: brow bulge, stretched mouth (horizontal/vertical), pinched eyelids, tense tongue, deepening of the naso-labial fold, tongue protrusion, wide lips, and chin quiver. By using the NFCS scale, medical personnel may reduce pain, discomfort, and problems during unpleasant procedures by being aware of the development of physiological or behavioral signs.

#### **2.8.5 Needs Oxygen Saturation, Expression, Elevated Vital Signs, and Sleeplessness (CRIES)**

The abbreviation CRIES stands for five behavioral and physiological factors that have been linked to newborn pain in the past. C stands for crying; R for requiring more oxygen to be administered; I for elevated vital signs; E for expression; and S for lack of sleep. The instrument is used to gauge a newborn's suffering after surgery (Bishop & Bishop, 2020). The most popular tool among nurses, the CRIES assessment assesses five factors in the neonate: crying, need for oxygen, elevated vital signs, expression, and lack of sleep. Each indication is given a numerical variable in order to get a score. For every indication, the scores vary from 0 to 2.

#### **2.8.6 Neonatal Bernese Pain Scale (BPSN)**

Nine signs are assessed by the BPSN tool: six behavioral indicators (such as body language, sobbing, crying, skin color, sleeping pattern, and consoling objects) and three physiological indicators (heart rate, breathing rate, and oxygen saturation).

#### **2.8.7 The mPHAT, or Modified Pain Assessment Tool**

This multimodal pain evaluation instrument was created especially for newborn

patients receiving surgery. For both surgical and non-surgical infants, from 24 weeks gestation to full term, up to 6 months of age, the mPAT has been validated. The new indication on the nurse's impression is part of the modified pain assessment tool (mPHAT), which focuses on behavioral and physiological responses to pain (Hall & Anand, 2014).

## **2.9 Reducing Pain in Infants**

So, preventing discomfort is the responsibility of nurses and everyone else providing care for newborns. The American Academy of Pediatrics advises all healthcare institutions that care for newborns to put into practice efficient pain avoidance measures. Among the strategies are routine pain assessment, reducing the number of painful procedures performed (Witt et al., 2016), preventing pain associated with routine minor procedures through effective use of pharmacologic and non-pharmacologic therapies, and removing pain associated with surgery and other major procedures (AAP, 2017).

In addition to being morally right, preventing suffering is essential as prolonged pain exposure has negative effects (Williams & Lascelles, 2020). In order to do this, evidence-based written recommendations that provide a step-by-step pain prevention and treatment strategy should be available in institutions that provide care for newborns (American Academy of Pediatrics, 2017). This involves routinely assessing pain and using both pharmaceutical and non-pharmacologic pain management techniques to minimize discomfort during both small and big invasive operations. Non-pharmacologic interventions like as "Kangaroo" mother care, nursing, and assisted tucking have been proven to significantly reduce discomfort when administered prior to operations, according to available data (McNair & Ec, 2019). Furthermore, analgesia was shown to be beneficial in procedures involving mild to moderate pain when pharmacologic treatments, such as oral glucose/sucrose, were used (Balice-bourgeois et al., 2020). For the management of severe pain, morphine and midazolam are used (AAP, 2016; Sposito et al., 2017).

Creating a conducive environment by reducing noise and lighting, scheduling specific procedures like physical examinations and diaper changes at the same time, minimizing blood sample withdrawal for laboratory testing, and using non-invasive devices like oximeters and bilirubin meters for analysis are some other recommended methods used to prevent neonatal pain (Shiff et al., 2021).

**Kangaroo Care:** This is a commonly utilized pain management technique. Research

has shown that providing Kangaroo care (KC), also known as skin-to-skin care (SSC), to preterm babies as an intervention may enhance the management of pain-related distress and lower responsiveness to pain (Saul, 2017). Lowering the PIPP scores, salivary cortisol, pulse variability, and weeping time all contribute to this benefit. According to a research, KC/SSC is a safe and affordable way to manage discomfort in preterm infants. This is accomplished by the technique by lowering the behavioral and physiological reactions to invasive treatments such as venipuncture, intramuscular injections, and heel lances (Efe et al., 2013). According to Cong et al. (2013), KMC is also recognized for providing the newborn with multisensory stimulation, which includes visual, olfactory, auditory, emotional, and thermal stimulation. This approach is thought to reduce and avoid pain perception, hence lessening the infant's reaction to unpleasant stimuli.

As a comfort measure, music therapy uses a global approach to change the neonate's whole environment instead than focusing on a single stressor. In the neonatal intensive care unit, music is used to reduce the disruptive environmental cues, including bright lights and loud noises, while also calming the newborns by lowering their behavioral state (Butt & Kisilevsky, 2000).

Cue-based care: It is possible to organize an infant's care using signals that are provided by both term and preterm babies. In order to support the neurodevelopmental needs of the infant, this approach takes into account the behavioral cues (signals) that the infant exhibits, such as readiness to engage, distress, hunger, or sleep/wake states (Perry et al., 2019). Cue-based care prioritizes the individualized approach when care is variable and is based on interpretation of the infant's signals over the routine or rigid protocol-based approach where individual needs are not taken into account.

## **2.10 The ability, attitude, perception, and knowledge of nurses in the management of newborn pain**

Recognizing that newborns do indeed suffer pain is the first step in learning about and comprehending their misery. Historically, newborns' suffering was either disregarded or not adequately addressed (K. Anand et al., 2007). This was mostly brought on by ignorance of how the newborn's developing nervous system processed pain. Nonetheless, there has been a notable advancement in recent times that has resulted in a heightened comprehension of the physiology of pain in newborns, thereby altering the belief that they are painless.

Numerous research have been conducted to determine the level of information that

nurses have about newborn pain (Cong et al., 2013; Muteteli, 2019; Wari et al, 2020). The research findings indicate that suboptimal pain management in newborns may be attributed to staff members' diverse knowledge, attitudes, and beliefs about pain, as well as their fear of the side effects of analgesia. Cong et al. (2013) conducted a research in the United States of America to evaluate nurses' attitudes about newborn pain care in the NICU. There were knowledge gaps in this research, despite the fact that the majority of participants were familiar with newborn pain treatment techniques. Notably, every individual had completed a bachelor's or master's degree, indicating that education is favorably connected with ethical behavior as stated in (Wari et al, 2020).

According to a 2017 research conducted in Brazil by Costa et al., the majority of nurses were aware that both preterm and term neonates suffer pain. The study evaluated nurses' knowledge and behaviors related pain treatment in babies hospitalized in NICUs and PICUs. In conclusion, research from the literature has shown that most members of the nursing community agree that pain is a reality for newborns. Additional data reveals that whereas some nurses are well-versed in pain management techniques, others are not at all. Furthermore, some nurses continue to maintain the belief that newborns are painless. Despite data supporting nurses' expertise in newborn pain management techniques, there are still gaps in the use of this information in practice (Costa et al., 2017). Additional research has shown that inadequate pain treatment causes newborn infants to continue endure pain (AAP, 2016; Muteteli, 2019, Wari, 2021). This has been linked to the staff's inadequate understanding of the specifics of newborn discomfort. Further study is necessary due to the disparities in research results regarding nurses' understanding of managing pain in neonates. Furthermore, there is a dearth of information and limited literature on the treatment of newborn pain.

Scholars from several African countries have underlined the importance of comprehending nurses' perceptions of the instruments and procedures they use to diagnose and manage pain in neonatal units (Kereri, 2019). It was previously believed that since newborns' neural systems are still developing and they are immature, they are incapable of feeling pain (Deaymar et al., 2014). According to other research, midwives and nurses believe that giving newborns painkillers to treat their discomfort might cause further problems (Kereri, 2019). Because of these views, the suffering of newborns was disregarded and went unaddressed. Since then, evidence-based

investigations (Riddell et al., 2020; Hoarau et al., 2021) have dispelled the myths around the aforementioned ideas by demonstrating that painful episodes do in fact occur in newborns. Evidence from publications throughout the years (Cong et al., 2014; Mehrnoush N et al., 2016; Carlsen Misic et al., 2021) has shown a relationship between nurses' attitudes and views of newborn pain and their knowledge and practice. Good pain management techniques are linked to nurses who think that neonates feel pain and who have a positive attitude towards it. However, two studies by Codipietro et al. revealed different results, despite the majority of the literature showing good knowledge and favorable opinions of newborn pain treatment (2011;Costa et al., 2017). According to Codipietro's research, knowledge and attitude have a poor correlation with pain treatment practice. According to the research, kids whose pain was evaluated by nurses were nine times less likely to get pain medication than babies whose discomfort was evaluated by physicians. These results show that nurses' perceptions of newborn pain differ. Research indicates that attitudes influence the decisions made on what to do in the neonatal units (Carlsen Misic et al., 2021;Ishak et al., 2019). Studies conducted worldwide reveal varying results, despite the fact that good attitudes are linked to beneficial behaviors. According to other research, healthcare professionals' assessments of newborn pain may have been overlooked throughout time (Muteteli et al., 2019b; Carlsen Misic et al., 2021). There is a research gap that needs to be adequately filled.

This section reviews the nurses' perceptions of newborn pain, including their degree of awareness of the condition, their own knowledge and skill in managing neonatal pain, and the aspects connected to health facilities that impact the treatment of neonatal pain. Neonatal pain is evaluated and treated effectively by nurses, who serve as the main caregivers in newborn units (Martinez, 2014). Costa et al. (2017) discovered in their research that although most nurses were aware of the necessity to use evaluation tools, they weren't always consistent in their usage. The existing analgesics' method of action for managing newborn pain was unknown to the nurses. It was also discovered in the same research that while the nurses were aware of the non-pharmacological methods for managing newborn discomfort, they never used them altogether. The research also found that agitation, sobbing, body language, and facial expressions were all utilized by nurses to identify newborn suffering.

### **2.11 Treating Pain in Infants**

The area of both therapy and diagnosis is growing more and more interested in the

problem of pain management in newborns. Research has shown again and again that reducing discomfort in the newborn stage is advantageous. Studies have shown that unmanaged neonatal pain is linked to behavioral, emotional, and learning disabilities, which can manifest at later stages of life, even though pain management improves improved physiologic, behavioral, and hormonal outcomes (Witt et al., 2016; AAP, 2017; Balice-bourgeois et al., 2020). In addition to being a moral obligation on the part of healthcare professionals, managing pain in neonates reduces the likelihood that the infant may have further difficulties (American Academy of Pediatrics, 2017). Neonates with altered pain sensitivity may be managed if painkillers are given as needed. There are several methods that may be used to control the pain. In order to prevent pain associated with routine minor procedures, surgery, and other major procedures, as well as the use of pharmacologic and non-pharmacologic approaches, the American Academy of Pediatrics (AAP) recommends the routine implementation of an effective pain prevention program in all healthcare facilities that deal with neonates. This program should also minimize the number of painful procedures performed (American Academy of Pediatrics, 2017).

It is crucial that nurses and other healthcare professionals strike a balance between using pain relievers sparingly and preventing serious health consequences for the newborn, even though effective pain relief procedures are given to the neonates during and after all surgeries (Popowicz et al., 2021). The safest and most effective way to manage neonatal pain is yet unknown. Further study is necessary because, despite the overwhelming evidence of the negative effects of pain on newborns, there is still a dearth of knowledge on the assessment and treatment of pain in this population.

The field of neonatal pain treatment is expanding and becoming fully recognized in certain areas. Normal medical treatment, which may include therapeutic and diagnostic procedures, blood sample collection, and other procedures, has the potential to cause significant suffering to both the newborns and their families. Even though these operations are necessary, it's imperative that they be carried out with little to no discomfort. In order to do this, the American Academy of Pediatrics (2017) suggests using four primary strategies: evaluation of pain, use of pharmaceuticals (pharmacological measures) and non-pharmacological measures, avoidance of pain, and environmental change.

A neonate's central nervous system reacts in a variety of ways when they experience

pain. There is a reliable way to quantify these reactions. According to Costa et al. (2017), one of the most effective ways for medical practitioners to quantify pain is via self-reported data. But because they cannot speak, newborns are unable to express their distress (Olsson et al., 2021). The Joint Commission guidelines for hospitalized patients (International JC, 2017) state that it is a required procedure for all patients to get a pain assessment. Neonatal cannot express their discomfort verbally, therefore assessing their suffering might be difficult. Thus, there is a need for substitute techniques for professional pain assessment, including validated scales.

