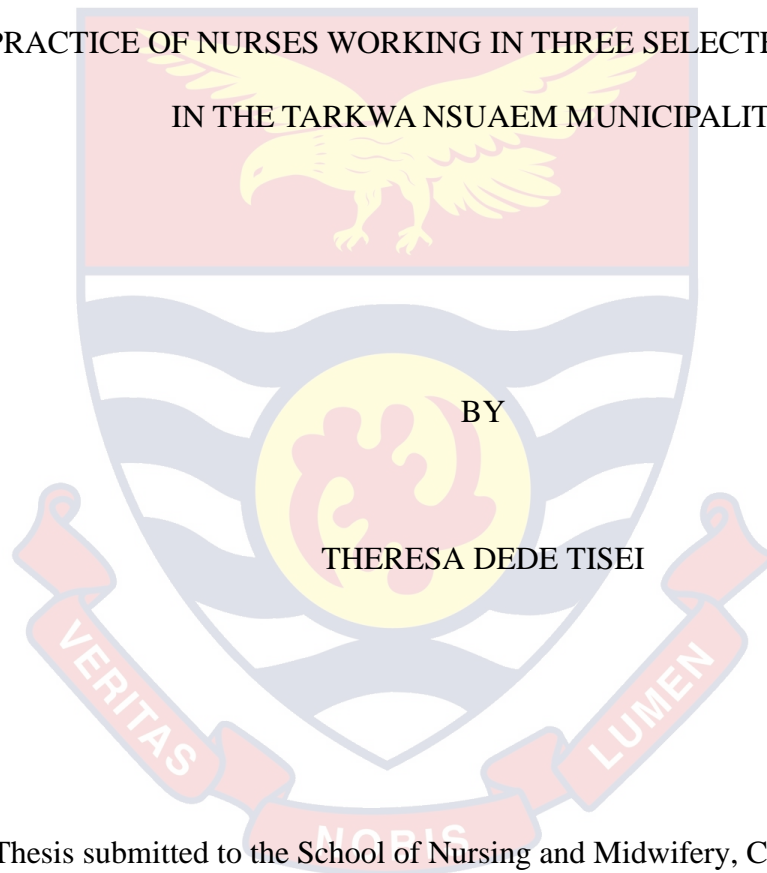UNIVERSITY OF CAPE COAST

OXYGEN THERAPY: ASSESSING KNOWLEDGE, ATTITUDE AND

PRACTICE OF NURSES WORKING IN THREE SELECTED HOSPITALS

IN THE TARKWA NSUAEM MUNICIPALITY

BY

THERESA DEDE TISEI

Thesis submitted to the School of Nursing and Midwifery, College of Health

and Allied Sciences, University of Cape Coast in Partial Fulfilment of the

Requirements for Award of Master of Nursing Degree in Nursing

MAY 2018

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original work and that

no part of it has been presented for another degree in this university or

elsewhere.

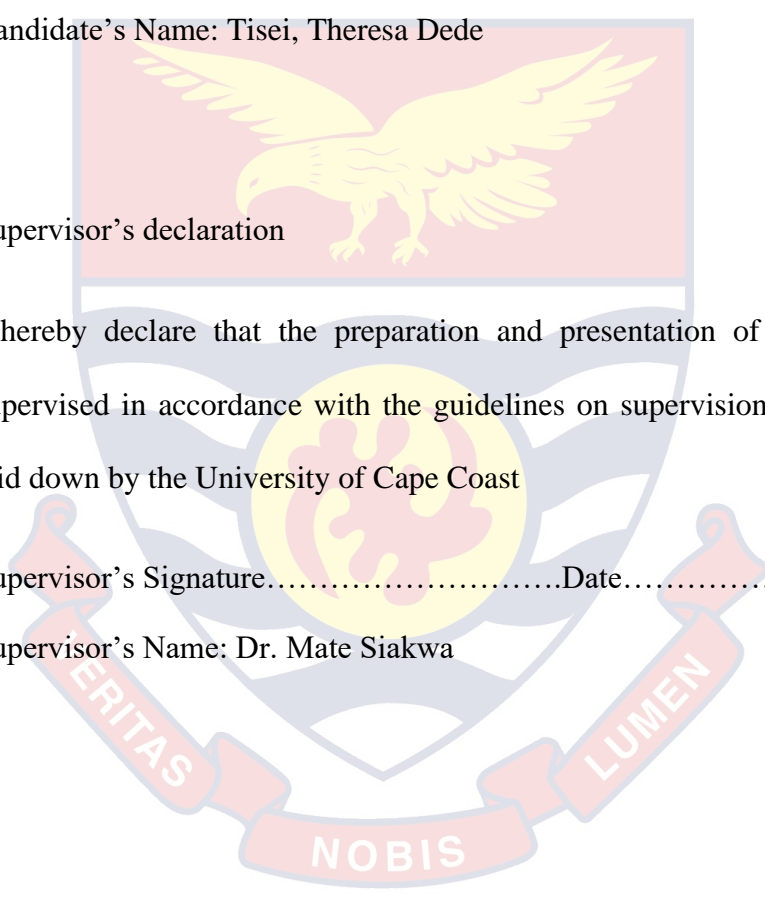Candidate's Signature …………………………Date ………………………

