

ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF NURSING AND MIDWIFERY

**KNOWLEDGE AND PRACTICE OF NURSES AND
ASSOCIATED FACTORS IN MANAGING NEONATAL PAIN IN
PUBLIC HOSPITALS IN ADDIS ABABA, ETHIOPIA, 2020.**

BY: GEMECHIS WARI (BSc)

**A RESEARCH THESIS SUBMITTED TO ADDIS ABABA
UNIVERSITY, COLLEGE OF HEALTH SCIENCES, SCHOOL
OF NURSING AND MIDWIFERY, NEONATOLOGY UNIT FOR
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF MASTERS ON NEONATAL NURSING.**

JULY, 2020

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MASTERS IN NEONATAL NURSING.**

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JULY, 2020

ADDIS ABABA, ETHIOPIA

APPROVAL BY THE BOARD OF EXAMINATION

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STATEMENT OF DECLARATION

By my signature below, I declare and affirm that this thesis is my own work. I have followed all ethical principles of scholarship in the preparation, data collection, data analysis and completion of this thesis. All scholarly matter that is included in the thesis has been given recognition through citation. I affirm that I have cited and referenced all sources used in this document. Every effort has been made to avoid plagiarism in the preparation of this thesis.

This thesis is submitted in partial fulfillment of the requirement for a graduate degree from the Addis Ababa University at College of Health Sciences, Department of Nursing and Midwifery. The thesis is deposited in the Addis Ababa University Digital Library and is made available to local, national and international scientific community. I seriously declare that this thesis has not been submitted to any other institution anywhere for the award of any academic degree, diploma or certificate.

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List of Abbreviations and acronyms

AAU--- Addis Ababa University

BSc---- Bachelor of Science

CSA--- Central statistical agency

ETB-----Ethiopian Birr

GMH--- Gandhi Memorial Hospital

IASP----International association study of pain

MSc--- Masters of science

NFCS ---Neonatal facial coding system

NGO---- Non-governmental organization

NICU----Neonatal intensive care unit

PIPP ----Premature Infant Pain Profile

NIPS ---Neonatal Infant Pain Scale

N-PASS--Neonatal pain, agitation, and sedation scale

SPHMMC--- St. Paul's hospital millennium medical college

SPSS---- Statistical package for social sciences

TASH---- Tikur Anbessa Specialized Hospital

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Abstract

Background: Pain is a significant global problem in the field of health. Hospitalized neonates experience moderate to severe acute or chronic pain which minimizes their comfort and suffering that result in short and long term complications. Health care providers in developing countries lack knowledge about neonatal pain management. Appropriate management of neonatal pain prevents unnecessary hospital stay and suffering them from pain.

Objective: The aim of the study was to assess the neonatal ICU nurses' knowledge and practice and factors associated regarding neonatal pain management at public hospital of Addis Ababa, Ethiopia, 2020.

Methods: Institutional based cross-sectional study design was used to collect data from four selected public hospitals in Addis Ababa, from 22April-22May 2020. Simple random sampling was used to recruit study participants using structured, self-administered questionnaire. Logistic regression model was used to identify the association. Odds ratio was used to test the strength of the associations between outcome and predictor variables at a 95% confidence level and p value of <0.05 was considered as statistically significant association. **Result:** This study conducted with 119 nursing staff working in Neonatal ICU with a response rate of 96.6%. Out of that 68.7% of nurses had adequate knowledge regarding neonatal pain management. Regarding practice, less than half (32.2%) of the respondents had Good practice. There was significant relationship between nurses' knowledge scores and receiving training on neonatal pain management being in NICU and getting neonatal pain management training at College/University. Availability of infant pain management policy in place, getting training on neonatal pain management at college/ university and knowledge category were factors significantly associated with practice of nurses' in managing neonatal pain.

Conclusion and Recommendation: This study revealed that nurses had poor practice but had adequate knowledge in managing neonatal pain. However majority of nurses didn't know and practice assessment of neonatal pain accordingly. The respective hospitals and Ethiopian ministry of health should provide convenient training program on neonatal pain management to nurses.

Keywords: Pain, NICU, knowledge, practice, nurses

1. Introduction

1.1. Background

The universal and widely cited medical definition of pain is given by the International Association for the Study of Pain (IASP) and it defines pain as a hostile sensual and receptive experience interrelated through concrete or possible injuries. Pain is all the time personal. The application of the word pain is learned by each individual through experience associated to sickness early in life(1). However, this definition has been confronted for the reason that newborns can't verbalize their pain; bearing in mind that nonexistence of verbal announcement does not avert one from feeling pain and requiring treatment. Hence, the measurement of neonatal pain is highly dependent on the observer's judgment, and the indicators in the indicating system must be subjectively observed and determined by others (2).

The cornerstone of pain management is its assessment and measurement especially in case of neonates who cannot report their pain and the assessment ought to comprise physiological (e.g. pulse rate, saturation of oxygen) and behavioral factors (e.g. cry, facial expression, body movement) and validated pain scale measurement usage is recommended(3, 4). There are also multiple validated pain scales utilized by NICUs to assess pain like neonatal infant pain scale (NIPS); neonatal facial coding system (NFCS); neonatal pain, agitation, and sedation scale (N-PASS); CRIES (cry, required oxygen, increased vital signs, expression, sleeplessness scale); COMFORT Scale; for term neonates and the premature infant pain Profile (PIPP) is a validated pain scoring system for preterm neonates (4, 5).

Based on the assessment done the management and intervention needed should be given to the neonate. In neonatal pain management, professional nurses that care for newborns have various roles like assessing the comfort needs of the neonate, observation of neonatal response to clinical procedures and evaluation of how these influence neonatal comfort and rest. Study reminds us of the susceptibility of newborns who cannot verbalize and advocate for themselves when they are in pain (4).

As it is argued by American Academy of Pediatrics, all health care professionals who work with neonates to make pain management as number one goal not only because it's ethical but also

because of consequences that come with pain(6). The use of pain assessment scales provides consistency between nurses and other clinicians, and provides an accurate measure for the presence of pain, stress, or discomfort and it can provide an accurate description of the effect of non-pharmacological and pharmacological management interventions on a neonate's pain (7).

Pharmacological modalities used to treat pain in neonates includes: topical anesthetics lidocaine 2.5%, tetracaine 2.5%, and liposomal lidocaine 4%, acetaminophen, local anesthetics like lidocaine injection, sedative medication like morphine, fentanyl, and ketamine are available(4, 7).

Combination of pharmacological and non-pharmacological or combination of non-pharmacological therapies provides synergistic effects. Non-pharmacological pain management includes oral sucrose, breast feeding, kangaroo care, swaddling or facilitated tucking, non-nutritive sucking, and positioning (4, 7).

As it has shown in previous research, pain in infants is often under recognized and under-treated(8). Factors to pediatric pain management may include organization, professional, and patient barriers. Organization obstacles are related to the regulatory barriers to access to analgesics, supply limitations, and prioritization of infectious diseases (9). In case of professional barriers it consists of believing that narcotics are more dangerous in the pediatric patient; that the infant's immature nervous system does not allow them to feel pain, that pain builds character, the tolerance of pain in children is better in adult, and that the memory of pain is absent in children(10). As it have shown in some studies, patient contextual factors such as infant age, previous pain experiences, gender and health status play an important role in pain responses, especially due to their lower threshold , premature newborns are more sensitive to pain and must be considered in the measurement of pain(3, 11).

Even if pain is reflected to have protective functions, however, suggestion exists to confirm that untreated or ineffectively treated pain has both short and long term negative effects on the health of the neonate. Midst these are the development of complications such as intracranial hemorrhage, decreased immune response, delayed weight gain, prolonged hospitalization, impaired neonate-parent bonding and the development of psychosomatic conditions such hyperalgesia and allodynia (12).

1.2. Statement of the problem

The International Association for the Study of Pain and World Health Organization explained, pain is a significant global problem in the field of health. However, regardless of huge investment and research efforts in relation to the issue of pain, the clinical practice is far from the recommended one. Pain is under-notified, poorly documented in medical charts and under-treated in both industrialized and unindustrialized countries (13, 14).

American Academy of Pediatrics (2016) states there is a great prevalence of knowledge divergences in health care professionals' capability to properly assess and manage pain in neonates (15). There are many studies reporting that deficiencies be present in knowledge and practice of assessing and treating pain in neonates. Study conducted in Iran showed that 65% of neonatal nurses didn't use any pain assessment tools and majority of nurses didn't felt as pain was being well managed in their neonatal intensive care unit(16).