Thus, the cornerstone of safe and effective pain treatment for newborns continues to be objective and trustworthy pain assessment. Pediatric Association of Anesthetists of Great Britain and Ireland (2012) recommends documenting the results of pain assessment, acting upon the results, and reassessing and reevaluating to ascertain the efficacy of interventions when assessing pain in neonates. In order to accurately evaluate and manage neonatal pain, the American Academy of Pediatrics (AAP, 2017; AAP, 2016) also suggests using trustworthy assessment tools. The use of pain assessment scales establishes consistency among healthcare professionals and offers an accurate way to measure the presence of pain, stress, or discomfort (Perry et al., 2019). The evaluation scales not only quantify pain but also accurately illustrate how pharmaceutical and non-pharmacological pain therapies affect a neonate's level of discomfort.

#### **2.11.1 Non-Medical Measures: Comfort Measures for Nurses**

The non-pharmacological techniques known as Nursing Comfort Measures (NCM) are critical for managing discomfort in neonates (Mangat et al., 2018). In addition to the analgesia-based therapies, the parents, other healthcare professionals, and nurses carry out the measures. Research shows that non-conventional analgesia, including sucrose (Krowchuk, 2018), as well as physical and environmental interventions, like suckling or tactile stimulation, may observably reduce the reaction to pain (Saul, 2017). As of right now, there is no indication that these actions might be hazardous (McNair & Ec, 2019). According to the Pediatric Association of Anesthesiologists (2012), the interventions include nursing the infant, moving the baby, swaddling, nesting, easier truckling, holding the confinement, and reducing environmental destructors such light and noise (Mangat et al., 2018; McNair & Ec, 2019). Additional NCM interventions include cue-based care improvement, kangaroo care method, tactile calming, talking to the infant, changing diapers, and using dummies to improve sucking (Priscah &

Martina, 2018).

One non-pharmacological control method is swaddling, which is covering the infant to limit mobility. It was shown that this reduced discomfort both during and after heel sticks (Latimer et al., 2009; Mangat et al., 2018). By enhancing the proprioceptive, tactile, and thermal systems; inhibiting nociception; and fostering inhibitory processes, swaddling is believed to lessen the stress response in newborns (Saul, 2017). It is believed that swaddling has soothing benefits because it replicates the sense of confinement that a baby has while still in the womb, which is beneficial for a newborn experiencing discomfort during a procedure. Previous studies by Huang et al. (2004) shown that when there are no outside stimuli, swaddling as a comfort strategy promotes regular breathing, lowers heart rate, and induces sleep. This fact has not altered despite further evidence over time (Pediatric Association of Anesthetists, 2012; McNair & Ec, 2019; Efendi et al, 2018). In order to decrease procedural discomfort in preterm infants, pacifier and swaddling usage were examined in a randomized control research conducted by Efendi et al. They advised swaddling preterm newborns to reduce their suffering. However, since the study focused on preterm infants, further investigation on the efficacy of swaddling on full-term newborns will be required.

**Massage:** The hands-on, skin-to-skin manipulation of the soft tissue by the caregiver, in accordance with the baby's body contours, constitutes massage treatment. By improving vagal activity, lowering insulin and insulin-like growth factor 1, and lowering cortisol and epinephrine levels, massaging the newborn's body helps to manage discomfort. Compared to prone orientation during heel sticks, gentle massage had an analgesic effect on preterm neonates delivered at 32 weeks (Liu et al., 2022).

**Acupuncture:** This technique is extensively used to relieve pain across Asia, mostly in China. In order to relieve pain, acupuncture sites are stimulated mechanically or electrically. It functions by endorphin system activation (Hall & Anand, 2014).

**Non-nutritive Sucking:** This technique reduces discomfort in newborns during heel stick and venipuncture procedures because it has a calming impact (Wade et al., 2020). Increased amounts of endogenous endorphins, which inhibit pain receptors, are how non-nutritive sucking works.

**Oral glucose:** Often mislabeled as non-pharmacological, oral sucrose or glucose causes the body to manufacture endogenous opioids in newborns, which lessen the discomfort associated with procedures. Research indicates that sucrose administration significantly reduces behavioral and physiological pain markers in newborns, and



improves many validated pain ratings (McPherson et al., 2020; Latimer et al., 2009). This is particularly evident in the reduction in physiological response measurements, such as heart rate, oxygen saturation, and vagal tone, in comparison to the placebo group (Hoarau et al., 2021).

**Breastfeeding:** It is thought that the release of cholecystokinin, a neuropeptide, during breastfeeding and non-nutritive sucking helps sustain analgesia in newborns (Mangat et al., 2018). Breastfeeding is advantageous for one-time unpleasant procedures like heel sticks or venipunctures because it is thought that the mother's familiar scents release cholecystokinin (Latimer et al., 2009). Latimer et al. (2009) discovered that breast-fed infants showed less physiological reaction than those who were given pacifiers, oral sucrose, swaddling, holding by the mother, or placebo. The infant took less time to cry overall and to cry for the first time, and their heart rate increased less. NIPS, PIPP, NFCS, and CRIES pain ratings were significantly decreased. It is believed that the way breast milk reduces pain is multifactorial, including the mother's skin-to-skin contact, sucking, the flavor of the milk, which is somewhat pleasant, and the endorphins that are present in the milk (Mangat et al., 2018).

### **2.11.2 Drug-related therapies**

Giving the newborn the right analgesia before invasive operations helps to avoid acute discomfort. There are several pharmacological treatments available to treat newborn discomfort (Kim, 2020). The most widely used pharmacological agents in pain relief are oral glucose, opioids, with fentanyl and morphine being used for persistent pain; other groups of drugs used are analgesics and sedatives. Pharmacological therapies for neonatal pain control include oral sucrose and other sweet liquids, local analgesia including topical anesthetics and lidocaine, and systematic analgesia including opioid therapy (morphine and fentanyl).

**Anesthetic Agents:** Topical anesthetics like tetracaine gel and EMLA (Eutectic Mixture of Local Anesthesia) when used in preterm babies showed lower N-PASS score. Local anesthetics like lidocaine are safe to use during cannulation, peripheral arterial puncture, and percutaneous central venous catheter insertion.

**Opioids:** These medications, which include fentanyl and morphine, are used to treat moderate-to-severe pain in newborns (Latimer et al., 2009). Given that morphine has a significant impact on the heart rate and breathing rate of newborns, nurses should exercise caution while giving this medication. In addition, hypotension, constipation, and urine retention are brought on by morphine. To manage pain prior to surgery,

fentanyl and its short-acting derivatives, remifentanyl and alfentanil, are utilized. But it is known to result in stiffness of the chest wall and bradycardia (Foster et al., 2013).

**Benzodiazepines:** According to Efe et al. (2013), benzodiazepines relax muscles and have a sedative effect. One such would be the use of midazolam, which has a sedative effect during operations such as mechanical breathing to prevent neonates from feeling discomfort. It has a little analgesic effect. Given that midazolam might increase the risk of respiratory depression and hypotension in neonates taking opioids, close supervision of these patients is crucial (Foster et al., 2013). The anesthetic ketamine has sedative, analgesic, and amnestic properties. It is an excellent option for unstable, hypotensive infants who need invasive procedures like intubation because of its little influence on cerebral blood flow (Martins et al., 2013).

**Analgesic:** Acetaminophen, or paracetamol, is widely accessible. There are formulations for oral, rectal, enteral, and infusion use. It reduces the need for opioids as an analgesic for pain management. Nurses must take great care to prevent overdosage because of the drug's harmful effects on the liver (Hall & Anand, 2015).

## **2.12 Aspects of health facilities that impact the treatment of newborn discomfort**

Because newborns cannot express their requirements verbally, newborn units are specific divisions in hospitals with particular needs. Neonatals need unique care since they are non-verbal and primarily communicate by physiological, behavioral, and bio-behavioral markers (Maxwell et al., 2019).

The availability of regulations and standards for pain management is a significant factor in determining how newborns control their pain. How newborn pain is treated may vary depending on a number of criteria relating to the health institution. These variables include, but are not limited to, personnel levels, the availability of policies, guidelines, and instruments for pain evaluation and treatment, as well as supplies. According to a research including doctors and nurses, management concerns, pain management guidelines, and supplies may all affect how well neonates are able to manage their pain (Mehrnoush et al., 2018). Due to the lack of a neonatal pain policy or procedure, nurses and doctors in this research choose how to treat newborn pain on their own. Another study (Popowicz et al., 2021) revealed that nurses were not managing newborn discomfort appropriately. The nurses blamed their lack of nursing personnel and heavy workload for their incompetence, stating that they gave priority to addressing crises.

Supplies are essential to patient treatment. Neonatals may be exposed to unpleasant,

repeated operations if essential equipment like cannulation devices and vein finders are not available.

Several obstacles to efficient newborn pain treatment were identified by nurses working in neonatal intensive care units in Poland and Egypt, according to subsequent investigations. The obstacles included a shortage of personnel for the units, inadequate or nonexistent training, a lack of resources, bad procedures, and a breakdown in communication within the new team (Popwicz et al., 2021; Adam et al., 2023).

Although research generally indicates that variables associated to health facilities are important in influencing whether or not pain is controlled in newborns, it is unknown whether this holds true in the study area.

### **2.13 Identified Gaps**

Many gaps or obstacles exist in the treatment of newborn discomfort. These gaps fall into three primary categories: the mishandling of standardized pain assessment instruments, the discrepancy between theory and practice, and more general institutional impediments that hinder the appropriate handling of newborn pain. An important gap identified in the literature is the uneven use of standardized pain assessment instruments in newborn hospitals. Although validated assessments like the CRIES scale, the Premature Infant Pain Profile (PIPP), and the Neonatal Infant Pain Scale (NIPS) are available, there is insufficient integration of these tools into standard clinical practice. According to research by Stevens et al. (2011), these instruments are underutilized even though they are useful for determining pain based on physiological and behavioral indicators. This is especially true in low-resource settings where medical professionals might place a greater emphasis on subjective measures like crying and facial expressions. This discrepancy often results in missing or delayed pain awareness, especially in newborns who are non-verbal and may not be aware of their suffering. Cong et al. (2013) provide more evidence that nurses often lack the training necessary to use these instruments even in well-equipped newborn facilities. In places like Nyanza and Western Kenya, where there are severe resource constraints and a lack of institutional support, this practice gap is particularly noticeable (Wari, 2021). Moreover, research indicates a significant discrepancy between nurses' actual use of pain management approaches and their theoretical comprehension of newborn pain management. Research have shown that while medical professionals are aware of the pharmacologic and non-pharmacologic pain management options for newborns, they

are not always using these options in daily practice (Costa et al., 2017; Muteteli et al., 2019). Because of uncertainties about side effects and inadequate dose guidance for newborns, pharmacologic interventions—such as the use of analgesics like morphine, fentanyl, or non-opioid substitutes—are often neglected (Hall & Anand, 2014). about instance, despite research showing that opioids are safe and effective when used appropriately, many nurses report feeling reluctant to give them out out of concern about respiratory depression or long-term developmental effects (Anand et al., 2007). This disparity emphasizes the need of ongoing education and bolstering nurses' self-assurance in order to guarantee the proper administration of pharmaceutical treatments when required. The underutilization of non-pharmacologic therapies, which have been shown in several studies to be successful in treating mild to severe newborn pain, is equally troubling. It has been shown that pain-related behaviors and stress in newborns may be decreased by interventions such breastfeeding, skin-to-skin contact, swaddling, and non-nutritive sucking (Witt et al., 2016). But as Popowicz et al. (2021) point out, a lot of nurses don't always use these therapies because of workload constraints, a lack of time, or a failure to see them as effective first-line techniques for managing newborn pain. This disparity is exacerbated in environments with little resources, when the need for newborn comfort and pain treatment is often subordinated to the requirement for basic survival. The difficulties in addressing newborn pain are further compounded by institutional variables, such as high patient-to-nurse ratios, a lack of resources, and unclear rules. Research shows that staffing levels in newborn wards are often inadequate, which makes it challenging for nurses to do routine pain assessments and provide prompt treatments (McPherson et al., 2020). This issue is especially serious in underdeveloped nations, where a lack of medical experts and restricted access to resources for neonatal care may cause newborns to suffer from pain untreated for prolonged periods of time. Moreover, Carbajal et al. (2008) contend that variations in treatment result from the fact that pain management is still not widely standardized, even in environments with greater resources, such those found in North America or Europe. Nurses in some hospitals are left to treat newborn pain on their own judgment, which might vary greatly according on their experience, workload, or personal prejudices. In these institutions, there are no explicit regulations or protocols regarding this matter.