Candidate's Name: Tisei, Theresa Dede

Supervisor's declaration

I hereby declare that the preparation and presentation of the thesis were

supervised in accordance with the guidelines on supervision of project work

laid down by the University of Cape Coast

Supervisor's Signature……………………….Date……………………….

Supervisor's Name: Dr. Mate Siakwa

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ABSTRACT

Oxygen therapy has been an important aspect in clinical practice for more than 20 decades. Oxygen is an undeniable live-saving gas when its double-edged nature is evaluated appropriately. Hence, as its administration plays a vital role in nursing practice, it is imperative for nurses and midwives to ensure that patients are provided with only the therapeutic characters of oxygen therapy while the toxic characters are prevented. This study aimed to assess knowledge, attitude and practice of nurses and midwives regarding oxygen therapy. In this study, a quantitative, cross-sectional hospital-based study was conducted, covering 207 nurses and midwives of which 182 survey responses were valid for data analysis. Data was analysed with descriptive and inferential parametric statistics. In this study, participants demonstrated knowledge, attitude and practice gap on oxygen therapy. 1.10% of the participates had adequate knowledge (≥ 80) with about 4 out of 10 (37.91%) participants having satisfactory attitude, which is low level of attitude. More so, in relation to the practice in oxygen therapy, none of the nurses and midwives could be categorized to have safe practice. Likewise, majority of the participants (60.44%) reported not to have adequate resources in their hospitals. Key recommendations include a need for periodic retraining on oxygen therapy to enhance attitude and knowledge of nurses and midwives and to ensure standard quality of nursing practice in this area.

KEY WORDS

Attitude

Knowledge

Nurses

Oxygen therapy

Practice

Safe and effective

ACKNOWLEDGEMENTS

DEDICATION

To my beloved aunty, Miss Georgina Dede Tisei

And to my husband Mr Bismark Osei Tutu and children Desmond Nyhira-

Asare Tutu and Penda Dromo Tutu

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CHAPTER ONE

INTRODUCTION

This chapter presents the background of the study, the problem statement, purpose of the study and specific objectives of the study. In addition, an overall view of the rationale for conducting the study as well as significance of the study to policy makers, nursing practice and education are provided. It also highlights the delimitations, limitations and operational definition of terms.

Overview of Oxygen and its Discovery

Oxygen is a colourless, odourless and tasteless gas vital to sustain life which makes up about 21% of the earth's atmosphere. By mass, oxygen is the third most abundant element in the universe, after hydrogen and helium (Beasley, Thayabaran, & Bardsley, 2017)

The discovery of oxygen as a separate gas has been attributed to three chemists in the 1770s. Joseph Priestly, an English chemist, in 1774 published his isolation of oxygen as a colourless gas by heating red mercuric oxide, a process that he noted caused a candle to burn brighter. However, prior to Priestly discovery, in 1771 a German-Swedish pharmaceutical chemist by name Carl Wilhelm Scheele, had already isolated oxygen and written about it but failed to publish his findings until 1777, he generated what he coined as 'fire air' by heating mercuric oxide, silver carbonate, magnesium nitrate and other nitrate salts. The third discoverer of oxygen was a French chemist, Antoine- Laurent de Lavoisier, who in 1775, repeated the experiments of Scheele's and Priestley's using advanced laboratory equipment making known

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the scientific knowledge of the chemical nature of oxygen and its role in normal breathing and naming the odourless gas "oxygen", derived from a Greek word "oxy" and "genes", meaning "acid- forming" (Heffner, 2013).