Neonates who are treated in a neonatal intensive care unit (NICU) are exposed to several of stressful procedures and to environmental stress. And study showed that, for example, on average 14 ± 4 stressful procedures throughout the first two weeks of life within a period of 24 hours midst 151 newborns(17). Recurrent and persistent pain exposure in preterm infants during a susceptible time for brain development may have adverse consequences (18) . Particularly, they may contribute to altered development of the pain system, behavior and cognition during later infantile and adolescence (19, 20)

Having no gold standard for managing neonatal pain remains to be a challenge to neonatal care providers and so far pain is taken as the fifth vital sign(21). Neonatal pain is nearly difficult to investigate because of having nothing to base on saying the neonate is in pain. Underutilizations of pharmacological and non-pharmacological pain interventions have a big gap among pain knowledge, evidence, and clinical practice worldwide (6, 22). Nurses and physicians in developing countries lack knowledge about assessing the extent of pain and using effective non-pharmacologic and pharmacologic analgesia in neonates (23).

Pain is experienced by hospitalized newborns from painful procedures and pain related to their physiological conditions (4). Pain in neonate is inevitable and nurses that give care for them must play a vital role in pain assessment and management and must be knowledgeable concerning

how to assess and manage neonatal pain. However, in some circumstances, nurses do not take into attention the pain that neonates may be undergoing during treatment procedures. Others performed several painful procedures at a time on different body areas without giving attention the neonate's pain. Such delivery of nursing care results in increased pain in neonates. Study also indicated that the knowledge, practice and beliefs of nurses have a significant influence on the effectiveness of pain management (24). Knowledge deficits may cause nurses to hold resilient beliefs towards neonatal pain management. As study conducted in South Africa showed, a knowledge deficit on neonatal pain management associated with the absence of practical guideline with neonatal pain management. This knowledge deficit is then associated with a lack of pain management in neonatal wards. The study is inspired from 10 year of clinical practice observing neonatal pain appeared to be the last priority, receiving little or no attention by neonatal staff (25).

It is hard to get relevant study that shows the prevalence of pain and its management among hospitalized neonates in Ethiopia. In spite of various factors surrounding pain management have been explored, little is known about the burden of unrecognized and undertreated pain to neonates in Ethiopia and in Addis Ababa. To my knowledge and searching process there are limited studies existing that examine nursing staff of knowledge and practice towards neonatal pain management and associated factors in neonatal units currently at public hospitals of Addis Ababa. As a result, it is valuable to address this gap. This will establish baseline information about nursing staff current knowledge and practice regarding neonatal pain management. Consequently, it is a significant step in the process of improving pain management in neonatal units. This in turn will positively reflect on improving the quality of life of newborns and hopefully decrease hospital stay which in turn lead to decrease in medical costs. Therefore this study aimed to identify nurses' knowledge and practice and factors associated with neonatal pain management in selected public hospitals in Addis Ababa and address this issue through researches.

1.3. Significance of the study

Several studies from worldwide specially in developing countries indicates as pain management is not given priority and also unrecognized and undertreated by any health care professionals. However, properly managing neonatal pain is the only option that can prevent neonates from suffering due to pain and unnecessary hospital stay. Little is known about burden of unrecognized and undertreated pain to newborns in Ethiopia as well as Addis Ababa city. Evaluating the knowledge and practice of nurses towards neonatal pain management will specifically help to identify the result and continue to deal with accordingly.

Appropriate neonatal pain management may help in reducing pain and must be encouraged as part of complementary pain management effort. It improves both the quality of care and health outcomes or quality of life. This study will help to identify gaps in nurses' level of knowledge and practice towards neonatal pain management and associated factors. The result of this study will also contribute to;

- **Nursing Practice:** the finding of this study will help for nurses and promote effective neonatal pain management in hospital setting.
- **Ethiopian Federal Ministry of Health and Addis Ababa health bureau;** This study may be the 1st regarding neonatal pain management area of nursing in Addis Ababa city and the finding of the study will give direction to the important of the development of pain management policy and guideline. And may be used for future planning and interventions of appropriate strategies to promote and maintain the nurses' knowledge and practice towards neonatal pain management as needed.

Thus, the finding of study can be used as a reference for **nurse educator**, health care professional specially **neonatal and pediatric health care professional** and others and also can be used as a **reference** that interested to carry out further **research** in the area.

2. Literature review

2.1. Knowledge of Nurses towards neonatal pain management

Study conducted in Brazil in 2017 indicated that only 63.3% of nurses' use pain assessment scale while majority (86.0%) of nurses know as neonates feel pain and the recorded pain management was 84.3%. The researcher concluded as nurses considered neonatal pain is a real event however they don't perform pain assessment or treatment of newborns in systematized way(26). In other study conducted in Iran showed that lower than half (45.5%) of nurses working in neonatal intensive care unit were at good level for complications and pain intensity awareness and on tool for measuring pain 54.6% of them were poor and it was concluded awareness about neonatal pain assessment was relatively low and identified as less knowledge of nurse is the most effective barrier to pain care of the patient(27).

Another study in Brazilian showed that 69.8% of the healthcare professionals knew of certain non-pharmacological management effective for relief of acute pain(28) . Similar study in Rwanda indicated that 74.2% nurses demonstrated a low level of knowledge of neonatal pain management. Based the five level of knowledge the finding reported was 3.03%, 22.73% and 74.24% of them had high, moderate and low knowledge level respectively .The mean knowledge scored was 61.74%. On the sign and symptom knowledge questionnaires of newborns pain the majority answered with crying (83.3%), vital signs change (56.15%), and agitation (53%). And it was concluded as there was knowledge deficit among nurses(29).

A descriptive study was conducted in Antalya, Turkey in 2018 indicated that 68.6% of the nurses supposed that the child/mother had mentioned the pain and 22.5% reported that the reason of the pain was constantly an illness. Nurses from this study indicated that 56.9% of them didn't received education about pain and 51% of nurses stated as they had insufficient knowledge about the evaluation of pain and the author of this study concluded as it was very helpful to make in-service training platforms for pain which is deliberated as a vital finding. The investigator also suggested that nurses maximize their level of knowledge to adverse false perception/practices about pain (30).

A study conducted in Ethiopia in 2018 on knowledge, attitude, practice and factors associated with pain management for hospitalized children among Nurses showed that as nurses had

inadequate knowledge (52.2%) on pediatric pain management. The investigator concluded with nurses had poor performance towards pain management and also recommended as the hospital administrative bodies should provide convenient training program regarding pain and its management to nursing staff(31).

2.2. Practice of nurses towards neonatal pain management

Pain has been unacknowledged and undertreated in the history of neonatal care because of healthcare provider's misunderstandings that newborn infants have a diminished or absent ability to feel pain due to immaturity of their nervous system(32). An effective pain prevention program should be implemented in every health care facility caring for neonates, which includes strategies for regularly assessing pain, reducing the number of stressful procedures done, and using of pharmacologic and non-pharmacologic therapies effectively for the inhibition of pain related with repetitive minor procedures and reducing pain related with surgery and other major procedures (33).

A study in Turkey on Non-pharmacological strategies used to reduce procedural pain in infants by nurses showed that that 65.3% nurses used non-pharmacologic methods during vaccinations, 63.3% used physical contact/massage techniques, 26.5% used cold compress, and 27.9% used breastfeeding and 33.3% of nurses used positioning methods during invasive procedures, whereas 31.3% used no particular method. It was also determined with respect to heel lance procedures, 57.8% nurses employed non-pharmacologic methods, 50.3% were knowledgeable about skin contact, 38.8% were aware of massage/vibration, and 38.1% were knowledgeable about positioning, and they actually used them in practice. Furthermore, as education levels of nurses increased, their tendency to use non-pharmacologic methods during painful procedures increased accordingly; a significant correlation was determined ($p < 0.05$)(34).

Other study in Rwanda showed that nurses do not use pharmacological interventions (analgesia) during painful procedures for a heel prick, IM injection, peripheral catheter insertion, NG tube insertion, or adhesive tape removal procedures. However, they reported as analgesia was used for a lumbar puncture, ET intubation; long line insertion and chest drain procedures. They also didn't use no-pharmacological involvements (comfort measures) during painful procedures for all the procedures. The mean level of nurses' practical neonatal pain management was 52.08%. About use of sucrose to manage neonatal pain indicated that 59.1% of respondents never use

sucrose during procedures, 22.7% rarely do, 10.6% often use it, 3.0% usually do, and 4.5% always do. The main pharmacological used was Paracetamol (84.8%) and morphine (10.6%) & Diclofenac (1.5%). Regarding practice of no-pharmacologic intervention used breastfeeding (31.8%), positioning 24.2%, non-nutritive sucking 12.1%, none 13.6%, use of sugar 3.0%, Kangaroo Mother Care 1.5%, swaddling 1.5%. No pain assessment tool (84.85%), no neonatal pain management guideline (93.94%). Regarding their level of neonatal pain management, high (4.55), moderate (10.6%) and lower level (84.85%)(29).