The larger healthcare system has an impact on the discrepancy between policy and practice. For instance, there is often insufficient oversight and responsibility to

guarantee that pain management guidelines are followed, even in cases when they are accessible. Although many neonatal facilities do not emphasize these metrics, Costa et al. (2017) pointed out that institutional assistance in the form of frequent audits, documenting of pain assessments, and feedback loops might play a vital role in closing this disparity. Furthermore, research highlights the need of multidisciplinary cooperation between neonatologists, nurses, and pain experts to create thorough pain management regimens while treating newborn pain (Stevens et al., 2011). Fragmented care is a result of this degree of cooperation not being completely achieved in many healthcare settings.

An other void noted in the literature relates to nurses' education and training in the care of newborn pain. Even though the value of this training has been well established, there is still a lack of consistency in continuing education about pain management strategies, especially in lower-class environments (Muteteli et al., 2019). While there may be more training programs available in high-income countries, they are often elective rather than required, which leaves a gap in the universal competency of newborn care professionals. This gap might be closed by ongoing professional development initiatives that focus non-pharmacologic and pharmacologic pain treatment techniques; however, these initiatives must be prioritized and made available to all healthcare settings (Witt et al., 2016).

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1 Overview**

This chapter focuses on the study's procedural methodology. Study design, variables of the study, study location, target population, inclusion and exclusion criteria, sample size determination and sampling techniques, construction and research instruments, pretesting, data collection techniques, validity and reliability, data analysis, and ethical and logistical considerations are the sections that make up this chapter.

**3.2 Study Design: A cross-sectional, descriptive-analytical study design was used.**

#### **3.3 Subject Matter**

Nyanza and Western Kenya were chosen as the research area because of the variety of public healthcare services in these regions. 9,776,913 people were living there according to census records from the year the research was conducted (Census 2009). Kisumu, Homa Bay, Migori, Kisii, Kakamega, Vihiga, Bungoma, and Busia counties were included in this region. Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu County Referral Hospital, Busia County Referral Hospital, Bungoma County Referral Hospital, Vihiga County Referral Hospital, Kakamega County Referral Hospital, Homa Bay County Referral Hospital, Kisii County Referral Hospital, and Migori County Referral Hospital were among the hospitals with NBUs in the study area.

#### **3.4 Research variables**

The sociodemographic characteristics of the respondents—such as the nurse's age, gender, degree of education, and work experience—were the independent variables in the study. Newborns' sensations of discomfort were additional independent factors. The perceptions were revealed via views on neonates' suffering, knowledge and competence. The use of muscle relaxants, sedation, completing pain score instruments, documenting the results, adopting a team approach to the scores, completing NCM, and including family members in pain management were among the practices that were shown. The nurse-managed newborn pain treatments were the dependent variable. Tools for measuring neonatal pain and aspects of the healthcare institution, such as personnel, regulations and procedures, workload, and supplies, were the intervening variables. The availability of pain scales, such as the mPHAT, PIPP, NFCS, NPASS,

and CRIES scales, served as an example of the instruments.

### **3.5 Research Subjects**

Because they are largely in charge of continuing pain evaluation and treatment in NBUs, the research concentrated on nurses working in nine hospitals within the study region. The medical professionals that regularly interact with babies the most are nurses. This does not imply, however, that other medical practitioners cannot treat neonatal discomfort. Interviews were conducted with 89 nurses who worked at the designated NBUs as well as seven key informants, or nurses in charge.

### **3.6 Criteria for inclusion and removal**

#### **3.6.1 Criteria for inclusion**

All of the nurses who had agreed to participate in the research, had worked for more than six months, and had the necessary expertise managing newborn pain at the chosen NBUs.

#### **3.6.2 Criteria for exclusion**

nurses who refused to give their permission to take part in the research.

### **3.7 Methods for Determining Sample Size and Sampling**

#### **3.7.1 Calculating the Sample Size**

A sample of nurses who gave their assent and had spent more than six months working in the NBUs of the nine institutions that were chosen were interviewed. 89 nurses in all were questioned using both closed- and open-ended questions based on these criteria. The sampled nurses were distributed as follows:

#### **Table 3.1: Frame for sampling**

|                                                  |
|--------------------------------------------------|
| Nursing facility count at NBU                    |
| Oginga Teaching & Referral Hospital, Jaramogi 16 |
| Hospital for Referrals in Kisumu County          |
| Hospital for Referrals in Busia County           |
| Hospital for Referrals in Bungoma County         |
| Hospital for Referrals in Vihiga County          |
| Hospital for Kakamega County Referral 9          |
| Hospital Referral Homa Bay County 13             |
| Hospital for Referrals in Kisii County           |
| Hospital Migori County Referral 7                |
| In total, 89                                     |

A qualified research assistant gave the respondents the questionnaires. With their cooperation, seven nurse-in-charge provided qualitative data.

### **3.7.2 Techniques for Sampling**

Purposive sampling was used to choose public hospitals in the research region that have established NBUs. Additionally, utilizing the survey questionnaire, nurses who had worked at the selected NBUs for longer than six months were questioned. Key informants were chosen from among the purposively sampled NBUs' nurse-in-charges.

## **3.8 Research Tools**

Two study tools were used in the data collection process. To gather qualitative information, the nurse-in-charges of the research area's purposively selected public hospitals were interviewed using a key informant interview guide. Quantitative data was gathered from 89 nurses working at the purposefully selected public hospitals using a survey questionnaire. The work of (Axelin et al., 2010; Nimbalkar et al., 2014; Priscah & Martina, 2018) served as the basis for the development of the tools. Information on the perception of nurses towards neonatal pain management, the tools used in neonatal pain assessment, protocols and procedures of pain assessment, adherence to pain assessment protocols, and the hospital infrastructure relevant to neonatal pain management was collected through the key informant interview guide. There were four parts in the survey questionnaire (A-D). The study participants' sociodemographic information was provided in Section A. The nurses' perception of neonatal pain in NBUs was discussed in Section B. The tools used by nurses to assess neonatal pain in NBUs were discussed in Section C. Questions about the practices of managing neonatal pain in NBUs were asked in Section D.

## **3.9 The validity and dependability of the study tools**

### **3.9.1 Accuracy**

Through a pilot study, the research instruments were pre-tested at the Moi Teaching and Referral Hospital (MTRH). MTRH is a public health center that provides services to people in Western Kenya and Nyanza. Furthermore, MTRH's illness profile resembles that of Nyanza and Western Kenya. It's also critical to remember that the research assistant received training on how to conduct interviews with respondents and record their information.



### **3.9.2 Trustworthiness**

At Moi Teaching and Referral Hospital (MTRH), a pilot study was conducted to pretest the research instruments' dependability. A 10% sample size (n=10) was used to assess the participants' consistency in their replies. The tool was reviewed using the respondents' feedback and then put through a reliability study with a 0.76 Cronbach's alpha cut off.

### **3.10 Data Collection Process**

Facility management was informed one week in advance of plans to use research locations for data collection so they could contact the appropriate participants. Before distributing the surveys, the researcher visited the locations and spoke with the people in charge. Data was gathered by giving questionnaires to the nurses who were sampled and by holding KIIs with the nurses who were in charge of the newborn units. A single research assistant received training on the methodology for collecting data. The assistant received training in interviewing and recording techniques to develop a standard questioning procedure after being briefed on the goal of the study. Information was gathered from September 2019 to April 2020.

#### **3.10.1 Gathering Quantitative Data**

Self-administered, semi-structured questionnaires were used. On a four-point Likert scale with four categories—Strongly Agree, Agree, Disagree, and Strongly Disagree—data on participants' perceived ability and knowledge in newborn pain treatment was gathered. Participants selected one answer for each item. The questions were broken down into three categories: nurses' views of newborn pain assessment, nurses' perceptions of neonatal pain therapies, and participants' perceptions of their own knowledge and skill in neonatal pain management.

#### **3.10.2 Empirical Information**

Important Source To get the qualitative data, the nurses overseeing the newborn units were interviewed. Open-ended questions were used by the researcher. Interviews were conducted with seven consenting in-charge nurses. As the interviews were happening, they were being captured on voice recorders. Important observations were also noted by the research assistant.

### **3.11 Information Evaluation**

The statistical data obtained from completed surveys was cleaned, coded, and variables were put into the then-current version of the Statistical Package for the Social Sciences

(SPSS) version 22.0 software for analysis. Frequencies for the demographic variables were computed. The association between nurses' perceptions and actions in the treatment of newborn discomfort was assessed using Spearman correlation. P-values less than 0.05 were regarded as statistically significant. Thematic analysis of qualitative data from the KIIs was conducted. Iteratively, themes were discovered and the transcripts were coded.

### **3.12 Moral Points to Remember**

Ethical clearance and consent for the purpose of conducting this study was gained by Masinde Muliro University's Institutional study and Ethics Committee (IREC). The hospital IRECs of JOOTRH, KTRH, and KCTRH as well as the corresponding county administrations of Busia, Bungoma, Vihiga, Migori, Homabay, and Kisumu granted permission for data collection in the research region. Prior to pretesting the questionnaire, the Chief Executive of Moi Teaching and Referral and Teaching Hospital (MTRH) gave verbal authorization to pretest the research instrument. The researcher introduced themselves in a letter that was created to go along with a questionnaire. The letter's contents made it very clear that the information provided by the responders would not be shared with other parties and that the data would only be utilized for academic reasons. After receiving all research information, participants were free to sign an informed consent form without feeling under duress. Since the identities of the responders were withheld and the material was coded and kept under lock and key, secrecy was preserved. Participants were informed that the research was completely voluntary and free of cost, therefore leaving the study early would not result in any penalties. The participating establishments were to be informed of the study's results.

## **CHAPTER FOUR**

### **RESULTS**

#### **4.1 Overview**

This chapter outlines the findings of the study. The data is presented in the form of tables and charts. Moreover, the results of inferential statistics have been provided.

#### **4.2 Questionnaire Response Rate**

The researcher targeted a sample size of 89. All the respondents filled the questionnaires and returned them, yielding a response rate of 100 %.

#### **4.3 Demographic characteristics of the respondents**

A total of 89 nurses filled and returned their questionnaires. Majority (84.3%) were females with diploma being the leading qualification (60.7%). Most of the respondents were in the age bracket of 21 – 39 (68.5%). Only slightly more than a third (36%) had worked for ten years or more. Eighteen percent were from JOOTRH followed by Kakamega (16.8%) and Kisii (14.6%) as per table 4.1.

**Table 4.1 Socio-demographic information of study participants**

| Characteristics    | Categories            | N  | %    |
|--------------------|-----------------------|----|------|
| Age group in years | 20 and below          | 1  | 1.1  |
|                    | 21 – 30               | 30 | 33.7 |
|                    | 31 – 40               | 31 | 34.8 |
|                    | 41 – 50               | 21 | 23.6 |
|                    | 51 – 60               | 6  | 6.7  |
| Gender             | Male                  | 14 | 15.7 |
|                    | Female                | 75 | 84.3 |
| Qualifications     | Diploma               | 54 | 60.7 |
|                    | Post-graduate diploma | 15 | 16.8 |
|                    | Degree                | 17 | 19.1 |
|                    | Post graduate degree  | 3  | 3.4  |
| Work experience    | 6 months – 11 months  | 10 | 11.2 |
|                    | 1 -2 years            | 17 | 19.1 |
|                    | 3 – 5 years           | 16 | 18.0 |
|                    | 6 – 9 years           | 14 | 15.7 |
|                    | ≥ 10 years            | 32 | 36.0 |
| Hospital           | Kakamega              | 15 | 16.8 |
|                    | Busia                 | 6  | 6.7  |
|                    | JOOTRH                | 16 | 18.0 |
|                    | Vihiga                | 7  | 7.9  |
|                    | Homa Bay              | 11 | 12.4 |
|                    | KCRH                  | 8  | 9.0  |
|                    | Kisii                 | 13 | 14.6 |
|                    | Bungoma               | 7  | 7.9  |
|                    | Migori                | 6  | 6.7  |

#### 4.4 Nurses' perceptions on pain in neonates

Using a Likert scale questions in the study, participants indicated their individual perception on neonatal pain as either - Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). When asked if they believe that neonates experience pain, the majority (75%) strongly agreed that neonates experience pain. However, less than

half strongly agreed that minor procedures are painful (39.3%). Almost half (44.9%) perceived that preterm babies are likely to experience more pain due to high numbers of procedures or such neonates experience more pain as compared to older babies. Regarding respondents' perceptions on neonatal pain assessment, less than a third (32.6%) strongly felt that the pain assessment tool is accurate and effective in pain assessment. Participants were also asked to rate their perceptions on neonatal pain interventions. Less than half strongly believed that pharmacologic (41.6%) and non-pharmacologic (42.7%) interventions are vital regardless of the duration taken to perform invasive procedures. Data from KIIs displayed conformity with quantitative data. Majority six out seven of those interviewed in in-depth agreed that neonates experience pain. ***“Nurses are very much aware that neonates feel pain but do little to address it since medication for neonates is limited”*** (KII number 2).