Shortly, oxygen came to be identified as a 'cure all' drug used for conditions varying from acute, chronic, communicable and sexual transmitted diseases. Around the second decade of the twentieth century, indications for oxygen therapy have been based on firm scientific grounds (Meakins, 1921).

Role of oxygen in the Human Body

Oxygen is a component of air and a vital element of life. It is also a basic human need required for survival. Human beings may survive days without water, weeks without food but only minutes without oxygen, as oxygen actually provides the fuel that runs the human body. Ninety percentage of energy in the human body is supported by oxygen (Beasley, Aldington, & Robinson, 2007).

Cellular respiration is the term used to describe the phase of the digestive process when food breaks down to supply cells with energy. During cellular respiration, cells use oxygen to break down sugar to produce ATP, or adenosine triphosphate, a molecule that supplies cells with energy (Singh et al., 2001). It is basically the energy released used for all cellular and other functions of the body including contraction of the body muscles, repair of body cells, and even calming of the nerves. Similarly, the ability of the heart to pump blood, the nervous system and brain to process and transmit information, depend on energy generated from oxygen.

With an adequate level of oxygen in the blood and tissues, the human body can function to utmost performance. However, deficiency in oxygen

level in the blood and tissue caused by pulmonary or non-pulmonary conditions may result in progressive deterioration of the patient, beginning with cell death, and if prolonged, organ failure and ultimately death (Singh, Singh, Brar, & Singh, 2001; Jindal, 2008).

To avoid this, oxygen therapy may be required to maintain adequate tissue oxygenation while minimizing cardiopulmonary work (Bateman & Leach, 1998).

Oxygen Therapy

Oxygen therapy is an area of patient care where recognition of its need and efficient administration can have a significant impact on a patient's well-being (Duke et al., 2012). To ensure that safe and effective oxygen is being administered, a prescription covering the oxygen delivery method, oxygen saturation target and flow rate, duration and monitoring of treatment, and indications must be provided (O'Driscoll et al., 2017).

By definition, oxygen therapy is the "administration of oxygen at concentrations greater than that in ambient air, required for the management of documented hypoxemia and/ or hypoxia" (National Guideline Clearinghouse, 2006).

Indication for Oxygen Therapy

Administration of supplemental oxygen is considered in the management of different clinical conditions across a range of specialties with the presence of documented hypoxemia and/or hypoxia. Hypoxemia could be determined by an arterial oxygen saturation (SpO_2) measured via pulse oximetry (O'Driscoll et al., 2008; Considine, Botti & Thomas, 2012).

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The usual arterial oxygen saturation (SpO$_2$) for a child or adult without cyanotic congenital heart disease or chronic lung disease breathing air at sea level is 94%- 98% and that of partial pressure of arterial oxygen (PaO$_2$) is 80- 100 mmHg. Whereas, hypoxemia may be defined as any arterial PaO2 below the normal lower limit, most literatures propose a value of <60mmHg, or SpO$_2$ of <90%, as clinically hypoxemic because the risk of hypoxic tissue damage increases below this level (Crapo, Jensen, Hegewald, & Tashkin, 1999).

Most common reasons for oxygen therapy to be initiated are acute hypoxemia (including shock, asthma, pneumonia, heart failure); ischemia (including myocardial infarction but only if associated with hypoxemia) and inadequate or impaired haemoglobin carrying capacity (including acute blood loss in trauma or carbon monoxide poisoning). Furthermore, oxygen therapy is also an essential component of resuscitation, basic life support, anaesthesia and postoperative care. Most importantly, this therapy is not indicated for the treatment of breathlessness in patients without hypoxemia (O'Driscoll et al., 2008; O'Driscoll et al., 2017).

Globally, the percentage of health problems requiring oxygen therapy is difficult to quantify and varies widely according to a population studies (Duke, Blaschke, Sialis, & Bonkowsky, 2002). Among adult, indication for supplemental oxygen is predominant in the following health conditions; chronic obstructive pulmonary disease (COPD), acute asthma and pneumonia (O'Driscoll et al., 2008). Oxygen therapy is also required for conditions such as sepsis, shock, major trauma, anaphylaxis, acute heart failure, pulmonary embolism, pleural effusion, pneumothorax, and lung fibrosis, carbon monoxide poisoning, obstetric and surgical emergencies and in sickle cell

crisis. Maternal care, especially for the management of complications associated with delivery cannot be counted out. Obstetric emergencies associated with the indication of oxygen therapy include amniotic fluid embolus, eclampsia and antepartum or postpartum haemorrhage (O'Driscoll et al., 2008).