A descriptive, cross-sectional study was done in Poland on 617 participants and reported insufficient treatment before selected procedures. Before chest tube insertion, 23.4% of nurses reported lack of use of pain medicines. Paracetamol was the frequent used analgesics as the study revealed. The study also showed (24%) of nurses reported as pain managed according to the guideline and (40.2%) of them reported as pain treated according to the knowledge and experience of physicians. Phenobarbital and paracetamol were the most frequently used. On assessment of neonatal pain the use of pain scales was reported by an insufficient number of nurses. More than 60% of respondents did. The author concluded with there was a deficiency in the knowledge and practice of neonatal pain management. This study also suggested that failure in the treatment and assessment of pain in neonates is more widespread than suspected(35).

A study done on neonatal nurses working in the Neonatal Intensive Care Units (NICUs) in Ardebil, Iran reported that 65% of nurses didn't use pain assessment tool and less than half (44.2%) of them use pain assessment accurately. And the author concluded with nurses' awareness of well-managed pain had a significantly associated with adequate training, use of suitable and correct pain tools, clear and evidence-based protocols, and family intervention(36).

2.3. Factors for pain management in neonates

Neonatal pain management is affected by different barriers as it was shown in several researches. According to a study in Kenya reported, the absence of evidence based written guideline, pain assessment scale tool, continuing professional development and the health workers years of experience were among the factors that affects positively or negatively concerning the management of neonatal pain(37). Similar study conducted in Iran indicated numerous factors that related with the application of managing pain in newborn by classifying individual and organizational factors. The individual issue contained of the classifications knowledge of the

persons and faithfulness of the personnel. Whereas the Organizational classes comprised pain control policy, work environment situation and management matters. And the researcher concluded with absence of teaching courses, nonexistence of an infant pain management policy and management subjects were the major hindrances in the way of carrying out of infant pain management by health care providers identified(38).

A study done in 2013 at University of Kentucky identified as knowledge and practice as a barrier in implementation of neonatal pain management among nursing staff working in neonatal intensive care unit. In the study, nurses recognized that the manifestation of pain in neonates can be affected by gestational age and prematurity, and pain may alter neurodevelopmental pathways. Nurses were unaware that premature neonates experience more pain than their full term equivalents, or that newborn experience more pain than adult or older children (39).

2.5. Conceptual Frame work

This conceptual frame work is developed by primary investigator by revising and assessing several literatures and reformed according to fit this study (3, 9, 11, 29, 37, 38, 40).As it is shown below, the relation of the health care provider factors, patient related factors (socio-demographic factors) and organizational factors influence the management of neonatal pain.

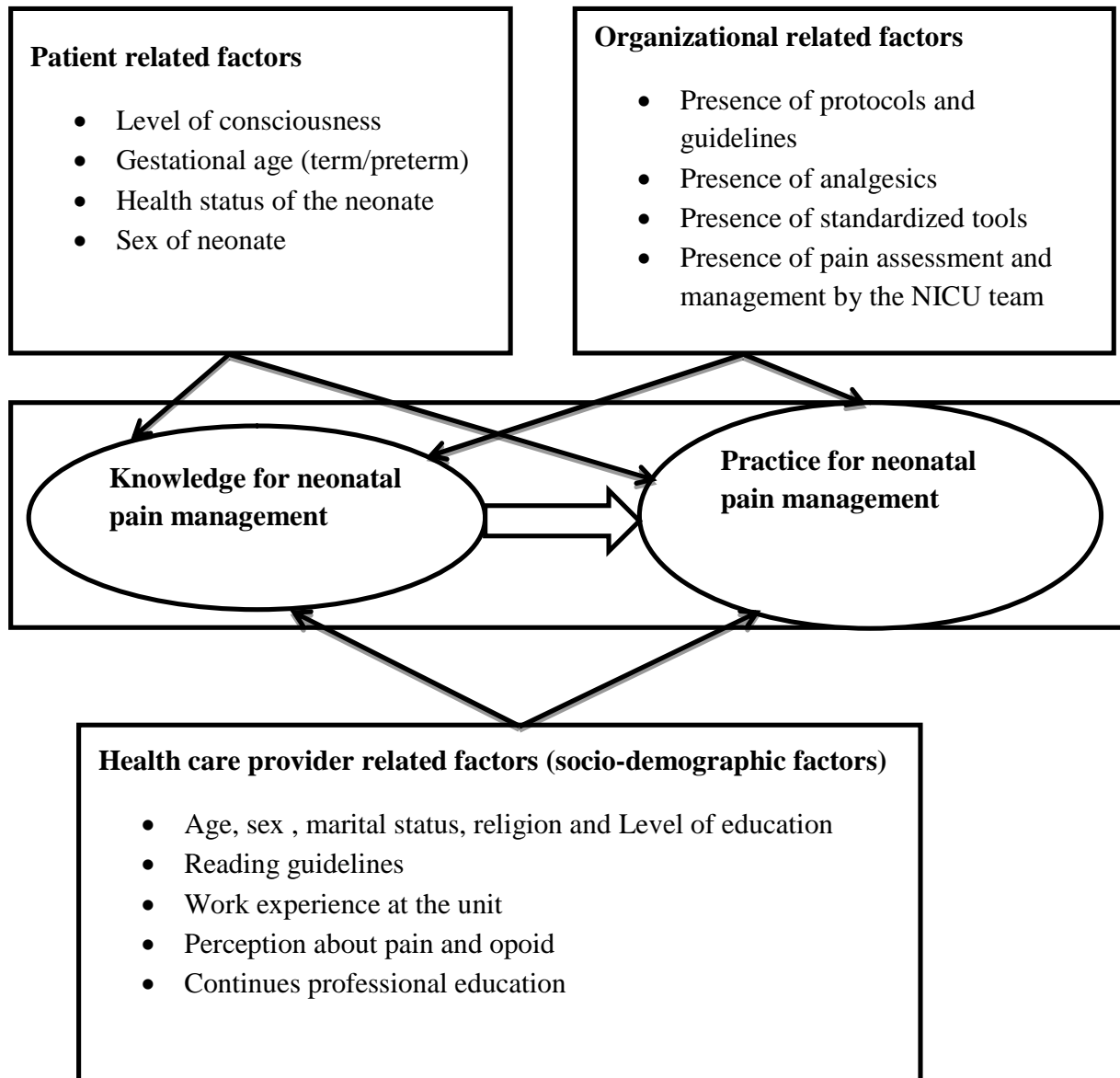


Figure 1: Conceptual framework; reflects relationship among Knowledge, practice and associated factors concerning neonatal pain management among nurses developed by reviewing several literatures.

The above conceptual framework indicates that the independent variables like patient related factors, organizational related factors and health care provider related factors affects the dependent variables knowledge directly and practice of nurses' directly or indirectly towards neonatal pain management. The patient related factor (neonatal related) like level of consciousness, gestational age (term/preterm), health status of the neonate, sex of neonate affects the knowledge and practice of nurses' towards neonatal pain management(3, 11).The organizational related factors like presence of pain management protocol and guideline, availability of analgesics, presence of standardized neonatal pain assessment tool, presence of pain assessment and management by neonatal ICU nursing staff team affect the directly the knowledge and practice of nurses regarding to neonatal pain management(9, 37). The health care provider related factor and socio-demographic factors like age, sex, marital status, religion, level of education, work experience at the unit, reading guidelines, perception about pain and opioid ,and continues professional education also affect the knowledge and practice of nurses' towards neonatal pain management(29, 38, 40).

3. Objective

3.1. General objective

- To assess the NICU nurses' knowledge, practice and factors associated regarding neonatal pain management in public hospitals in Addis Ababa, Ethiopia 2020.

3.2. Specific Objectives

- To determine the NICU nurses' knowledge on management of neonatal pain.
- To identify the NICU nurse' knowledge related associated factors on management of neonatal pain.
- To identify the NICU nurse' practice on management of neonatal pain.
- To determine the NICU nurse' practical related associated factors on management of neonatal pain.

4. Methodology

4.1. Study Area

This study was conducted in Addis Ababa, the Capital City of Ethiopia and the city was selected purposely due to having more hospitals with neonatal intensive care unit. The city has ten sub-cities. The city is surrounded by Oromia liyu zones in all directions. According to the projected census of 2007, conducted by the central statistical agency of Ethiopia (CSA), the city has a total population of 2,153,937, an increase of 26.68% over the 1994 census, of whom 1,066,716 are men and 1,087,221 women; with an area of 14,004.47 square kilometers. Currently the population of Addis Ababa is growing and estimated to 3.4 million with population density of 5,165.1/km² (13,378/sq. mi)(41).