#### **4.5 Nurses perceived knowledge and competency of pain management in newborn units**

Participant's perception on their knowledge and competency on neonatal pain management was assessed. Those that knew the pharmacological interventions were (41.6%) while those who knew non-pharmacological interventions were (42.7%). When asked if they felt comfortable with their knowledge and skills in neonatal pain management, (31.5%) reported to be uncomfortable using both pharmacological and non-pharmacological interventions while less than a quarter (22.5%) felt that neonatal pain management was undertaken well in their newborn units as shown in table 4.2. This show nurses' beliefs and attitudes towards neonatal pain, which influence their knowledge and competency in managing neonatal pain.

**Table 4.2: Nurses perceived knowledge and competency of pain in newborn units**

| Statement                                                                                               | Strongly agree | Agree     | Disagree  | Strongly disagree |
|---------------------------------------------------------------------------------------------------------|----------------|-----------|-----------|-------------------|
| <b>Nurses' perceptions on neonatal pain</b>                                                             |                |           |           |                   |
| Neonates experience pain                                                                                | 67 (75.3)      | 8 (9.0)   | 1 (1.1)   | 13 (14.6)         |
| Minor procedures are painful                                                                            | 35 (39.3)      | 45 (50.6) | 4 (4.5)   | 5 (5.6)           |
| Preterm babies are likely to experience more pain due to high numbers of procedures                     | 40 (44.9)      | 27 (30.3) | 10 (11.2) | 12 (13.5)         |
| Preterm neonates experience more pain as compared to older babies                                       | 29 (32.6)      | 22 (24.7) | 19 (21.4) | 19 (21.4)         |
| <b>Nurses' perceived knowledge and competency on neonatal pain assessment</b>                           |                |           |           |                   |
| The pain assessment tool is accurate and effective in pain assessment                                   | 29 (32.6)      | 30 (33.7) | 15 (16.8) | 15 (16.8)         |
| <b>Nurses' perceptions on neonatal pain interventions</b>                                               |                |           |           |                   |
| Pharmacologic interventions are vital regardless of the duration which the invasive procedures take     | 37 (41.6)      | 33 (37.1) | 11 (12.4) | 8 (9.0)           |
| Non-pharmacologic interventions are vital regardless of the duration which the invasive procedures take | 38 (42.7)      | 39 (43.8) | 9 (10.1)  | 3 (3.4)           |
| <b>Nurse's perceived knowledge and competency of neonatal</b>                                           |                |           |           |                   |

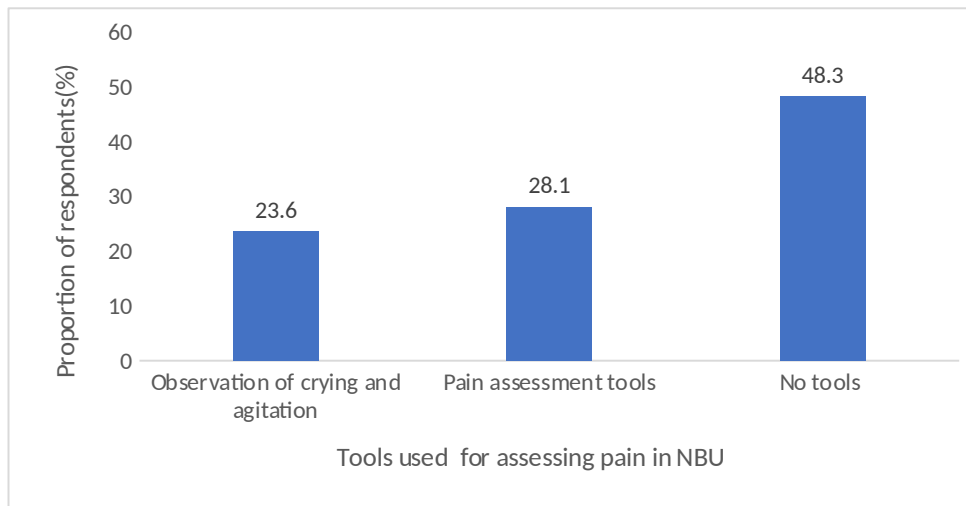
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|                                                                                                                     |              |           |           |              |
|---------------------------------------------------------------------------------------------------------------------|--------------|-----------|-----------|--------------|
| <b>pain interventions</b>                                                                                           |              |           |           |              |
| I know the pharmacological interventions for neonatal pain management                                               | 37<br>(41.6) | 27 (30.3) | 18 (20.2) | 7 (7.9)      |
| I know non-pharmacological interventions for neonatal pain management                                               | 38<br>(42.7) | 35 (39.3) | 12 (13.5) | 4 (4.5)      |
| I feel comfortable with my knowledge and skills in neonatal pain management using pharmacological interventions     | 28<br>(31.5) | 28 (31.5) | 18 (20.2) | 15 (16.8)    |
| I feel comfortable with my knowledge and skills in neonatal pain management using non-pharmacological interventions | 28<br>(31.5) | 34 (38.2) | 21 (23.6) | 6 (6.7)      |
| I feel that neonatal pain management is undertaken well in my newborn unit                                          | 20<br>(22.5) | 21 (23.6) | 29 (32.6) | 19<br>(21.3) |

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#### 4.6 Tools used in neonatal pain assessment in newborn units

Figure 4.1 illustrates participants' responses concerning tools used by nurses to assess pain in NBUs. Out of the 89 respondents, 48.3 % affirmed not to be having the recommended tools. Slightly more than a quarter (28.1%) of the respondents reported use of pain assessment tools while 23.6% relied on baby's crying and on expression of agitation to assess for pain. Those that reported using tools cited Face, Legs, Activity, Cry, and Consolability (FLACC) and Faces pain scale (FPS) as the tools they utilize. These findings slightly contradicted those from IDIs. According to all KIIs there were no established neonatal pain assessment tools in the facilities. **“The hospital has no tools for assessing pain in the neonates. Concentration is on older pediatrics and adults” (KII NO3).** Another KII reported lack of protocols to guide pain management in neonates.

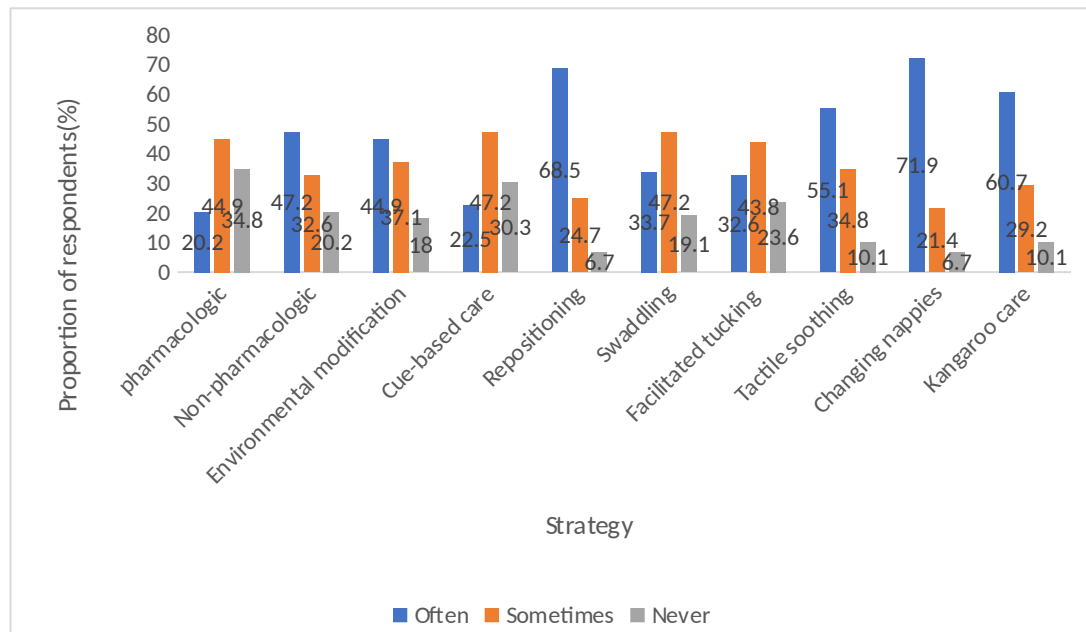


**Figure 4.1: Tools used in pain assessment in neonates in NBU**

#### **4.7 Frequency and type of strategy used in neonatal pain management in NBUs**

Figure 4.2 is an illustration of the frequency and type of strategy nurses used in managing pain in neonates. The four leading approaches used by nurses were changing nappies (71.9%), repositioning (68.5%), using Kangaroo care approach (60.7%) and tactile soothing (55.1%). More than twice as many nurses often use non-pharmacologic interventions compared to those who use pharmacologic (20.2%) interventions. On the other hand, 34.8% and 20.2% have never used pharmacologic or non-pharmacologic interventions, respectively. Data from KIIs indicated that pain management in neonates was objective since all facilities lacked laid down protocols on how to manage pain in neonates. ***There are no laid down measures that I have ever known. The NBU has no protocols and procedures for managing pain in neonates we manage the pain as per what we think (KII No4).***





**Figure 4.2: Type of strategy nurses use in neonatal pain management in NBU**

#### 4.8 Neonatal pain management practices among Nurses

The responses are presented in Likert Scale. From the results, 28.1% and 34.8% strongly agreed that they use pharmacologic or non-pharmacologic interventions for neonatal pain management, respectively. Minority (5.6%) reported regular use of pain assessment tools or complete pain assessment scores (3.4%). Whereas nearly forty percent (39.3%) strongly agreed that they use physiological and behavioral factors to assess pain in neonates, 30.3% use massage in pain management. Less than one-in-five consult other clinicians on actions to undertake after they have the scores (16.9%), conduct pain assessment frequently among the neonates as per the protocols (11.2%), record all the scores and actions during pain assessment and management (11.2%), read guidelines and protocols of pain assessment and management (19.1%) or use non-nutritive suckling in pain management (10.1%).

Data from in-depth interviews indicated use of selected drugs like ibuprofen and morphine to manage neonatal pain. For example, one participant reported the use of ibuprofen and another one reported use of morphine for managing pain in neonates.

*“Syrup ibuprofen is given to a few newborns upon prescription by the doctor” KII NO1. “Syrup morphine is used many times and to distract a*

*neonate feeling pain they are made to suck a gauze soaked 50% dextrose”*

*KII NO3.*

**Table 4.3 Nurses’ practices in management of neonatal pain**

| <b>Type of practice</b>                                                      | <b>Strongly agree (%)</b> | <b>Agree (%)</b> | <b>Disagree (%)</b> | <b>Strongly disagree (%)</b> |
|------------------------------------------------------------------------------|---------------------------|------------------|---------------------|------------------------------|
| I use pharmacologic interventions for neonatal pain management               | 25 (28.1)                 | 33 (37.1)        | 20 (22.5)           | 11 (12.4)                    |
| I use non-pharmacologic interventions for neonatal pain management           | 31 (34.8)                 | 40 (44.9)        | 12 (13.5)           | 6 (6.7)                      |
| I use pain assessment tools regularly                                        | 5 (5.6)                   | 17 (19.1)        | 29 (32.6)           | 38 (42.7)                    |
| I use physiological and behavioral factors to assess pain in neonates        | 35 (39.3)                 | 26 (29.2)        | 20 (22.5)           | 8 (9.0)                      |
| I always complete pain assessment scores                                     | 3 (3.4)                   | 13 (14.6)        | 41 (46.1)           | 32 (33.0)                    |
| I consult other clinicians on actions to undertake after I have the scores   | 15 (16.9)                 | 20 (22.5)        | 27 (30.4)           | 27 (30.4)                    |
| I conduct pain assessment frequently among the neonates as per the protocols | 10 (1.2)                  | 22 (24.7)        | 32 (36.0)           | 25 (28.1)                    |
| I record all the scores and actions during pain assessment and management    | 10 (11.2)                 | 18 (20.2)        | 29 (32.6)           | 32 (36.0)                    |
| I read guidelines and protocols of pain assessment and management            | 17 (19.1)                 | 21 (23.6)        | 22 (24.7)           | 29 (32.6)                    |
| I use non-nutritive sucking in pain management                               | 9 (10.1)                  | 32 (36.0)        | 25 (28.1)           | 23 (25.8)                    |
| I use massage in pain management                                             | 27 (30.3)                 | 34 (38.2)        | 17 (19.1)           | 11 (12.4)                    |

#### **4.9 Spearman correlation between nurses' perceptions and practices in management of neonatal pain**

Spearman correlation was used to evaluate relationships between nurses' perception and practices about neonatal pain management. The two major categories were ordinal variables with scale of 5 for strongly agree and 1 for strongly disagree. Investigating statistical, significant differences were found between nurses' views that neonates experience pain and their use of use pharmacologic interventions for neonatal pain management ( $p = 0.006$ ), neonates experience pain and their use of use non-pharmacologic interventions for neonatal pain management ( $p=0.002$ ), pharmacologic interventions are vital regardless of the duration which the invasive procedures take and use of pharmacologic interventions ( $p=0.02$ ), pharmacologic interventions are vital regardless of the duration which the invasive procedures take and use of pharmacologic interventions ( $p=0.001$ ), pharmacologic interventions are vital regardless of the duration which the invasive procedures take and use physiological and behavioral factors to assess pain in neonates ( $p=0.03$ ), non-pharmacologic interventions are vital regardless of the duration which the invasive procedures take and use pharmacologic interventions for neonatal pain management ( $p = 0.005$ ), and non-pharmacologic interventions are vital regardless of the duration which the invasive procedures take and use of pain assessment tools ( $p = 0.05$ ).