Among children, statistics available show that 52% of 461 sick neonates and children presenting to a provincial hospital in the highlands (1600 m above sea level) of Papua New Guinea (PNG), were hypoxemic, hence needed oxygen therapy. Hypoxemia was present in 73% of the neonates and children with pneumonia, and also in 32% of those with non- pneumonia illnesses, including meningitis, septicaemia, and severe malnutrition, low birth weight and birth asphyxia (Duke et al., 2002). Kenya shares similar woes, 5.3% of children admitted to a district hospital in rural coastal Kenya were hypoxemic. The most frequent final diagnoses among these children were malaria (35%), pneumonia (32%), malnutrition (10%) and gastroenteritis (7%) (Mwaniki et al., 2009). One study has also shown that indication for oxygen in acute asthma is an increasing problem in low and middle income settings (Pearce et al., 2007). Similarly, a study done in India found that 26% of 51 children presenting to an emergency unit with asthma needed oxygen therapy (Rahnama, Geilen, Singhi, Akker, & Chavannes, 2006).

Background to the Study

Oxygen therapy is a life-saving therapy and has been an important aspect in clinical practice for more than 20 decades. It forms part of the first line treatment used in the hospital settings in the management of many life-

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threatening conditions (Varvinski & Hunt, 2001; WHO, 2017; Howie et al., 2009).

In 2008, it was projected that (17%) of hospitalized patients in Great Britain received oxygen on a daily basis (Hale, Gavin & O'Driscoll , 2008), which indicates a high percentage usage of oxygen in the hospital. Similarly, records from the Korle-Bu Teaching Hospital (KBTH) in Ghana also shows that the hospital uses about $600 \, m^3$ of cylinder oxygen per month on the average and about 90% of the patients admitted at the Surgical Medical Emergency (SME) ward receive some amount of oxygen (Adipa, Aziato, & Zakariah, 2015).

Oxygen is considered as a double-edged sword having both positive biological benefits and toxicity effects. Thus, this drug therapy has the potential to cause great harm to patients and even death if administered and managed inappropriately (Poole, 2011; Howell, 2001). Hence, the detrimental effect of under-oxygenation and over-oxygenation ought to be appreciated. For instance, a high concentration of oxygen used on patients at risk of type 2 respiratory failure, such as patients with chronic obstructive pulmonary disease (COPD), can result in life-threatening hypercapnia (higher than normal levels of carbon dioxide in arterial blood), respiratory acidosis, organ dysfunction, coma and death (Jindal, 2008; O'Driscoll, Howard, & Davison, 2008). Likewise, a high concentration of oxygen can affect the lungs tissue in the presence of oxygen toxicity. The production of surfactant in the lungs is reduce when concentration of oxygen is high, which in turn results in the collapse of alveoli (Kim, Benditt, Wise, & Sharafkhaneh, 2008). Similarly, a flow rate less than 5L/minute using a simple face mask can also cause

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rebreathing and increased the levels of carbon dioxide (CO_2). Likewise, the administration of oxygen on an empty oxygen cylinder may pose suffocation hazard, the need for mechanical ventilation and even death (Kim et al., 2008).

On the other hand, appropriate recognition of its need and efficient administration can have a significant impact on a patient's well-being. Thus, ensuring that oxygen administered is prescribed to cover the oxygen delivery method, oxygen saturation target and flow rate, duration and monitoring of treatment, and indications for both humidification and weaning of the oxygen therapy is important (O'Driscoll et al., 2017).

There is a growing body of evidence concentrating on optimal administration of oxygen therapy including guidelines, campaigns and advocacy for safe and effective delivery of oxygen to all patients. The goal is to avoid hyperoxia (an increased amount of O_2 in tissues and organs) or hypoxia (inadequate supply of O_2 to tissues or cells) by using titrated oxygen therapy. (O'Driscoll et al., 2008; Beasley et al., 2015; O'Driscoll et al., 2017) to add more citations.