With regard to health institutions the city has 13 government hospitals (five are owned by Ethiopian federal ministry of health, six by the Addis Ababa city Administration Health Bureau, one by the Ethiopian Federal Police, and One by Ethiopian armed force). The hospitals are built in all the 10 sub-cities. Nine of the hospitals have neonatal intensive care unit set up. Four of the hospitals with NICU were randomly selected using lottery method to be included in this study. The selected hospitals were; Tikur Anbessa Specialized Hospital, St. Pauls' Hospital Millennium Medical College, Yekatit 12 Hospital and Gandy Memorial Hospitals are selected for the study and currently the total NICU nursing staffs working in selected four public hospitals are 150.

1. **Tikur Anbessa Specialized Hospital** was established in 1966 and located in Lideta Sub City. Formerly it was called Princess Mekonnen for memory of Harar, but in 1975 it is named as Tikur Anbessa Hospital. Now it is called Tikur Anbessa Specialized Hospital (TASH). It is the largest referral hospital in country. TASH provides several tertiary level health care services, such as medical, gynecological and obstetrics, surgical, pediatrics and emergency healthcare services at outpatient and inpatient level. These services are organized under specialty units such as chest, renal, neurology, cardiology, dermatology, gastro intestine, infectious disease, orthopedics, general surgery, gynecologic and obstetrics, diabetic, hematology, and

- intensive care units (ICU)(41). Currently 33 nurses are working in the NICU of TASH.
2. **St. Paul's Hospital Millennium Medical College:** was built in 1969 and located in Gulelle Sub-city. Previously it was named St Paul General Specialized Hospital until 2008 and currently it is called Saint Paul's Hospital Millennium Medical College. It is the second largest referral hospital in Ethiopia. The hospital has the following departments under which the specialty services are provided. These are;-Forensic medicine and toxicology, internal medicine neurology, general surgery, ENT, psychiatry, ophthalmology, dentistry (maxillofacial surgery), radiology, dermatology, gynecology& obstetrics, pediatrics, biomedicine, emergency medicine and neurosurgery. And also has neonatal intensive care unit which has been functional over 8 years(42). Currently the numbers of nursing staffs in this NICU are 60.

 3. **Gandy Memorial Hospital GMH:** was established in 1951E.c and found in Kirkos sub city. This hospital is governed under Addis Ababa city administration health bureau and provides maternal and neonatal service(41). The number of nursing staff working in neonatal intensive care unit is 23 currently.

 4. **Yekatit 12 hospital medical college:** was established in 1945 E.C. The currently services given by this hospital is, Maternal Health service, Child Health services, and adolescent reproductive health. Yekatit 12 hospital is the only hospital under the city Administrative Health Bureau of Addis Ababa with high number of neonatal and pediatric(43). It also has neonatal intensive care unit and 34 nurses are working in this neonatal care unit now as information obtained from the hospital.

4.2. Study Design and Period

Institutional based Crosse-sectional study was done in public hospitals in Addis Ababa from 22April to 22May 2020.

4.3. Population

4.3.1. Source population

- The nursing staff working in NICU in public hospitals in Addis Ababa, Ethiopia 2020.

1.3.2. Study population

- The nursing staff who had been working in the neonatal intensive care unit of selected public hospitals in Addis Ababa.

1.3.3. Sampling population

- The sampling populations were the nursing staff working in the neonatal intensive care unit and randomly selected by simple random sampling of selected four public hospitals in Addis Ababa.

1.3.4. Sampled Population

- Each nursing staff working in neonatal unit of selected four public hospitals who was selected by simple random sampling.

4.4. Inclusion and Exclusion criteria

4.4.1. Inclusion criteria

- All nurses who had at least six months of work experiences in the selected NICUs, and willing to take part in the study.

4.4.2. Exclusion criteria

- Nurses who were on annual, sick or maternity leave at the time of data collection were excluded.

4.5. Sampling Methods

4.5.1. Sample size determination

The sample size of this study was determined by using the formula for calculating a single population mean, $ni = \frac{(z\alpha/2)2p(1-p)}{d^2}$

Where ni = initial estimated sample size

Z = Normal standard

P = proportion/prevalence of knowledge and practice of nurses on neonatal pain management

d = margin of error

The following assumption was used to determine the sample size:

The proportion mean of nurses' knowledge and practice towards neonatal pain management taken from a previous related study conducted in Uganda since there is no related previous study in Ethiopia and it was 61.74% and 52.08% respectively(29). And a 95% confidence level with 0.05 margin of error assumed.

$$ni(1) = \frac{(1.96)^2 \times 0.52(1 - 0.52)}{(0.05)^2} = 383.545 \approx 384$$

$$ni(2) = \frac{(1.96)^2 \times 0.6174(1 - 0.6174)}{(0.05)^2} = 362.98 \approx 363$$

Therefore, the proportion mean of nurses' practice towards neonatal pain management (p = 52.08%) was given large sample size (384) and was used to calculate the final samples for this study.

Since the total population (nurses working in the neonatal intensive care unit of selected public Hospitals) were 150 nurses, which was less than 10,000, the adjustment formula was used:

$$nf = \frac{ni}{1 + \frac{ni}{N}}$$

Where nf= final sample size

ni=initial sample size

N = total population

$$nf = \frac{384}{1 + \frac{384}{150}} = 107.865 \approx 108$$

After considering a 10% non-response rate, the final sample size was 119 nurses.

4.5.2. Sampling procedure

The number of study units to be sampled from each hospital was determined using proportional to site allocation formula from the selected four hospitals: $\frac{nf \times ni}{N}$

Where: ni =number of nurses in each of the selected NICU.

nf = the final sample size

N= the total number of nurses working in the selected NICU.

$$\text{Tikur Anbessa Specialized Hospital} = 119 * 33 / 150 = 26.18 \approx 26$$

$$\text{Saint Paul's Millennium Medical College} = 119 * 60 / 150 = 47.6 \approx 48$$

$$\text{Yekatit 12 Medical College Hospital} = 119 * 34 / 150 = 26.9733 \approx 27$$

$$\text{Gandy Memorial Hospital} = 119 * 23 / 150 = 18.2466 \approx 18$$

Simple random sampling technique had been used to select sampled nurses from each hospital. Each study unit in the population who were present during data collection had been represented by a slip of paper, these were put in a box and had been mixed, and a sample of the required size had been drawn from the box. This was done after obtaining the lists of nurses' from mentor of nurses' by their alphabetical name and giving serial number according to their alphabetical order.

4.6. Operational definition

Adequate knowledge: Those of nurses who scored equal or greater than 80% of the knowledge questions correctly.

Inadequate knowledge: Those of nurses who scored below 80% to knowledge items.

Good practice: Nurses who scored equal or greater than 80% of practice questions correctly.

Poor Practice: Those of nurses who scored below 80% for practice related questions correctly.

Presence of protocol/guideline: refers to availability of standard neonatal pain management guideline

Presence of analgesic: availability of analgesic drug used for neonatal pain management like opioid and acetaminophen.

Presence of standard tool: availability of neonatal pain assessment tool.

4.7. Variables

4.7.1. The independent variables

- Socio demographic factors (age, sex, religion, level of education, work experience)
- Environment (presence of assessment tool, presence of guideline, presence of analgesics and provision of training).
- Organizational factors; presence of protocol and guideline, presence of analgesics, presence of standardized tool for neonatal pain assessment.

4.7.2. Dependent (Outcome) variable

- Knowledge related to neonatal pain management
- Practice related to neonatal pain management

4.8. Data Collection tools and procedures

4.8.1. Data Collection Instrument

A self-administered structured questioner was used to collect the data. It was adapted from a valid and reliable instrument used in previous research done on similar topic (40, 44). As the questionnaire tested against validity and reliability in Brazil and Uganda, It suit with the objectives of this study and also congruent with the system in Ethiopia. The questionnaire consisted of four parts. The first part containing information regarding nurse's profile such as: age, sex, religion, training, years of experience, professional qualification and consists 8 questions; the second part is regarding nurses' knowledge (20 questions) composed of affirmative sentences by using the Likert Scale, and answered as follows: I disagree(1), I partially disagree(2), I don't know(3), I agree(4), and I strongly agree(5) that graded as 1-5 and transformed , computed and recoded to 3-point rating scale as disagree (1) to agree (3) . The third part was regarding nurses' practice (15 questions), the answers as follows; never(1), rarely(2), sometimes(3), most of the time(4), and always(5) and this transformed, computed and recoded to 3-point rating scale; 1(never) to 3(always): the fourth part was regarding about institutional factors (six questions), and answered using yes/no.