Similarly, there was a positive correlation between knowledge on the pharmacological interventions for neonatal pain management and use of pharmacologic interventions for neonatal pain management ( $p < 0.0001$ ), knows non-pharmacological interventions for neonatal pain management and use pharmacologic interventions for neonatal pain management ( $p=0.03$ ), knows non-pharmacological interventions for neonatal pain management and use pharmacologic interventions for neonatal pain management and use physiological and behavioral factors to assess pain in neonates ( $p = 0.01$ ), feeling comfortable with my knowledge and skills in neonatal pain management using pharmacological interventions and use pharmacologic interventions for neonatal pain management ( $p=0.0004$ ), feeling comfortable with my knowledge and skills in neonatal pain management using non-pharmacological interventions and use pharmacologic interventions for neonatal pain moment ( $p=0.0002$ ), and feeling comfortable with my knowledge and skills in neonatal pain management using non-pharmacological interventions and use physiological and behavioral factors to assess

pain in neonates ( $p=0.03$ ). Nurses who felt that that neonatal pain management is undertaken well in my newborn unit were more likely to use pharmacologic interventions ( $p=0.0004$ ). Likewise, there was statistically significant relationship between nurses who were of the view that preterm babies are likely to experience more pain due to high numbers of procedures and use of pharmacologic interventions ( $p = 0.02$ ). Results also show positive correlation between nurses who perceive that preterm neonates experience more pain as compared to older babies and use of pharmacologic interventions ( $p= 0.04$ ), felt comfortable with my knowledge and skills in neonatal pain management using pharmacological interventions and pain assessment frequently among the neonates as per the protocols ( $p= 0.003$ ), felt that neonatal pain management is undertaken well in my newborn unit and pain assessment frequently among the neonates as per the protocols ( $p=0.007$ ), felt comfortable with my knowledge and skills in neonatal pain management using pharmacological interventions and read guidelines and protocols of pain assessment and management ( $p=0.003$ ), and felt comfortable with my knowledge and skills in neonatal pain management using non-pharmacological interventions and use non-nutritive section in pain management ( $p = 0.02$ ).

On the contrary, there was negative correlation between expressed knowledge on non-pharmacological interventions for neonatal pain management and use of pain assessment tools ( $p = 0.01$ ), preterm babies are likely to experience more pain due to high numbers of procedures and use pain assessment tools regularly ( $p = 0.01$ ), non-pharmacologic interventions are vital regardless of the duration which the invasive procedures take and always complete pain assessment scores ( $p=0.03$ ), non-pharmacological interventions for neonatal pain management and always complete pain assessment scores ( $p = 0.04$ ), non-pharmacological interventions for neonatal pain management and consult other clinicians on actions to undertake after I have the scores ( $p=0.05$ ), and non-pharmacological interventions for neonatal pain management and record all the scores and actions during pain assessment and management ( $p = 0.01$ ).

**Table 4.4 Spearman correlation between nurses' perceptions and practices in management of neonatal pain**

| Variable indicators                                                                                                                                      | R         | P value     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------|
| Neonates experience pain <b>vs</b> use pharmacologic interventions                                                                                       | 0.29      | 0.006       |
| Neonates experience pain <b>vs</b> use non-pharmacologic interventions                                                                                   | 0.33      | 0.002       |
| Pharmacologic interventions are vital <b>vs</b> use pharmacologic interventions                                                                          | 0.24      | 0.02        |
| Pharmacologic interventions are vital <b>vs</b> non-pharmacologic interventions                                                                          | 0.33      | 0.001       |
| Pharmacologic interventions are vital <b>vs</b> use physiological and behavioral factors to assess pain in neonates                                      | 0.23      | 0.03        |
| Non-pharmacologic interventions are vital <b>vs</b> use pharmacologic interventions                                                                      | 0.29      | 0.005       |
| Non-pharmacologic interventions are vital <b>vs</b> use pain assessment tools                                                                            | -<br>0.20 | 0.05        |
| Knows pharmacological interventions <b>vs</b> uses pharmacologic interventions                                                                           | 0.44      | <0.000<br>1 |
| Knows non-pharmacological interventions <b>vs</b> uses pharmacologic interventions                                                                       | 0.23      | 0.03        |
| Knows non-pharmacological interventions <b>vs</b> use pain assessment tools                                                                              | -<br>0.26 | 0.01        |
| Knows non-pharmacological interventions <b>vs</b> uses physiological and behavioral factors to assess pain                                               | 0.26      | 0.01        |
| Feels comfortable with my knowledge and skills using pharmacological interventions <b>vs</b> use pharmacologic interventions                             | 0.37      | 0.0004      |
| Feels comfortable with my knowledge and skills using non-pharmacological interventions <b>vs</b> use pharmacologic interventions                         | 0.38      | 0.0002      |
| Feels comfortable with my knowledge and skills using non-pharmacological interventions <b>vs</b> use physiological and behavioral factors to assess pain | 0.23      | 0.03        |
| Feels that neonatal pain management is undertaken well in my newborn unit <b>vs</b> use pharmacologic interventions                                      | 0.37      | 0.0004      |
| Preterm babies are likely to experience more pain due to high numbers of procedures <b>vs</b> use pharmacologic interventions                            | 0.24      | 0.02        |

|                                                                                                                                                                                                       |      |       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|
| Preterm babies are likely to experience more pain due to high numbers of procedures <b>vs</b> use pain assessment tools regularly                                                                     | -    | 0.01  |
|                                                                                                                                                                                                       | 0.26 |       |
| Preterm neonates experience more pain as compared to older baby's <b>vs</b> use pharmacologic interventions                                                                                           | 0.21 | 0.04  |
| Non-pharmacologic interventions are vital <b>vs</b> always complete pain assessment scores                                                                                                            | -    | 0.03  |
|                                                                                                                                                                                                       | 0.23 |       |
| Knows non-pharmacological interventions <b>vs</b> always complete pain assessment scores                                                                                                              | -    | 0.04  |
|                                                                                                                                                                                                       | 0.22 |       |
| Knows non-pharmacological interventions <b>vs</b> consults other clinicians on actions to undertake after I have the scores                                                                           | -    | 0.05  |
|                                                                                                                                                                                                       | 0.21 |       |
| Knows non-pharmacological interventions <b>vs</b> records all the scores and actions during pain assessment and management                                                                            | -    | 0.01  |
|                                                                                                                                                                                                       | 0.26 |       |
| Feels comfortable with my knowledge and skills in neonatal pain management using pharmacological interventions <b>vs</b> I conduct pain assessment frequently among the neonates as per the protocols | 0.31 | 0.003 |
|                                                                                                                                                                                                       | 4    |       |
| Feels that neonatal pain management is undertaken well in my newborn unit <b>vs</b> conduct pain assessment frequently                                                                                | 0.28 | 0.007 |
| Feels comfortable with my knowledge and skills using pharmacological interventions <b>vs</b> read guidelines and protocols of pain assessment and management                                          | 0.31 | 0.003 |
| Feels comfortable with my knowledge and skills using non-pharmacological interventions <b>vs</b> use non-nutritive suckling in pain management                                                        | 0.24 | 0.02  |

## **CHAPTER FIVE**

### **DISCUSSION**

#### **5.1 Overview**

The study on nurses' perceptions of newborn pain treatment methods at NBUs in Nyanza and Western Kenya is discussed in this chapter, along with a comparison of the results with previous research.

#### **5.2 Aspects of the sociodemographic**

Numerous sociodemographic variables pertaining to nurses impact the prevention and treatment of pain in newborns. The majority of the nurses working at NBUs were female, with an average age of 35. Correlation studies between demographics and nurses' behaviors were not conducted for this research. Similar results were found in studies conducted by Muteteli, Suleiman, and Costa's colleagues (Costa et al., 2017; Muteteli et al., 2019a; Suleiman et al., 2019). The results are representative of nursing practitioners throughout several areas. It has been shown that the kind of pain avoidance and treatment used for newborns is highly correlated with both gender and educational attainment. According to other writers, there is a greater likelihood of following the recommended pain treatment for newborns with more education (Jeong et al., 2014; Tarjoman et al., 2019). Although the present research did not examine the association between education level and newborn pain treatment techniques, it was observed that the majority of participants had completed a diploma program. Contradictory results were revealed by a cross-sectional research conducted in Ethiopia (Wari, 2021). According to this survey, the majority of nurses employed at NBU (81%) have a bachelor's degree in nursing. About half of these nurses had been educated in newborn pain treatment. The fact that this group showed a solid understanding of managing newborn discomfort is significant.

Younger and less experienced nurses are less equipped to care for the infant than older and more experienced nurses working in NBUs (Collados-Gómez et al., 2018; Parvizy et al., 2020). This is explained by how long they have been able to care for newborns. Naturally, female nurses will perform better than their male colleagues when comparing the impact of gender on newborn pain treatment (Wari, 2021). In a family setting, where they look after younger siblings, women are exposed to child care from an early age. This skill is refined when they marry and have their own children. During this time, they learn how to take care of both ill and healthy babies. When a baby is in discomfort, they can quickly determine it and seek medical attention (Wari, 2021).

However, it is assumed that female nurses in NBUs have a superior ability to recognize neonatal pain than male nurses do since women are more likely than men to get emotionally moved while seeing a baby in pain (Wari, 2021). There are several levels of nursing education available, including certificate, diploma, undergraduate, and graduate programs. Neonatal pain treatment is covered in detail in each training level's curriculum (Sedighie et al., 2020). Therefore, nurses with higher education levels will have more information and expertise about nurses' perceptions of newborn pain treatment procedures. Based on this, we propose that programs aimed at enhancing nursing education and training might improve the way newborn pain is managed.

### **5.3 Nurses' perspectives on pain in newborns**

It was formerly believed that since newborns' neural systems were still developing, they were incapable of feeling pain (Bishop & Bishop, 2020). This idea was so widely held that analgesics and anesthetics were not used during even major surgeries, such as open heart surgery. However, data from recent research (Gursul et al., 2019; Williams & Lascelles, 2020) demonstrates that newborns may feel pain on par with, if not higher than, that of adults.

In this research, many facets of newborns' pain perception were evaluated. Results indicate that 66.75 percent of nurses think that newborns feel discomfort. Reports from the KII provide confirmation, as six out of seven interviewees said that although nurses don't discuss it, they are aware that newborns typically suffer discomfort. These results support the belief held by nurses (Ishak et al., 2019; Muteteli et al., 2019a) that pain is experienced by newborns. Similar to this study, research conducted in Malaysia and Rwanda by Ishak and Muteteli, respectively, also employed a cross-sectional design and a self-administered questionnaire as the data collecting tool. This might be one reason for the parallels in the data results. Similar findings have been reported in other prior research (Costa et al., 2017; Avila-Alvarez et al., 2016), with the majority of the nurses agreeing that newborns feel discomfort. Costa et al.'s 2017 research, which used a descriptive cross-sectional methodology and included nurses in six public hospitals with NICUs, is comparable to the present investigation.