However, many barriers hinder the effective and safe delivery of oxygen to indicated patients; this could be healthcare professional-related, healthcare system-related or patient-related. Generally, knowledge, attitudes and practice gap towards administration of oxygen has widely been reported as part of the most common barriers to its effective and safe delivery among nurses and other health professional (Brokalaki et al., 2004; Ganeshan, Quen, & Soonawalla, 2006; Decalmer & O'Driscoll, 2013; Adipa et al., 2015; Lemma, 2015; Eastwood et al., 2007; Goharani, Miri, Kouchek, & Sistanizad, 2017). With the major roles nurses and midwives play in the administration of

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oxygen, it is vital for them to have proper information, sufficient knowledge and practice in concordance to the evidence-based physiological principles and guidelines on oxygen therapy.

In the Ghanaian setting, little is known on the competency level of nurses on oxygen therapy. In the light of these issues the knowledge, attitude and practice of nurses towards the safe and effective administration of oxygen in three hospitals within Tarkwa Nsuaem Municipality was studied at in this thesis.

Problem Statement

Oxygen therapy is essential to life. Its deficiency has been linked to preventable deaths, and avoidable intensive care unit (ICU) admission (Cameron, Pilcher, Weatherall, Beasley, & Perrin, 2012). However, with its double-edged properties, ensuring appropriate delivery is vital, as there is potential for serious harm when it is administered and managed inappropriately (Poole, 2011; Cameron et al., 2012; O'Driscoll et al., 2008). In this era of evidence-based practice, the benefits and potential complications of oxygen therapy are well recognised. Yet, this drug therapy is often delivered without special attention and sufficient knowledge regardless of the availability of several expert guidelines and protocols on oxygen therapy (Brokalaki et al., 2004 ; Ganeshan et al., 2006; Eastwood et al., 2007; O'Driscoll et al., 2008; Beasley et al., 2015; Goharani et al., 2017; O'Driscoll et al., 2017).

Previous studies have evaluated the use of these guidelines on oxygen therapy in the hospital wards settings (Austin, Willis, Blizzard, Walters &

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Wood, 2010; Cameron et al., 2012). For example, the study of Austin et al (2010) showed evidence of benefits in the delivery of titrated oxygen therapy to patients with COPD. Their results revealed that administration of titrated oxygen reduced mortality by 58% when compared with those who received high flow oxygen therapy. However, a report by the UK National Patient Safety Agency (NPSA) in 2010 in response to oxygen therapy in the hospital uncovered that nine deaths between 2004 and 2009 were attributed to inappropriate oxygen therapy, including four cases of insufficient oxygen therapy and four cases of excessive oxygen therapy (National Patient Safety Agency, 2010). Equipment failure such as empty or disconnected oxygen supplies, or accidental connection to air outlets instead of oxygen outlets accounted for most of the incident related to under-use of oxygen (National Patient Safety Agency, 2009).

Curiously, some countries across Africa including Ghana cannot be absolved. A study by Goharani et al (2017) revealed that about 27.9% of both nurses and doctors had fair knowledge on the indication for oxygen therapy. Similarly, a study by Adipa et al (2015) unveiled knowledge gap on oxygen therapy among nurses with poor compliance to guidelines on O_2 therapy.

Therefore, if hospitals in developed countries where myriad researches on oxygen therapy have been done, multiple interventions to improve the administration of this drug therapy have been proposed and tested as well as regular auditing and review of clinical practice and practice gaps have been performed (Cousins, Wark, & McDonald, 2016) could record significant limitations in the area of oxygen therapy, what then is the situation in hospitals within Tarkwa Nsuaem Municipality in the Western Region of Ghana? Where

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oxygen is also frequently used but, its safe and effective administration have not been fully assessed. Hence, requires an investigation.

The enormous mining activities in the municipality come along with numerous exposures to dust and chemicals having detrimental effect on the environment and its habitants which contributes to the high prevalence in respiratory conditions recorded in the municipality (Ayaaba, Li, Yuan, & Ni, 2017).