4.8.2. Data collection procedure

Data had been collected from 20April to 20May 2020, after permission was obtained from the selected hospitals. A total of 2 BSc nurses working in Addis Ababa health institutions for data collection and one first year MSc nurse student for supervision were recruited and participated throughout the data collection and were trained for one day by the principal investigator on the objective, confidentiality of information, respondents' right, informed consent, and technique of questioner administration. The aim of the study, consent form, confidentiality issue and informed consent had been explained and ensured to all of the study subjects. The supervisor and the principal investigator were closely following the data collection process through the data collection period and check for missed value.

4.8.3. Data quality control

The structured validate and reliable adapted questionnaire (40, 44) were used to collect the data and to ensure further quality of data collection tool, pre-test was done on 5% (6 nurses) of the total sample size calculated working in Ras-Dasta hospital two weeks before the actual data

collection and the questionnaire were checked for its clarity, understandability and simplicity. After pre-test, the questionnaires were reviewed and reformatted based on the inputs and comments generated by seniors. The filled questionnaires were checked for its completeness to assure the quality of data. Both the Principal investigator and recruited supervisors were responsible for supportive supervision on the spot and on reviewing all filled questionnaires on daily basis.

4.9. Data processing and analysis

The data was checked for completeness and consistency. Then, it was coded and entered into Epi data v4.6.0.2 for cleaning and transferred to SPSS version 26 for further analysis. Finally the data was processed descriptively and analytically. The descriptive analysis was used to process and present the frequencies of some of the constructs such as socio-demographic attributes, of the knowledge and practice of nurses on neonatal pain management. The knowledge and practice of nurses regarding neonatal pain management were obtained after transforming and scoring all variables related to knowledge and practice. Using and modifying McDonald's criteria measuring learning outcome were knowledge and practice are categorized into five levels as very low (<60%); low (60-69.99%); moderate (70-79.99%); high (80-89.99%) and very high (90-100%)(45) , percentage score were used to categorize knowledge and practice into two as adequate and inadequate for knowledge and good and poor for practice respectively. The analytical method was used to determine the predicting variables of nurses' knowledge and practice on neonatal pain management. The data was, thus, fitted the logistic regression model. The predictive variables were identified in two stages. First, a bivariate analysis was conducted to identify factor with $p < 0.25$ at 95% CI. Then the identified factors were entered a multivariate analysis in order to control the confounding factors. Finally, those factors with $p < 0.05$ at 95% CI were considered as the predictors of NICU nurses' knowledge and practice on managing neonatal pain. The findings are presented using text, tables, graphs and figures.

4.10. Ethical Consideration

Ethical clearance was obtained from Institutional Review Board of Addis Ababa University, College of health sciences, Department of Nursing. And official letter was obtained and given to Addis Ababa Health Bureau and to the selected hospitals ahead of initiation of data collection.

Letter of permission was secured from administrative bodies of the hospitals to communicate with relevant bodies in the health institutions. All of the study participants' were informed verbally about the purpose of the study, about their right to participate or not or withdraw from the study at any time, and the benefit and cost of the study. The privacy and confidentiality of information was strictly maintained by not writing the name of study participants during data collection on tool.

4.13. Dissemination and Utilization of Findings

The result of the study will be submitted to Addis Ababa University College of health sciences through presentation and submission of hard and soft copy of reports will be available in the library of this University. Publication on peer reviewed journal for further use will be attempted and also be presented in different conferences like health related seminars; especially on Ethiopian pediatric association.

5. Results

5.1. Socio-Demographic Characteristics of the Participants

A total of 119 questionnaires were distributed of which 115(96.6%) were fully filed out and collected back. Majority (89.6%) of them were females,91(79.1%) were aged between 24-28 years with a mean of age 26.7+/-2.907 years, and 61(53.0%) were single. Additionally, 93(80.9%) of them were BSc nurses, and 78(67.9%) had an NICU experience ranging from six months to two years. Regarding their training in neonatal pain management, 61(53.0%) of them reported being taught about it during their BSc study, and 60(52.2%) reported receiving in-service training on it (Table 1).

Table 1: Socio-demographic characteristics of nurses in Public Hospitals in Addis Ababa, Ethiopia, 2020, (N= 115).

Variables	Response category	N (%)
Age	18-23	11(9.6)
	24-29	91(79.1)
	30 and above	13(11.3)
Gender of participants	F	103(89.6)
	M	12(10.4)
Marital status	Single	61(53.0)
	married	53(46.1)
	Divorced	1(0.9)
Religion	Orthodox	86(74.8)
	Protestant	18(15.6)
	Muslim	11(9.6)
Profession	Diploma	1(.9)
	BSc	93(80.9)
	BSc neonatal nurse	19(16.5)
	MSc	2(1.7)
Work experience in NICU.	6Months-2yrs	78(67.9)
	2-5yrs	28(24.3)
	>5yrs	9(7.8)

Training on neonatal pain management at college/ university	Yes	43(37.4)
	No	72(62.6)
Received training on neonatal pain management being in NICU.	Yes	48(41.7)
	No	67(58.3)

5.2. Nurses knowledge about neonatal pain management

In order to assess nurse's knowledge regarding neonatal pain management, the participants were asked to answer 20 questions written in five Likert scale: disagree, partially disagree, I don't know, agree and strongly agree questions which then were transformed to a 3-point rating scale ranging from 1 (disagree) to 3 (agree). The total score ranged from 20-60 and based on the above operational definition, those of nurses who answered equal or greater than 80% of knowledge related questions said to have adequate knowledge.

Knowledge Categorization

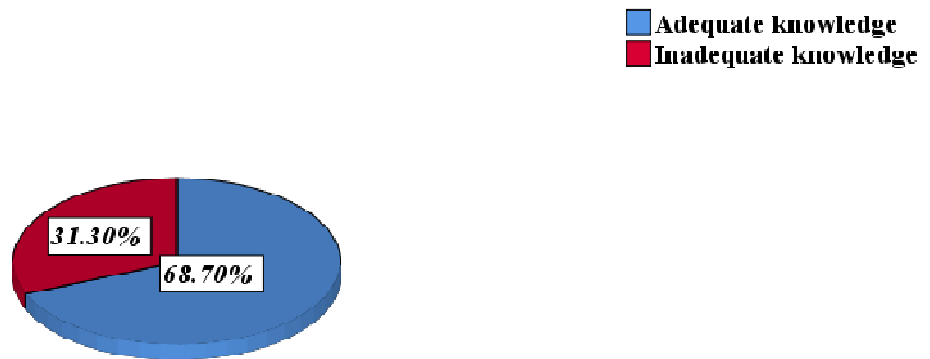


Figure 2: Nurses' knowledge on the management of neonatal pain in Public Hospitals in Addis Ababa, Ethiopia, 2020. (N= 115).

Accordingly, 79(68.70%) of the study participants had adequate knowledge concerning neonatal pain management while 36(31.30%) of them had inadequate knowledge (Figure 2).

Out of the total respondents 104(90.4%) agreed as preterm new-born feel pain. Almost all 112(97.4%) of the respondents agreed as full term new-born feel pain while only 3(2.6%) of them didn't know. The respondents who agreed with the vital sign of neonate can be affected by pain were 98(85.2%) while 6(5.2%) of participants didn't know as pain affects baby's vital sign. There were also 74(64.3%) reported they knew that light and noise affect new-born reaction to pain.

The respondents who know that as new-born pain not recognized by professions constitute only 23(20%). Almost two-third 70(60.9%) respondents know as pain is considered as one of the Vital sign in new-born. The majority 94(81.7%) of respondents reported as pain assessment in new-born must be systematized. There were also almost the same numbers of respondents 96 (83.5%) knew pain assessment should be part of the nursing prescription.

Table 2: Nurses knowledge in managing neonatal pain in Public Hospitals in Addis Ababa, Ethiopia, 2020 (N= 115).