Studies (Shiff et al., 2021; Gursul et al., 2019) have provided evidence that preterm newborns suffer discomfort to an even greater extent than term neonates. This has been shown by the measurement of newborns' brain activity using invasive techniques like magnetic resonance imaging (MRI) and electroencephalography (EEG) (Gursul et al., 2019). (Brummelte et al., 2012). Contrary results have been reported elsewhere,



despite the majority of the nurses in this research believing that pain is experienced by both term and pre-term newborns. According to a descriptive research (Popowicz, 2021) conducted in Poland among nurses and midwives, many of the participants did not think that older children and adults and notably premature neonates had more discomfort than the latter. They said it was because the newborns' immune systems were still developing. This runs counter to the results of the present research, which showed that most individuals felt preterm neonates hurt more than older newborns did. In contrast to the present research, the Poland study had 558 respondents from 43 institutions, a bigger sample size, and more than 25% of the respondents were over 50. Nurses will use various pain management techniques to handle neonates' discomfort when they are aware that the babies feel pain while receiving care in the newborn unit and they have a good attitude about it. They must have the appropriate pain assessment instruments in order to do this.

#### **5.4 Nurses' perceptions of their proficiency and understanding in managing newborn discomfort**

The present study's participants expressed dissatisfaction with their understanding of and proficiency with pharmaceutical therapies for managing newborn discomfort. Of those surveyed, less than half (42%) were aware of the pharmacologic and non-pharmacologic approaches to neonatal pain treatment. This may be explained by a lack of focused instruction on managing pain in newborns and by continuing professional development after completing a basic college degree. The results correspond with those of previous worldwide investigations (Muteteli et al., 2019; Costa et al., 2017; Popowicz et al., 2021). It was discovered in these research that nurses lacked expertise in some areas related to managing neonatal pain, including using pain assessment instruments and understanding infant physiology and pain management. According to the Muteteli research conducted in Rwanda, a significant portion of nurses—74.2%—did not know enough about managing pain in newborns. Given that the study population in both Muteteli and the present research was fewer than 100 and that both are low-income African nations, the results may be comparable. Additionally, the hospitals were run by the government. The results of this research are different from those of Popowicz et al. (2021), when the majority of participants were said to know enough about newborn discomfort. Even though Popowicz's research used the same group of NICU nurses as the present study, it was conducted in a more industrialized nation in Europe. Additional variations may be ascribed to the respondents'

educational background and work history. In contrast to the participants in the present research, over 50% of the responders in the Polish study had a neonatal nursing bachelor's or master's degree, and over 75% had over ten years of experience working in NICUs. Higher education and experience are both connected with higher knowledge (Wari, 2021).

The ability to do a job with confidence comes from knowledge. Nurses who are knowledgeable about managing pain in newborns admitted to intensive care units won't hesitate to put the ideas into practice. They will have the ability to instruct other nurses and medical professionals in the management of newborn discomfort. A knowledgeable nurse will feel capable of carrying out a certain activity. The outcome will be well-managed babies and a contented nurse since it will inspire the nurse.

### **5.5 Instruments for measuring neonatal pain**

The most reliable method for measuring pain is self-report. However, newborns are unable to self-report for developmental reasons. Various methods have been used in various contexts to evaluate newborn pain. In order to measure pain in newborns, nurses must utilize specialized tools that enable them to grade assessments and create treatment plans. The use of trustworthy assessment instruments is advised by the American Academy of Pediatrics (AAP) for the precise diagnosis and treatment of newborn discomfort. Notwithstanding the aforementioned suggestions, research has shown that inadequate attention is paid to newborn pain assessment, as evidenced by studies conducted by Muteteli et al., 2019 and Rocha et al., 2021, which indicate little to no availability of neonatal pain assessment instruments at study locations.

The new study's results are consistent with the preceding research. Nearly half of the respondents (48.3%, n=89) in this research attested to the lack of instruments for assessing newborn discomfort. Furthermore, it was discovered that not a single one of the suggested tools—PIPP, N-PASS, NIPS, NFCS, CRIES, or BPSN—was being used in the research field. A small number of participants reported utilizing the FLACC and FACES tool. The data from KIIs agrees. There were no recognized instruments for assessing neonatal pain at the institution, according to the KIIs. The absence of procedures and strategies for managing newborn pain in the research locations may be connected to the deficiency of evaluation instruments. Additional reports from KIIs in this investigation show a complete absence of procedures. According to every person in charge who was questioned, there are no established procedures for evaluating and treating newborn discomfort. The conclusions of other investigations concur.

These results are at odds with research conducted in other nations. The results of studies conducted by Popowicz et al. (2021) and Suleiman et al. (2019) differed. Neonatal pain evaluation and treatment methods were present at the research locations in both investigations, but insufficiently. The procedures were also straightforward for the nurses to learn and comprehend. The Polish study's conclusions were based in a developed nation where there may have been more knowledge of and adherence to newborn pain treatment guidelines. That nation is Poland. Although conducted in Nigeria, an underdeveloped nation similar to Kenya, the research by Suleiman et al. (2019) included a population of physicians. It's important to remember that, in the studies where pain evaluation instruments were available, their use was quite low. In the first three days after admission to the pediatric unit or critical care unit, for instance, the NIPS scale was the only one used, according to a primary observational and prospective clinical research conducted in Brazil by Rocha with 12 nurses and 26 nursing technicians (Rocha et al., 2021).

Pain cannot be self-reported by newborns. The American Association of Paediatrics (AAP) advises using multidimensional pain assessment instruments in this respect so that behavioral and physiological markers of pain are measured (AAP, 2017). Changes in body language, sobbing, and facial emotions are examples of behavioral markers of pain. The current investigation yielded positive results that are consistent with the aforementioned suggestions. According to the study's results, slightly more than 25% of respondents—28.3%—reportedly relied on the baby's cries and agitation to gauge how much pain the newborn was experiencing. However, the responders lacked reference procedures.

### **5.6 Nurses' approaches to managing newborn discomfort in NBUs**

Two important aspects of health care are prevention and pain management. Since recurrent exposure to pain during the newborn period is known to have short- and long-term detrimental consequences, including changes in pain sensitivity, among other things (AAP, 2017; Walker, 2019), pain relief in neonates is an essential responsibility for health professionals. Numerous tactics have shown efficacy in the handling of mild to severe pain in neonates. Nevertheless, research (Muteteli et al., 2019; Wari, 2021) indicates underuse of efficient pain management for common operations, despite heightened knowledge that newborns suffer pain.

The results of this research are consistent with those of earlier investigations. A significant portion of respondents in the present research (20.2%) had never employed

non-pharmacologic (34.8%) or pharmacologic (34.8%) therapies to treat newborn discomfort. Most non-pharmacologic interventionists used physiological and behavioral techniques, such as changing diapers, employing the Kangaroo care strategy to realign the infant, and providing tactile comfort. Numerous additional investigations conducted abroad (Muteteli et al., 2019a; Costa et al., 2017; Wari, 2021; Popowicz et al., 2021) found results that were consistent with the findings. A significant proportion of non-pharmacological pain treatment techniques were used in all of these investigations. Repositioning and non-nutritive sucking were the most often mentioned non-pharmacological therapies. This result corroborates previous studies (Hall & Richard, 2015), which showed that the pacifying impact of non-nutritive sucking and the rise in endogenous endorphins decreased infant discomfort during invasive operations. The study's findings also indicate that a respectable proportion of the nurses—30.3%—used massage to treat infant discomfort in their units. This outcome strongly corroborates previous research (Liu et al., 2022) that suggested massage therapy for neonatal pain management due to its beneficial effects on the alleviation of uncomfortable procedures.

Clinical study data (Krowchuk, 2018; Hoarau et al., 2021) demonstrate that oral administration of sucrose prior to modest yet painful operations has been shown to significantly reduce facial grimacing, weeping episodes, and motor activity. The results of this investigation showed that glucose is completely unnecessary for the treatment of newborn discomfort, even in spite of this body of data. As a kind of analgesia, ibuprofen and paracetamol were the most often reported pharmaceutical treatments, according to IDI. These results are consistent with those of other international research. A retrospective investigation (Rocha et al, 2021) done in Brazil showed no records of analgesic sedative usage in roughly 80% of the investigated files. Neonates in Rwanda showed favorable opinions regarding the practice of pain management, according to a different research (Muteteli et al., 2019a). The survey participants did not, however, show much enthusiasm for putting the practice into effect since they thought that pharmaceutical analgesics should not be given to newborns or, if they were, that they should only be used in exceptional circumstances. The same research setups in both middle-income nations and the fact that the studies were conducted among nurses may be the reason for the similar results. A comprehensive study conducted in Kenya revealed contradictory results (Wade et al., 2020). According to this analysis, oral sugar and expressed breast milk were the

second-line analgesics advised for newborns having regular operations in Kenyan non-tertiary healthcare facilities. Additional contradictory results (Krowchuk, 2018). demonstrate that giving newborns oral sucrose as a pain treatment strategy does not stop the development of long-term pain consequences such distant hyperalgesia. This suggests a gap, which makes it necessary to create procedures to direct the treatment of pain in newborns.

### **5.7 Nurses' methods for treating newborns' discomfort**

Patient outcomes are significantly influenced by the practices of nurses. The use of pharmaceutical or non-pharmacologic pain management techniques, pain assessment, documentation, physician consultation, and reading recommendations on pain assessment and treatment in newborns are among the activities related to neonatal pain management that are evaluated in this research. The results show that newborn pain management techniques are not often used. Globally, corroborated results have been seen (Roga et al., 2023; Popowicz et al., 2021; Carlsen et al., 2021).

According to nursing research on pain management in neonates, non-pharmacological pain therapies may be used to help newborns with discomfort related to procedures (Mangat et al., 2018; Rocha et al., 2021). To treat discomfort in newborns, just over one-third of the nurses in the present research used non-pharmacologic techniques such massage and non-nutritive sucking, in accordance with this advice. In the Costa et al., 2017 research, 58.8% of the subjects reported using non-nutritive sucking, which produced corroborating results. Similar to the present research, Costa and colleagues used a self-administered questionnaire, a descriptive cross-sectional technique, and an assessment of pain management procedures among nurses working in NICUs in public hospitals. But in the Costa trial, where they spoke with 51 nurses, the sample size was somewhat less than in the present study.

A route for managing pain is provided by pain evaluation. It is advised to utilize a validated pain assessment method for evaluating a newborn's level of pain (Pediatric Association Of Anesthesists, 2012). When asked about their methods for assessing newborn pain, slightly over one-third of the study's participants said they used behavioral and physiological factors, while less than 10% said they used tools for measuring pain or even finished filling out pain assessment forms. These results are mostly consistent with previous research (Costa et al., 2017; Muteteli et al., 2019a). The results of the two earlier research by Costa and Muteteli show that study participants had a strong understanding of how to utilize pain rating measures. The

research locations saw very little usage of the pain assessment measures, even with the reported high level of understanding. In contrast to the present investigation, Costa and Muteteli's research documented the availability of pain measurement instruments at the study locations.

### **5.8 Connections between nurses' attitudes and actions for the treatment of newborn pain**

Previous research (Wari, 2021; Muteteli et al., 2019a) shown that practice is influenced by knowledge and attitude. The results of this investigation support the findings of earlier research. In this research, pain management practices were linked to both knowledge and attitudes about pain management. There is a significant positive connection ( $p < 0.0001$ ) between the use of pharmaceutical therapies for newborn pain management and the awareness of these interventions. The likelihood of using newborn pain management techniques was higher among nurses who felt confident in their abilities to treat pain in neonates using both non-pharmacological and pharmaceutical interventions ( $p = 0.0002$ ). Other research (Popowicz et al., 2021) and (Muteteli et al., 2019b) revealed similar results. The study found that nurses who demonstrated confidence were more likely to utilize the pain assessment instruments. However, another research (Costa et al., 2017) revealed different results. Costa claims that there is technological understanding on the therapy of newborn discomfort. Unfortunately, there is a gap in the application of knowledge, which lowers the standard of treatment. Additional research reveals that nurses were more likely to use pharmacologic therapies ( $p = 0.0004$ ) if they thought their newborn unit handled neonatal pain management adequately. This is encouraging evidence that pain management for newborns is possible.

## **CHAPTER SIX**

### **CONCLUSION AND RECOMMENDATIONS**

#### **6.1 Overview**

The study's conclusion on nurses' perceived practices for managing newborn pain in newborn units in Nyanza and Western Kenya is presented in this chapter. It also emphasizes the guidelines for managing discomfort in newborns.

#### **6.2 Recap**

According to the research, nurses are typically aware that newborns are in pain, but their understanding of practical pain management techniques is severely lacking. Merely a small percentage of nurses expressed confidence in their comprehension and abilities about pharmaceutical and non-pharmacological approaches to pain treatment. The skill of nurses in treating newborn discomfort was found to be lacking. Many nurses felt unprepared to employ non-pharmacological techniques successfully and uncomfortable with their capacity to give pharmaceutical therapies.