With the massive use of oxygen therapy in the municipality and the major roles nurses play before, during and after the administration of the drug, there is the need to know how safe and effective oxygen is delivered in the hospital settings. To help ensure that patients are provided with only the therapeutic characters of the therapy while the toxic characters are prevented. Currently, no studies have been published that assessed nurses' and midwives' level of knowledge, attitude and practice on safe oxygen therapy in hospitals at Tarkwa Nsuaem Municipality in the Western Region of Ghana. In addition, no studies have examined if a predictive relationship exists between availability of resources and oxygen therapy. Therefore, it is worthwhile to address this gap in literature. This will establish baseline information about the nurses' and midwives' current knowledge, attitudes and practices towards oxygen therapy. Accordingly, examining the level of nurses' knowledge, attitudes and practices on oxygen therapy is a significant step in the process of positively enhancing the patients safety (Cameron et al., 2012).

Purpose of the Study

The purpose of this study was to seek the depth of knowledge, attitude and practices of nurses and midwives on the administration of safe oxygen therapy and to gain insight on the predictive relationship that may exist between availability of resources in hospitals and oxygen therapy.

Specific Objectives

1. To determine the level of nurses' and midwives' knowledge on safe oxygen therapy

2. To determine nurses' and midwives' attitude towards safe oxygen therapy.

3. To evaluate nurses' and midwives' practices on safe oxygen therapy.

4. To identify the availability of resources for oxygen therapy in the hospitals.

5. To determine factors that influence Knowledge, Attitudes and Practices of nurses and midwives on oxygen therapy.

Research Questions

The study sought to answer the following research questions

1. What are the nurses' and midwives' level of knowledge on safe oxygen therapy?

2. What are the nurses' and midwives' attitudes towards safe oxygen administration?

3. How adequate do nurses and midwives practice safe oxygen therapy?

4. What factors influence the Knowledge, Attitude and Practices of nurses and midwives on oxygen therapy?

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5. How adequate are the availability of resources for oxygen therapy in the hospitals?

Significance of the Study

This study makes several noteworthy contributions to nursing practice, education, policy and research in regards to oxygen therapy.

Oxygen is vital for life, without an adequate amount of it in the human body, vital organs damage within few minutes (Beasley et al., 2007). However, the damage of vital organ in the body often may not be due to only the lack of oxygen but also as a result of the inappropriate administration of oxygen to the body (Ganeshan et al., 2006). This study may inform the nursing and midwifery staffs on the need to use expert guidelines on oxygen therapy and also how imperative it is to change the entrenched culture of 'more oxygen is better' or 'more oxygen won't hurt' in practice. Finally, findings from this study may serve as evidence information that could sensitize nurses and midwives on their limitations in regards to oxygen therapy and the need to have retraining periodically on oxygen therapy.

Nurses and midwives play central roles in reducing or preventing adverse effects related to oxygen therapy. Having sound educational strategic designs that may lead to a long-term improvement in clinical practice in the nursing profession will be vital. This study may inform instructors to put emphasis on the use of evidence-based physiological principles and expert guidelines on oxygen administration in practice in the nursing curricula.

This study may inform policymakers of missed opportunities worthy of consideration in the implementation of policies in the area of oxygen therapy.

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Findings from this study may inform policymakers and administrators on how effective and safe oxygen is administered to patients. Similarly, these same findings may also direct policy makers to find effective interventions to assist in translating expert guidelines and protocols on oxygen therapy into clinical practice. Ultimately, findings from this study may indicate to policymakers the importance of regular auditing and review of clinical practice and practice gap.

The research gap in Ghana remains very wide since very little has been done on oxygen therapy among nurses in Ghana. This study may yield information that would add to the existing knowledge in academia and research in the field of oxygen therapy among nurses, thus the findings of the study may be used as a basis for further studies on this subject area.

Limitations of the Study

As with many research projects, this study has some limitations which include the following:

1) The fact that no study has been conducted so far in the Western Region of Ghana on this topic; no enough literature was available to discuss in regional context.

2) The practice component may not be well addressed, as observational checklist was not used.

3) The study may be subjected to response set bias from the respondents.

4) The study was cross-sectional; therefore, it was difficult to know which occurred first the exposure or the outcome.