Variables	Disagree N (%)	I don't know N (%)	Agree N (%)
Preterm new-borns feel pain	9(7.9)	2(1.7)	104(90.4)
Full-term new-borns feel pain		3(2.6)	112(97.4)
Pain can affect new-born's heart rate, respiratory rate, temperature, blood pressure, oxygen saturation, intracranial pressure.	11(9.6)	6(5.2)	98(85.2)
Pain can affect new-born's facial expressions, limb movements and crying	3(2.6)	6(5.2)	106(92.2)
Light and noise may affect new-born's reactions to pain.	28(24.4)	13(11.3)	74(64.3)
New-born's pain is not recognized by professionals.	77(67.0)	15(13.0)	23(20.0)
New-born's pain is not considered by researchers	64(55.7)	33(28.7)	18(15.6)
New-borns react to pain in a particular way.	25(21.7)	16(13.9)	74(64.4)
Pain is considered as one of the Vital sign in new-borns.	32(27.8)	13(11.3)	70(60.9)
Pain assessment in new-borns must be systematized	8(7.0)	13(11.3)	94(81.7)
Pain assessment should be part of the nursing prescription.	9(7.8)	10(8.7)	96(83.5)

New-borns require painkillers due to maturity of the nervous system to feel pain.	18(15.6)	17(14.8)	80(69.6)
Neonatal pain can be assessed without the use of scales.	48(41.7)	14(12.2)	53(46.1)
The use of scales for pain assessment is important to the practice	18(15.6)	13(11.3)	84(73.1)
It is important to record pain on the new-born's chart.	13(11.3)	13(11.3)	89(77.4)
Recording pain assessment is a prerequisite to its control.	9(7.8)	13(11.3)	93(80.9)
Nurses have sufficient knowledge to assess pain in new-borns.	24(20.8)	14(12.2)	77(67.0)
Pain management in new-borns depends on its assessment	21(18.3)	10(8.7)	84(73.0)
Recording new-born's pain assessment will result in relief.	20(17.4)	17(14.8)	78(67.8)
New-borns submitted to repeat painful procedures may have harmful effects on their development.	19(16.5)	17(14.8)	79(68.6)

5.4 Nurses' practice in management of neonatal pain

The respondents were also asked to answer five point Likert scale questions related to nurses' pain management practice in newborns.

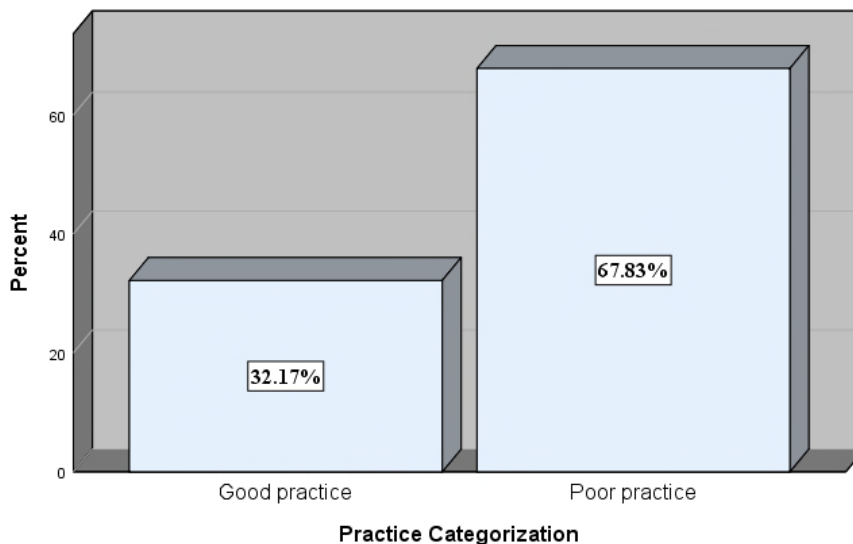


Figure 3: Category of practice of nurses regarding neonatal pain management in public Hospitals in Addis Ababa, Ethiopia, 2020. (N= 115)

Based on the category specified in the operational definition, this study found that 78(67.8%) of the study participants had poor practice regarding neonatal pain management practice (Figure 3).

Majority 71(61.7%) of the respondents always assess new-born pain through crying while 61(52.7%) through facial expression. Almost half 61(52.7%) of nurses assess new-born pain through vital sign but 58(50.1%) not use vital sign as part of neonatal pain assessment. Majority 78(67.9%) of participants reported they didn't use scale to assess neonatal pain while only 18(15.7%) of them use it. The assessed neonatal pain scored on medical charts by only 17(14.8%) of respondents while majority of them didn't record on medical chart.

Concerning neonatal pain management, 56(48.7%) of participants always use non-nutritive suckling, 73(63.5%) of them always encourage breastfeeding to relieve the pain in new-born. In other hand, 52(45.2%) of nurses always encourage skin-to-skin contact to relieve the pain in

new-born. However, 19(16.9%) never encourage skin-to-skin contact to relieve the pain in new-born. (Table 2)

Table 3: Nurses practice in managing neonatal pain in Public Hospitals in Addis Ababa, Ethiopia, 22April to 22May 2020. (N= 115)

Items	Never N (%)	Sometim es N (%)	Always N (%)
I assess new-born's pain through crying.	10(8.7)	34(29.6)	71(61.7)
I assess new-born's pain through facial expressions	17(14.8)	37(32.2)	61(52.0)
I assess new-born's pain through body movement and agitation	22(19.1)	39(33.9)	54(47.0)
I assess new-born's pain through the Vital sign.	58(50.5)	27(23.5)	30(26.0)
I use scales to assess pain in new-borns.	78(67.9)	19(16.5)	18(15.6)
I record new-borns' pain scores on their medical chart.	81(70.4)	17(14.8)	17(14.8)
I use non-nutritive suckling to relieve pain in new-borns.	26(22.6)	33(28.7)	56(48.7)
I encourage breastfeeding to relieve the pain in new-borns.	13(11.3)	29(25.2)	73(63.5)
I encourage skin-to-skin contact to relieve the pain in new-borns.	19(16.5)	44(38.3)	52(45.2)
I offer oral glucose or sucrose to relieve new-borns' pain prior to painful procedures.	51(44.4)	22(19.1)	42(36.5)
I offer oral glucose or sucrose to relieve new-borns pain during painful procedures.	24(20.9)	40(34.8)	51(44.3)

I position the new-born to relieve their pain.	18(15.6)	40(34.8)	57(49.6)
I perform facilitated tucking in new-borns during painful procedures.	28(24.4)	42(36.5)	45(39.1)
I use more than one non-pharmacological measurement to relieve the pain of new-borns.	36(31.3)	44(38.3)	35(30.4)
I use pharmacological and non-pharmacological combined to relieve pain in new-borns.	26(22.6)	23(20.0)	66(57.4)

5.5. Facility related factors affecting neonatal pain management

Concerning the question about availability of protocols and guidelines for neonatal pain management in the unit, greater than three-fourth 92(80%) reported no. Out of the total participants 63(54.8%) reported as analgesics are not present in the unit (Table 3).

Table 4: Facility related factors on Knowledge, and Practice of Nurses in Managing Neonatal Pain in Public Hospitals in Addis Ababa, Ethiopia, 2020, (n=115)

Items	Response category	Frequency N (%)
Protocols and guidelines for neonatal pain management available in the unit.	Yes	23(20.0)
	No	92(80.0)
	Total	115(100)
Analgesics are present in the unit.	Yes	52(45.2)
	No	63(54.8)
	Total	115(100)
Standardized neonatal pain scale measurements are available in the unit.	Yes	23(20.0)
	No	92(80.0)
	Total	115(100)
In-service neonatal pain management training is provided	Yes	77(67.0)
	No	38(33.0)
	Total	115(100)
There is pain management policy in place.	Yes	18(15.7)
	No	97(84.3)
	Total	115(100)
There is support from leadership on neonatal pain management	Yes	16(13.9)
	No	99(86.1)
	Total	115(100)

5.6. Factors associated with knowledge of nurses on neonatal pain management.

To determine the set of predictor variables which predicted toward nurses' knowledge of neonatal pain management bivariate logistic regression was used. Among those predictors, getting training on neonatal pain management being in NICU, getting training on neonatal pain management at college/university, and work experiences of nurses in NICU were associated with the knowledge of nurses' toward neonatal pain management in bivariate logistic regression analysis ($p < 0.25$). Those variables that have association with the outcome variable in bivariate regression analysis were included in the multiple logistic regression models. Getting training on neonatal pain management being in NICU and receiving training on neonatal pain management at College/University were significantly associated with the knowledge of nurses' towards neonatal management after controlling for the effect of potentially confounding variables using multiple logistic regression ($p < 0.05$).

Nurses who got training on neonatal pain management being in NICU were 2.76 times (AOR = 2.76; CI=1.13-6.71) more likely to have adequate knowledge than those who didn't get training on neonatal pain management being in NICU. Those nurses who received training on neonatal pain management at College/University were 2.61 times (AOR= 2.61; CI=1.04-6.55) more knowledgeable than those nurses who didn't receive training on neonatal pain management at College/University (Table 5).