The results of the research showed that the study region did not make extensive use of standardized pain assessment instruments including PIPP, N-PASS, and NIPS. Rather of using objective markers like sobbing and agitation, nurses frequently used subjective signs to gauge pain, underscoring the need for more organized and consistent evaluation procedures.

Pharmacological treatments were less prevalent than non-pharmacological ones, such as repositioning, changing diapers, and providing care similar to that of a kangaroo mother. The uneven use of these kinds of tactics, however, suggests that more training and funding are required.

#### **6.3 Suggestions**

Frequent training sessions addressing both pharmacological and non-pharmacological approaches for newborn pain treatment are necessary. Workshops, seminars, and courses for ongoing professional development should be part of this. All nursing personnel in newborn units should have access to teaching materials and guidelines on managing pain in neonates.

To assist nurses practice and build confidence while delivering pain management therapies, this could be required. Establishing mentoring programs where more seasoned nurses instruct and assist less seasoned staff members in newborn pain

management techniques may be crucial.

Standardized pain assessment instruments, such as PIPP, N-PASS, and NIPS, must be made available in every neonatal unit. Instruction in tool use: To guarantee accurate and consistent pain assessment procedures, it is necessary to provide specialized training on the use of these assessment instruments. For the purpose of managing newborn pain, it is necessary to create and put into effect explicit policies and procedures that stress the value of both pharmaceutical and non-pharmacological approaches. Ensuring that all neonatal units have sufficient resources, such as supplies for non-pharmacological therapies and the appropriate drugs, is essential.

The results of this research show that nurses in Western Kenya have significant deficiencies in their ability, knowledge, and use of standardized procedures for managing newborn pain. Neonates in these settings may benefit greatly from improved pain management practices and outcomes by filling up these gaps via focused training, cascading applicable policies to the county and facility levels, and allocating resources (staffing, equipment).

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## APPENDICES

### APPENDIX I: INFORMED CONSENT FORM

I am Teresa Okiri, a student at Masinde Muliro University of Science and Technology pursuing an advanced midwifery master's degree in nursing. "Neonatal Pain Management Among Nurses in New Born Units in Nyanza and Western Kenya" is the topic of my academic study. The information gathered will be helpful in a variety of areas to enhance national health care.

#### Steps that must be taken

You will need to provide answers to a number of questions if you consent to take part in this research. You may ask any questions you may have about the survey at the beginning of the interview or at any other time, so participation is completely optional. If answering a question bothers you, you have the option to decline. Additionally, you are free to leave the conversation whenever you want.

#### Uncomfort and Hazards

You have the option to refuse to respond if you think a certain topic or questions are disrespectful. If you'd like, you may also end the interview. We'll be talking for roughly fifteen minutes total.

#### Rewards and Advantages

This survey is completely optional, and there are no rewards for participating. On the other hand, by taking part, you will get knowledge about a range of topics related to the treatment of newborn discomfort.

#### Keep Information Private

The survey will be done in a site which is convenient for your job. Your name will not appear on the questionnaire, and the data you provide will be kept private.

#### Details of Contact

If you have any questions about this research, don't hesitate to call me at the numbers below or my supervisors;

-----  
-----  
-----

#### The Participant's Statement

I've read and comprehended the remarks made above about the study. Additionally, I



have an opportunity to ask pertinent questions about the survey. I realize that my information will be kept private and that I have agreed to participate willingly. I am also aware that I have the option to end the interview at any moment. I also know that there won't be any incentives offered by the researcher to get me to take part in the study.

-----◆◆

Signature of the participant Time of Date

The statement of the interviewer

The participant has been informed in the language that he or she is aware of the steps, dangers, and advantages associated with taking part in the survey.

Researcher's name-----

Date-----

Signature of the interviewer .....

Date.....

For any clarification, please contact.

Teresa Kerubo Okiri (Researcher)

Telephone 0721-878-425

Email terryokiri@yahoo.com

## **APPENDIX II: A SAMPLE QUESTIONNAIRE**

### **APPENDIX III: IN-DEPTH INTERVIEW GUIDE**

1. How do you feel about the nurses' perspectives on the evaluation and treatment of newborn pain?
2. Do you think the nurses in the newborn units are viewing neonatal pain evaluation appropriately? Please include an explanation for your response.
3. What safeguards does the hospital put in place to guarantee that nurses view newborn pain treatment appropriately?
4. In the newborn units, what instruments do nurses use to evaluate and treat neonatal pain?
5. How would you rank the neonatal units' use, accessibility, and efficacy of pain assessment methods on a scale of 1 to 10?
6. What are some of the neonatal units' policies and processes for assessing and managing pain?
7. How would you rank the nurses' adoption and adherence to the pain assessment and treatment tools in the neonatal units, on a scale of 1 to 10?
8. What are some of the steps the hospital has taken to guarantee that nurses follow pain treatment protocols, both pharmaceutical and non-pharmacological?

## APPENDIX IV: APPROVAL FROM DIRECTORATE OF POSTGRADUATE STUDIES



### MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

Tel: 056-30870  
Fax: 056-30153  
E-mail: [directordps@mmust.ac.ke](mailto:directordps@mmust.ac.ke)  
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P.O Box 190  
Kakamega – 50100  
Kenya

#### Directorate of Postgraduate Studies

Ref: MMU/COR: 509099

9<sup>th</sup> July, 2019

Teresa Kerubo Okwiri,  
HNR/G/01-55703/2016,  
P.O. Box 190-50100,  
KAKAMEGA.

Dear Ms. Okwiri,

#### RE: APPROVAL OF PROPOSAL

I am pleased to inform you that the Directorate of Postgraduate Studies has considered and approved your Masters Proposal entitled: *“Neonatal Pain Management among Nurses in Newborn Units in Nyanza and Western Kenya”* and appointed the following as supervisors:

1. Dr.Mary Kipmerewo - SONMAPS, MMUST
2. Ms. Beatrice Mukabana - SONMAPS, MMUST

You are required to submit through your supervisor(s) progress reports every three months to the Director of Postgraduate Studies. Such reports should be copied to the following: Chairman, School of Nursing & Midwifery Graduate Studies Committee and Chairman, Department of Clinical Nursing and Health Informatics and Graduate Studies Committee. Kindly adhere to research ethics consideration in conducting research.

It is the policy and regulations of the University that you observe a deadline of two years from the date of registration to complete your master's thesis. Do not hesitate to consult this office in case of any problem encountered in the course of your work.

We wish you the best in your research and hope the study will make original contribution to knowledge.

Yours Sincerely,



**Prof. John Obiri**  
DIRECTOR, DIRECTORATE OF POSTGRADUATE STUDIES

## APPENDIX V: APPROVAL LETTER FROM INSTITUTIONAL ETHICS AND REVIEW COMMITTEE



**MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
Tel: 056-31375 P. O. Box 190-50100  
Fax: 056-30153 Kakamega, Kenya  
E-mail: [ierc@mmust.ac.ke](mailto:ierc@mmust.ac.ke)  
Website: [www.mmust.ac.ke](http://www.mmust.ac.ke)

### Institutional Ethics Review Committee (IERC)

Ref: MMU/COR: 403012 vol2 (42)

Date: 20<sup>th</sup> August, 2019

**Teresa Kerubo Okiri**

Masinde Muliro University of Science and Technology  
P.O. Box 190-50100  
**KAKAMEGA**

Dear Ms. Kerubo

**RE: Neonatal pain management among nurses in New born Units in Nyanza and Western Kenya - MMUST/IERC/63/19**

Thank you for submitting your proposal entitled as above for initial review. This is to inform you that the committee conducted the initial review and approved (with minor revisions) the above Referenced application for one year.

This approval is valid from **20<sup>th</sup> August, 2019 through to 20<sup>th</sup> August, 2020**. Please note that authorization to conduct this study will automatically expire on **20<sup>th</sup> August, 2020**. If you plan to continue with data collection or analysis beyond this date please submit an application for continuing approval to the MMUST IERC by **20<sup>th</sup> July, 2020**.

Approval for continuation of the study will be subject to submission and review of an annual report that must reach the MMUST IERC secretariat by **20<sup>th</sup> July, 2020**. You are required to submit any amendments to this protocol and any other information pertinent to human participation in this study to MMUST IERC prior to implementation.

Please note that any unanticipated problems or adverse effects/events resulting from the conduct of this study must be reported to **MMUST IERC**. Also note that you are required to seek for research permit from **NACOSTI** prior to the initiation of the study.

Yours faithfully,

Dr. Gordon Nguka (PhD)  
**Chairman, Institutional Ethics Review Committee**

Copy to:

- The Secretary, National Bio-Ethics Committee
- Vice Chancellor
- DVC (PR&I)
- DVC (A & F)

## APPENDIX VI: RESEARCH LICENCE

|                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>REPUBLIC OF KENYA                                                                                                                                                                                                                                                         | <br>NATIONAL COMMISSION FOR<br>SCIENCE, TECHNOLOGY & INNOVATION |
| Ref No: 238629                                                                                                                                                                                                                                                                                                                                                 | Date of Issue: 26/September/2019                                                                                                                   |
| <b>RESEARCH LICENSE</b>                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                    |
|                                                                                                                                                                                                                                                                               |                                                                                                                                                    |
| <p>This is to Certify that Ms., TERESA OKIRI of Masinde Muliro University of Science and Technology, has been licensed to conduct research in Bungoma, Busia, Homabay, Kakamega, Kisii, Kisumu, Migori, Vihiga on the topic: NEONATAL PAIN MANAGEMENT AMONG NURSES IN NEWBORN UNITS IN NYANZA AND WESTERN KENYA for the period ending : 26/September/2020.</p> |                                                                                                                                                    |
| License No: NACOSTI/P/19/1517                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                    |
| 238629                                                                                                                                                                                                                                                                                                                                                         |                                                               |
| Applicant Identification Number                                                                                                                                                                                                                                                                                                                                | Director General<br>NATIONAL COMMISSION FOR<br>SCIENCE, TECHNOLOGY &<br>INNOVATION                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                | Verification QR Code                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                |                                                               |
| <p>NOTE: This is a computer generated License. To verify the authenticity of this document,<br/>Scan the QR Code using QR scanner application.</p>                                                                                                                                                                                                             |                                                                                                                                                    |



**APPENDIX VII: APPROVAL LETTER FROM COUNTY GOVERNMENT  
OF KISUMU**

**COUNTY GOVERNMENT OF KISUMU**

Telegrams: "PRO(MED)"  
Tel: 254-057-2020105  
Fax: 254-057-2023176  
E-mail: [kisumucdh@gmail.com](mailto:kisumucdh@gmail.com)



County Director of Health,  
Kisumu.  
P.O. Box 721-40100,  
KISUMU.

**DEPARTMENT OF HEALTH**

REF: GN.133.VOL.III/804

Date: 09/09/2019

**Teresa Kerubo Okiri**  
**Masinde Muliro University of Science and Technology**  
**Kakamega**

**RE: APPROVAL TO CONDUCT RESEARCH ON "NEONATAL PAIN MANAGEMENT  
AMONG NURSES IN NEW BORN UNITS IN NYANZA AND WESTERN KENYA"**

We are in receipt of your request for research approval as stated above.

The County Department of Health has reviewed the proposal to conduct the above study and support its implementation.

This office has no objection and grants you permission to continue with research at Kisumu County Referral Hospital (KCRH) for a period of one year. Share your findings with this office in both hard & soft copies after the study.

By copy of this letter, kindly accord her your necessary cooperation.

Dr. Ng'ong'a A.  
For: County Director of Health  
Kisumu County



CC. Med Supt. - KCRH

*From the County Director of Health office*

**APPENDIX VIII: APPROVAL LETTER FROM VIHIGA COUNTY  
HOSPITAL**

TERESA K. OKIRI  
TEL: 0721 878 425

DATE: 18/09/2019

**TO  
THE COUNTY DIRECTOR OF HEALTH  
VIHIGA COUNTY HOSPITAL  
P.O.BOX  
VIHIGA**

Dear Sir,

**RE: PERMISSION TO CONDUCT RESEARCH AT VIHIGA COUNTY HOSPITAL**

I am a student at Masinde Muliro University of Science and Technology pursuing a Master's Degree in Nursing.

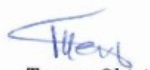
One of the requirements to enable me complete my training is to carry out a research in my field of study.

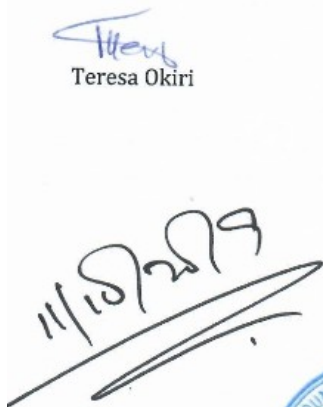
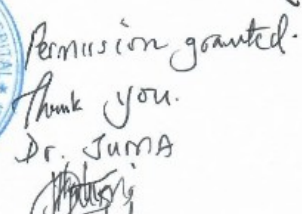
It is therefore in this regard that I request for permission to achieve this requirement in VCH New born unit.

Attached herein are the clearance letters from the University.

Thanking you in advance for your positive response.

Yours sincerely,

  
Teresa Okiri




## APPENDIX IX: APPROVAL LETTER FROM HOMABAY COUNTY

### MINISTRY OF HEALTH

Telegrams: "MOH" Homa Bay  
Telephone: 21039  
When replying please quote



MINISTRY OF HEALTH,  
HOMA BAY COUNTY,  
P.O. BOX 52,  
**HOMABAY.**

REF:MOH/RA/VOL.III/008

9<sup>th</sup> October 2019

**Teresa Kerubo Okiri**  
**HNR/G/01-55703/2016**  
**P O Box 190-50100**  
**KAKAMEGA**

#### **RE: AUTHORITY TO CONDUCT RESEARCH**

Following your request to collect data on your research title, "*Neonatal Pain Management among Nurses in Newborn Units*", in *Homabay County Referral Hospital* has been granted for the period ending 31<sup>st</sup> July 2020

You will be required to adhere to the hospital's norms and regulations, and involve both the County Health Management Team and hospital's staff during the research period, and we expect to get communication on your findings at the hospital level and by the undersigned at the end of the research period.

Wish you all the best in your research.

  
Dr.Vincent Waringa  
Deputy Director of Health  
**HOMABAY COUNTY**



*Maternity 1/c*  
*Please note and*  
*assist.*  
*Exercise will take*  
*3 days.*  
*DS*  
*9/10/2019*

## APPENDIX X: APPROVAL LETTER FROM KISII TEACHING AND REFERRAL HOSPITAL

MINISTRY OF HEALTH



Telegramme "medical" Kisii  
Telephone: (058) 31310 Kisii  
Email: [kisiihospital@gmail.com](mailto:kisiihospital@gmail.com)  
Web: [www.kisiihospital.org.ke](http://www.kisiihospital.org.ke)

DEPARTMENT OF RESEARCH  
THE KISII TEACHING & REFERRAL HOSPITAL  
P.O. BOX 92  
KISII

REF. NO.

DATE: 23<sup>rd</sup> October, 2019

TERESA KERUBO OKIRI

### **RE: DATA COLLECTION**

This is to inform you that the research committee of Kisii Teaching and Referral Hospital has gone through your proposal titled,

**Neonatal pain management among nurses in newborn units in Nyanza and Western Kenya Kisii Teaching & Referral Hospital, Kisii County**" and the following are our comments:

- 1) You have been authorized to proceed with data collection upon payment three thousand shillings (Kshs. 3,000/=).
- 2) Ensure confidentiality for your study subjects.
- 3) Share with the department the final data and copy of report for retention and use.

Thank you.

*amb...* 23/10/2019  
MOGIRE HESBON –Msc. BIOTECHNOLOGIST  
FOR: CHIEF EXECUTIVE OFFICER  
**KISII TEACHING AND REFERRAL HOSPITAL**



## APPENDIX XI: APPROVAL LETTER FROM BUSIA COUNTY HOSPITAL



### DEPARTMENT OF HEALTH AND SANITATION OFFICE OF THE MEDICAL SUPERINTENDENT



Telegram: 'MEDICAL', Busia  
Telephone: 055 22126, /22136  
Fax: 05522136  
E-mail: busiahospital@gmail.com

When replying please quote

Ref : BSA/CRH/R/5VOL.II/37

Office of the Medical Superintendent  
Busia County Referral Hospital  
P. O. Box 87  
BUSIA (K)

Date: 30<sup>th</sup> OCTOBER, 2019

TERESA OKIRI  
MASINDE MULIRO UNIVERSITY  
TEL :0721878425

Dear sir,

#### **RE: RESEARCH AUTHORIZATION**

Following your application to be granted an authority to carry out research on '**Neonatal Pain Management among Nurses in New Borns Units**' at Busia County Referral Hospital.

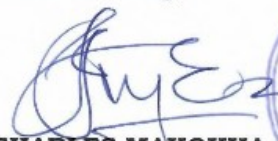
I wish to inform you that you have been authorized to conduct the research on the above topic starting from 30<sup>th</sup> October to 1<sup>st</sup> November 2019.

Please note that your findings <sup>shall</sup> be shared with the Department of Health and Sanitation (Pediatric Department).

Once you are through with your research, you are to report to the undersigned for directions.

Thank you

Yours faithfully,

  
**CHARLES MAKOKHA**  
**FOR : MEDICAL SUPERINTENDENT**  
**BUSIA COUNTY REFERRAL HOSPITAL.**





## APPENDIX XII: APPROVAL LETTER JOOTRH



### MINISTRY OF HEALTH

Telegrams: "MEDICAL", Kisumu  
Telephone: 057-2020801/2020803/2020321  
Fax: 057-2024337  
E-mail: [medsuptnpgh@yahoo.com](mailto:medsuptnpgh@yahoo.com)  
*When replying please quote*

JARAMOGI OGINGA ODINGA TEACHING &  
REFERRAL HOSPITAL  
P.O. BOX 849  
KISUMU

ERC.IB/VOL.1/612

25<sup>th</sup> October, 2019

Ref: .....

Date .....

TO: Teresa Kerubo Okiri

Dear Madam,

**RE: STUDY TITLE:**  
**NEONATAL PAIN MANAGEMENT AMONG NURSES IN NEWBORN UNIT IN**  
**NYANZA AND WESTERN KENYA.**

This is to inform you that **JOOTRH IERC** has reviewed and approved your above research proposal. Your application approval number is **IERC/JOOTRH/138/19**. The approval period is **25<sup>th</sup> October, 2019 – 25<sup>th</sup> October, 2020**.

This approval is subject to compliance with the following requirements;

- i. Only approved documents including (informed consents, study instruments, MTA) will be used
- ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by **JOOTRH - IERC**.
- iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to **JOOTRH - IERC** within 72 hours of notification
- iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to **JOOTRH - IERC** within 72 hours
- v. Clearance for export of biological specimens must be obtained from relevant institutions.
- vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
- vii. Submission of an executive summary report within 90 days upon completion of the study to **JOOTRH - IERC**.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) <https://oris.nacosti.go.ke> and also obtain other clearances needed.

In case the case of study site is JOOTRH, kindly report to Chief Executive Officer before commencement of data collection.

Yours sincerely,

SECRETARY, IERC



APPENDIX XIII: APPROVAL LETTER BUNGOMA COUNTY HOSPITAL

Permission granted.  
See med. Supt.  
BCHM for authorization  
of the Hospital.

TERESA K. OKIRI

TEL: 0721 878 425

DATE: 27/10/2019

OP00008596/19

TO  
THE COUNTY DIRECTOR OF HEALTH  
BUNGOMA COUNTY  
P.O. BOX  
BUNGOMA



Dear Sir,

**RE: PERMISSION TO CONDUCT RESEARCH AT BUNGOMA COUNTY HOSPITAL**

I am a student at Masinde Muliro University of Science and Technology pursuing a Masters Degree in Nursing.

One of the requirements to enable me complete my training is to carry out a research in my field of study.

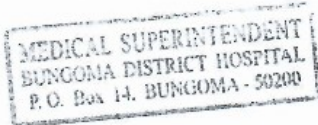
It is therefore in this regard that I request for permission to achieve this requirement in New born unit.

Thanking you in advance for your positive response.

Yours sincerely,

Teresa Okiri

Approved  
& signed  
on  
29/10/19



**APPENDIX XIV: APPROVAL LETTER FROM COUNTY GOVERNMENT  
OF KAKAMEGA**

**COUNTY GOVERNMENT OF KAKAMEGA**

E-mail: wpgh15@yahoo.com  
Telephone: Kakamega 0702930346  
When replying, please quote:  
REF:CGH/KAK/ERC/VOL 2/72



COUNTY GENERAL HOSPITAL  
P.O. Box 15-G.P. O-50100  
KAKAMEGA

DATE: 10<sup>th</sup> March, 2020

**MINISTRY OF HEALTH SERVICES**

TERESA KERUBO OKIRI,

BOX 190

KAKAMEGA.

Dear Madam,

REF: RESEARCH PROPOSAL APPROVAL (102/03/2020)

This is to inform you that the Ethics and Research Committee has reviewed and approved your work titled "NEONATAL PAIN MANAGEMENT AMONG NURSES IN NEWBORN UNITS IN KAKAMEGA COUNTY GENERAL HOSPITAL".

The approval is valid for 1 year from the above date and any continuation thereafter will necessitate a request for renewal.

Note that this approval is only for the work that you have submitted to us. The committee must be notified of any changes or amendments and serious or unexpected outcomes related to the study. You will be expected to submit a final report at the end of the study and may be requested to do a presentation of the same to the hospital.

This information will form part of the database that will be consulted in future when processing related research studies so as to minimize chances of study duplication.

Thank you for your interest in research in our institution.

  
Dr. AUSTIN S. AJEVI  
CHAIRMAN

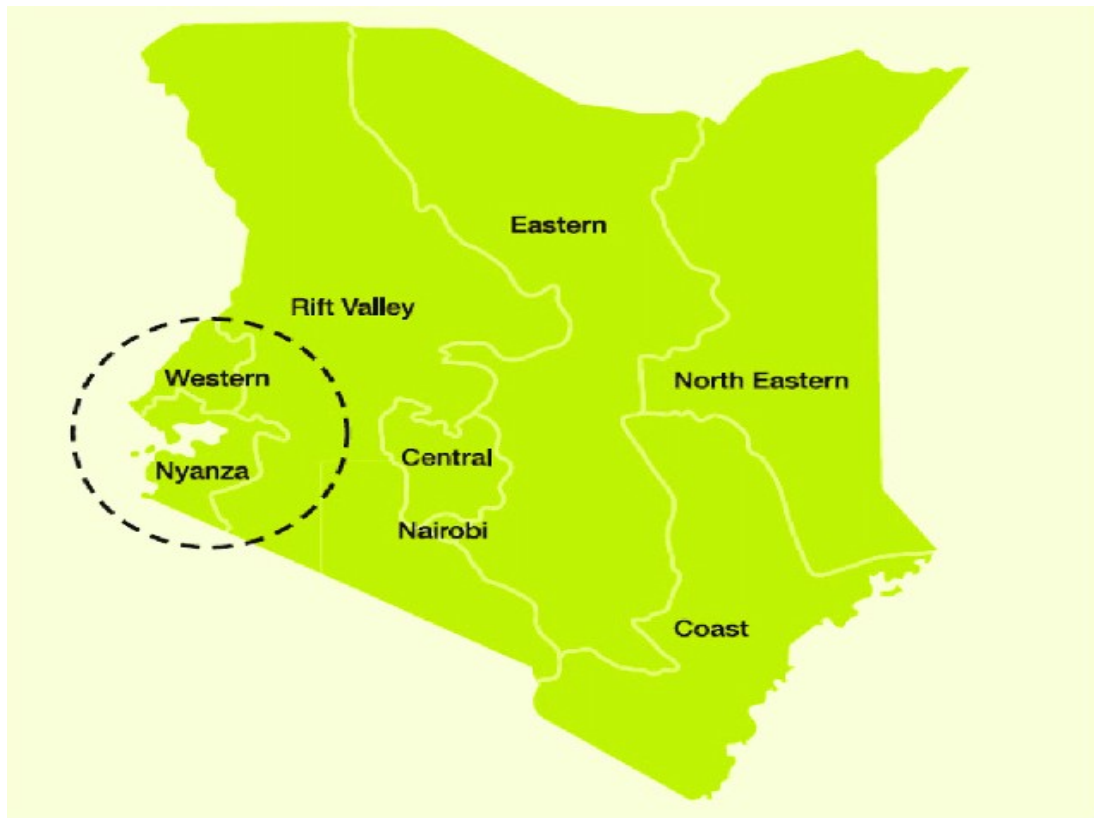
ETHICS AND RESEARCH COMMITTEE

CC. Medical Superintendent

CGH KAKAMEGA



## APPENDIX XV: MAP OF THE STUDY AREA



Source: Research gate org. (2019). Nyanza and Western Kenya. Retrieved from <https://www.google.com/search?q=nyanza+and+western+kenya&client=firefox>