Table 5: Factors associated with knowledge of nurses on neonatal pain management in in Public Hospitals in Addis Ababa, Ethiopia, 2020, (n=115)

Variables		Knowledge		Odds Ratio		P-value
		Adequate	Inadequate	OR(CI)	AOR(CI)	
Receiving training on neonatal pain management at College/University	Yes	35	8	2.78(1.13-6.87)	2.61(1.04-6.55)	0.042
	No	44	28	1	1	
Getting Training on neonatal pain management being in NICU	Yes	39	9	2.93(1.22-7.00)	2.76(1.13-6.71)	0.025
	No	40	27	1	1	

1= Reference category

OR=Odds ratio

AOR= adjusted odds ratio

5.7. Factors associated with practice of nurses on neonatal pain management.

To determine the set of predictor variables which predicted toward nurses' practice of neonatal pain management, bivariate logistic regression was used. Among those predictors, gender, marital status, getting training on neonatal pain management being in NICU, availability of protocol and guidelines for neonatal pain management in the unit, getting training on neonatal pain management at college/university, knowledge toward neonatal pain management, and policy on pain management in place were associated with nurses' practice on managing neonatal pain in bivariate logistic regression analysis ($p < 0.25$).

To control the effects of cofounding variable, multiple logistic regression models with $p < 0.05$ was used and getting training at college/university, availability of pain management policy in the unit and knowledge toward pain management persisted in significant in the multivariate analysis.

Those nurses who had been taught on neonatal pain management at college/ university were 2.96 folds (AOR = 2.96; CI = 1.21-7.22) more likely to had good practice neonatal pain management than those who didn't get training on neonatal pain management at college/ university. Those nurses who had infant pain management policy in place were 7.87 times (AOR = 7.87; CI = 2.44-25.25) more likely to practice good neonatal pain management than those nurses who didn't have infant pain management policy in place. Good practice was 12.08 times (AOR = 12.08; CI = 2.48-32.78) more likely among those nurses who had adequate knowledge on neonatal pain management than those who had inadequate knowledge on neonatal pain management (Table6).

Table 6: Factors associated with practice of nurses on neonatal pain management in in Public Hospitals in Addis Ababa, Ethiopia, 2020, (n=115).

Variables		Practice		Odds ratio		p-value
		Good	Poor	OR	AOR	
Receiving neonatal pain management training at University/College	Yes	19	24	2.38(1.06-5.31)	2.96(1.21-7.22)	0.017
	No	18	54	1	1	
There is pain management policy in place	Yes	12	6	5.76(1.96-16.97)	7.87(2.44-25.25)	0.001
	No	25	72	1	1	
Knowledge category	Adequate	35	44	13.5(3.04-60.22)	12.08(2.48-32.78)	0.002
	Inadequate	2	34	1	1	

OR= Odds ratio

AOR= adjusted odds ratio

1 = reference category

6. Discussion

NICU nurses' knowledge on neonatal pain management

This study revealed that greater than half (68.70%) of the nurses' had adequate knowledge on neonatal pain management. This indicates the majority of nurses were knowledgeable about neonatal pain and this may be due to their level of education as almost all of them were Bachelor degree holders. In fact as knowledge increase the care for neonatal pain management also increase. It is similar with study done in Rwanda which revealed special ranks knowledge to neonatal pain management(44). In contrast, the present study showed higher level of knowledge when compared to other studies (16, 29). This difference might be due to different tool used or the sampling technique.

In other hand, the current study revealed a few of nurses didn't know as newborn feel pain. This may contribute to ineffective pain management in neonates among nurses. This knowledge deficit may be lack of awareness towards neonatal pain. However, three-fourth (74.3%) of the respondents knew that the use of scales for pain assessment is important to the practice. This indicates that majority of nurses aware the use of scale in the assessment of neonatal pain which result in appropriate intervention. It is higher than with the study conducted in Brazil which reported 62.7% of nurses using scale to assess pain in neonates (40).

According to the results of the current research, majority (85.2%) of participants knowledgeable as vital sign of newborns can be affected with pain. However, only (60.9%) of nurses considered pain is one of the vital sign in newborns. This indicates neonatal pain may not be assessed as frequent as vital sign. In contrast, study done in Turkey reflect higher number (30). On other hand majority (68.7%) of nurses knew New-born submitted to repeat painful procedures may have harmful effects on their development and it implies that they not expose neonate to repeated painful procedures and also minimize repeated painful procedures. In controversy, this was lower than the study conducted in Brazil which was (88.4%) (46).

NICU nurse' knowledge related associated factors on management of neonatal pain.

The current study showed that knowledge of nurses on management of neonatal pain positively associated with getting training on neonatal pain management being in NICU. Those of nurses who get neonatal pain management training being in NICU were, 2.76 folds more likely to have

adequate knowledge than those of whom not getting the training. Similar studies done in Rwanda and Amhara hospitals on neonatal and pediatric nurses revealed that training on pain management was significantly associated with knowledge of pain management of nurses(31, 44).This suggests that presence of formal training improves the nurses' knowledge to assess and manage pain properly. Consequently, continuous professional training and enhanced at work setting on the way to standard practice are keys to pick up adequate knowledge and good performance.

The current study also indicated that those nurses who taught on neonatal pain management at college/ university were 2.76 times more likely to have adequate knowledge on neonatal pain management than those who didn't get training on neonatal pain management at college/ university ($p = 0.025$). A similar study conducted in Amhara region showed lack of training was one factor which negatively associated with the knowledge of nurses on pain management (31). Apparently getting training concerning to pain assessment tools, principles and techniques of pain assessment and management compromises the ideal care to a neonate in pain.

NICU nurse' practice on management of neonatal pain.

The present study revealed that greater than half (52.2%) of nurses had good practice in neonatal pain management scoring. This indicates majority of nurses practice better on neonatal pain management and it might be due to their educational level and also having adequate knowledge regarding pain management in neonates. A similar result revealed in study conducted in Rwanda (29).

The use of more than one non-pharmacological measurement to relieve the pain of new-born was reported as always (30.4%), sometimes (38.3%) and never (31.3%). This implies poor practice of nurses with combination of more than one no-pharmacological managing pain in neonates. This was in contrast with the studies done in Rwanda and Brazil which reported majority of participants always use of more than one non-pharmacological intervention to relief pain in newborns (29, 40). From the current study, the uses of comfort measures give the impression not understandable as an essential role of nurses. It might be result in ineffective neonatal pain management with comfort.

Assessment of neonatal pain is crucial to professional practice as treatment. Different mechanism of pain control intervention in neonate including pharmacological and non-pharmacological as well as minimizing stressful and invasive procedures should be part of care protocols in all neonatal intensive care unit as recommended by American Association of pediatrics(15). The current study demonstrated that greater than half 66(57.4%) of respondents always use pharmacological and non-pharmacological combined to relieve pain in newborns. This indicates effective management of pain in neonate was provided. However study done in Turkey showed only 24.5% of the nurses used pharmacologic and non-pharmacologic methods combined when children experienced pain(34).

It is notable that half of respondents never assess newborn's pain through the Vital sign implying the nurses didn't consider pain to be a vital sign in newborns, as recognition of pain as the fifth vital sign produces significant changes in professional practice, meanwhile this necessitates developmental of protocols for assessing and treating pain in neonatal care unit(21).

NICU nurse' practice related associated factors on management of neonatal pain.

This study indicated that availability of pain management policy in the unit, getting neonatal pain management training at college/university and knowledge toward pain management persisted in significantly associated with the practice on neonatal pain management. The current study indicated that the availability of infant pain management policy was significantly associated with the practice of nurses concerning neonatal pain management.

Those nurses who had infant pain management policy in place were 7.87 folds more likely to practice good in managing neonatal pain than those of nurses who didn't have pain management policy in place ($p=0.001$). Similarly, study conducted in Iran on pain management perceptions of the neonatal nurses in NICU and neonatal unit's revealed the infant pain management policy was associated with practice of nurses in managing infant pain(38) . This implies presence of infant pain management policy in the unit is key point to practice neonatal pain management and result in effective managing pain in neonates among nurses. As a result, presence of infant pain management policy and management issues was keys to pick up good practice.

This study also revealed that good practice in managing neonatal pain was indicated among those of nurses received training concerning neonatal pain management at University/College than

those of nurses didn't receive training on neonatal pain management at University/College. This is similar with study done in Amhara region(31). This implies receiving neonatal pain management at University/College improves nurses' neonatal pain management practice effectively.

Finally those respondents who had adequate knowledge were 12.08 folds more likely to good practice on neonatal pain management than those who had inadequate knowledge on neonatal pain management ($p=0.002$).This denotes adequate provision of neonatal pain management of nurse can be improved with the knowledge they had with neonatal pain management. Those of nurses have adequate knowledge emphatically practice pain management in neonate effectively. This study consistent with the studies done in Rwanda and Amhara region which revealed knowledge of pain management significantly associated with practice (29, 31).

7. Strength and Limitation

7.1. Strength

- The information about knowledge and practice of nurses regarding neonatal pain management and some of associated factors are tried to mention in this study.
- As it is the first study in its kind and could generate new ideas about neonatal pain management.
- As the study conducted in almost similar setting hospitals, the study subject who participates in this study practiced similar neonatal pain management and the result can represents all public hospitals found in Addis Ababa.

7.2. Limitation

- Private hospitals were not included and the result couldn't represent them.
- There was limited study in the country to compare the result.
- As it was used cross-sectional study due to time constraint, it didn't address the cause and effect relationship between the determinant and the outcome of interest.

8. Conclusion and recommendation

8.1. Conclusion

This study identified the knowledge, practice and associated factors concerning neonatal pain management. Nurses working in selected public hospitals in Neonatal intensive Care unit in Addis Ababa were included. Most nurses had poor practice in managing neonatal pain but greater than half of nurses had adequate knowledge concerning neonatal pain management. However, nurses had inadequate knowledge and poor practice on neonatal pain management related to items assessment of neonatal pain without using pain scale and not considering and assessing neonatal pain as part of vital sign. And also there was gap between their knowledge and practice. There was significant positive association between getting training on neonatal pain management and knowledge, getting neonatal pain management education at college/university and knowledge and presence of infant pain management policy in the unit and practice, knowledge and practice, and also getting neonatal pain management education at college/university and practice.

8.2. Recommendation

The following recommendations are forwarded based on the findings of this study;

To the respective hospitals;

- Provide continues on job training related to neonatal pain management to all nurses working in NICU.
- It is also helpful to make and implement infant pain management policy in the hospitals.

To the Ethiopian ministry of health and nursing schools;

- The ministry of health and nursing college should review educational curriculum in order to include neonatal pain management.

To researchers

- Further research with qualitative study design also recommended evaluating more accurate nurses' knowledge and practice as well as attitude and perception on neonatal pain assessment.

To professional nurses:

- Nurses need to further improve their knowledge and practice on neonatal pain management.
- Those of nurses who had adequate knowledge and good practice on neonatal pain management should also teach their respective colleagues who had deficit on pain management in neonates.

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ANNEXS

Annex. I. Information sheet for the Participation in the Research Study

Dear Madam, Miss, Sir,

My name is Gemechis Wari. Currently I am a candidate in Master of Science in Neonatal nursing graduate at AAU, College of Health Science, Department of Nursing and Midwifery. And kindly I request for your participation in this study titled “Knowledge, And Practice of Nurses’ And Associated Factors in Managing Neonatal Pain in Public Hospitals in Addis Ababa, Ethiopia with the aim of assessing the NICU nurses’ knowledge, practice and factors associated regarding neonatal pain management.

Participants: Randomly selected nurses having equal or greater than six months work experience in neonatal intensive care unit in public hospitals of Addis Ababa. **Potential Risks:** There is no foreseen risk by being participating in this study. **Benefits:** No financial benefit will be related with this study.

If you would take a few minutes out of your busy schedule and fill out this attached questionnaire it would be of a great help to me. There are no right or wrong answers, just choose the response which you feel reflects your insights.

The total confidentiality of your voluntary participation in this study is guaranteed and the information you provide will be kept unnamed. Your participation in this study is highly appreciated and is for invaluable contribution in the improvement of the quality of care in regard to neonatal pain management. These questionnaires will be used only by myself for my research and will be destroyed following tabulation. No attempt will be made to link you with the answers. You can also choose not to participate in this study if you become uncomfortable during this study, you will be allowed to leave the study at any time.

Will you willing to participate in the study? Yes/ No (Circle their response).

Yes = continue and thank you very much for taking part in this study. If no, stop and thank the nurse

Annex II. Consent form

In signing this document, I am giving my consent to participate in the study entitled Knowledge, and Practice of Nurses’ And Associated Factors in Managing Neonatal Pain in Public Hospitals in Addis Ababa, Ethiopia with the aim of assessing the NICU nurses’ knowledge, practice and factors associated regarding neonatal pain management. I have been informed that the purpose of this research project and I understand that I am selected to participate in this study randomly. I have been informed that my participation in this study is willing full and voluntary even I have right to refuse or interrupt the filling of questionnaire and my name will not be mentioned on the questionnaire. I, undersigned, have understood the purpose of the study & fully agree to participate in the study.

Signature of the participant----- Date -----

Thank you and has a nice day!

Name of investigator- Gemechis Wari

Address of investigator: phone no- +251967348866, Email: gemelog5@gmail.com

Annex III. Questionnaire

Pain management for hospitalized newborns

Date Hospital code.....

Instruction: Read each question carefully and tick [] against the option that the best suits your response.

Part I: Demographic Data

101. Characteristics of nurse's age (in years) -----

101. Nurse's gender: - 1/Female [] 2/Male []

103. Nurse's Marital status: - 1/ Married [], 2/Single [], 3/ Divorced [], 4/Widowed [].

104. Religion: 1/Orthodox [], 2/ Protestant [], 3/ Muslim [], 4/Others (Jova, Adventist, Wakefata).

105. Nurses level of education? 1/Diploma nurse [] 2/BSc Nurse [] 3/Neonatal BSc N [] 4/MSc []

106. How many years have you been working in neonatal intensive care unit? 1/ 6 months-to 1 year [], 2 / 1-2 years []. 3/ 2-5years [], 4/ >5years.

107. Did you receive any training on neonatal pain and neonatal pain management during your study at university or college? 1/ Yes [], 2/ No [].

108. Have you received any formal training on neonatal pain and neonatal pain management in your present post? 1/ Yes [], 2/ No [].

Part II: Questions related to knowledge of neonatal pain management

Questions	Disagree	Partially disagree	I don't know	Agree	Strongly agree
201. Preterm newborns feel pain	1(0.8)	8(6.7)	2(1.7)	72(60.5)	32(26.9)
202. Full-term newborns feel pain					
203. Pain can affect newborn's heart rate, respiratory rate, temperature, blood pressure, oxygen saturation, intracranial pressure.					
204. Pain can affect newborn's facial expressions, limb movements and crying					
205. Light and noise may affect newborn's reactions to pain.					
206. Newborn's pain is not recognized by professionals.					
207. Newborn's pain is not considered by researchers					
208. Newborns react to pain in a particular way.					
209. Pain is considered as one of the Vital sign in newborns.					
210. Pain assessment in newborns					

must be systematized					
211. Pain assessment should be part of the nursing prescription.					
212. Newborns require painkillers due to maturity of the nervous system to feel pain.					
213. Neonatal pain can be assessed without the use of scales.					
214. The use of scales for pain assessment is important to the practice					
215. It is important to record pain on the newborn's chart.					
216. Recording pain assessment is a prerequisite to its control.					
217. Nurses have sufficient knowledge to assess pain in newborns.					
218. Pain management in newborns depends on its assessment					
219. Recording newborn's pain assessment will result in relief.					
220. Newborns submitted to repeat painful procedures may have harmful effects on their development.					

Part III: Practical related questions regarding pain management among nurses

Questions	Very rarely	rarely	sometimes	most times	always
301. I assess newborn's pain through crying.					
302. I assess newborn's pain through facial expressions					
303. I assess newborn's pain through body movement and agitation					
304. I assess newborn's pain through the Vital sign.					
305. I use scales to assess pain in newborns.					
306. I record newborns' pain scores on their medical chart.					
307. I use non-nutritive suckling to relieve pain in newborns.					
308. I encourage breastfeeding to relieve the pain in newborns.					
309. I encourage skin-to-skin contact to relieve the pain in newborns.					
310. I offer oral glucose or sucrose to relieve newborn pain prior to painful procedures.					

311. I offer oral glucose or sucrose to relieve newborn pain during painful procedures.					
312. I position the newborn to relieve their pain.					
313. I perform facilitated tucking in newborns during painful procedures.					
314. I use more than one non-pharmacological measurement to relieve the pain of newborns.					
315. I use pharmacological and non-pharmacological combined to relieve pain in newborns.					

Part IV. Factors associated with neonatal pain management

Questions	yes	no
401. No Protocols and guidelines for neonatal pain management available in the unit.		
402. Analgesics are not present in the unit.		
403. Standardized neonatal pain scale measurements are not available in the unit.		
404. In-service neonatal pain management training is provided		
405. There is pain management policy in place.		
406. There is support from leadership on neonatal pain management		