Definition of Terms

TERMS	CONCEPTUAL	OPERATIONAL
Attitude	Degree of willingness or unwillingness to maintain the knowledge and practice in providing oxygen therapy	The attitude of participants on the administration of oxygen as measured by items in the "KAP Questionnaire regarding Oxygen Therapy" developed by the author
Knowledge	Degree of factual and procedural understanding on oxygen therapy	Score level of knowledge on oxygen therapy by respondents as measured by items in the "KAP Questionnaire regarding Oxygen Therapy" developed by the author
Nurses and midwives	An individual who holds a current license to practice within the scope of professional nursing (general nurse or midwife)	State registered nurses and midwives
Safe oxygen therapy	Administration of supplemental oxygen without complications	Delivering of oxygen without any complication
Practice	ability to perform patient care procedures and use equipment appropriately and safely	Score level of practice on oxygen therapy by respondents as measured by items in the "KAP Questionnaire regarding Oxygen Therapy" developed by the author

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Organization of the Study

Chapter one presents the background of the study, the problem statement, purpose of the study, specific objectives of the study. In addition, the significance of the study to policy makers, nursing practice and education are provided. It also highlights the delimitations, limitations and conceptual and operational definition of terms. Chapter two of this research presents the literature review. It presents both theoretical and empirical perspectives. Chapter three focuses on the tools and methods employed and consists of research design, setting, study population, sample and sampling plan, data collection instruments and, plan for data collection procedure and processing, ethical considerations as well as pretesting. Chapter four presents the results and discussion. Finally, chapter five presents the summary, conclusions and recommendation.

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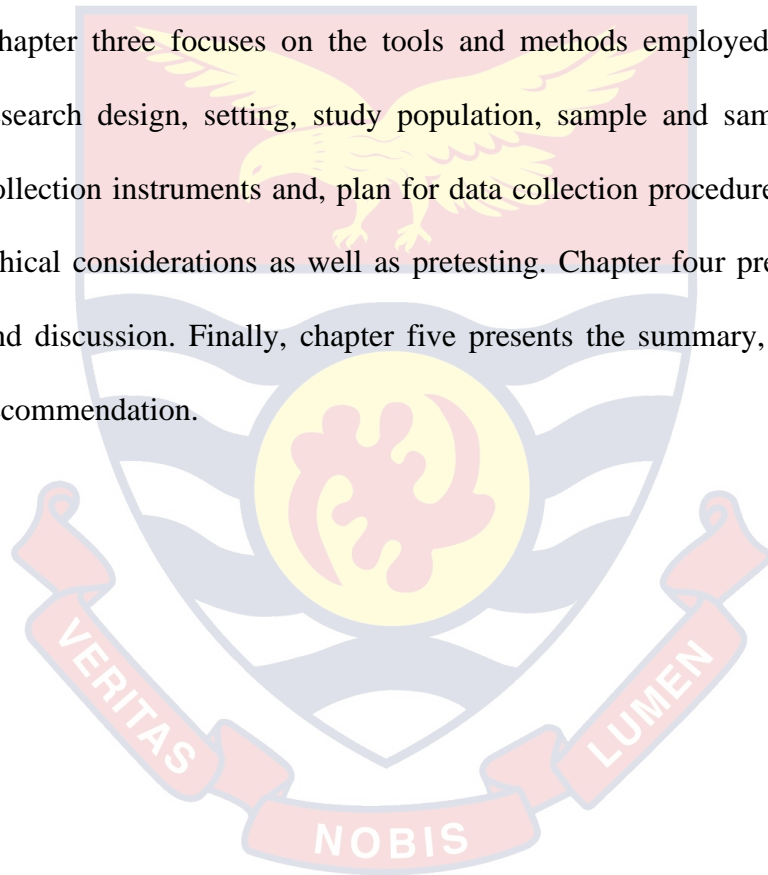
CHAPTER TWO

LITERATURE REVIEW

Introduction

Oxygen therapy has been an important aspect in clinical practice for more than 20 decades. The benefits and potential complications of oxygen therapy are well recognised (Brokalaki et al., 2004). However, the possibility that "too much" oxygen may be as harmful as "not enough" is often not appreciated which could compromise on patient's safety (Bateman & Leach, 1998; Brokalaki et al., 2004; Ganeshan et al., 2006; Eastwood et al., 2007; O'Driscoll et al., 2008; Beasley et al., 2015; O'Driscoll et al., 2017 ; Goharani et al., 2017). Therefore, the cornerstone to a safe oxygen delivery is by the provision of only the therapeutic characters of oxygen therapy while the toxic characters are prevented.

This chapter reviews the literature related to oxygen therapy especially on acutely ill patients admitted in the hospital settings. In addition, studies related to nurses' knowledge, attitudes and practices towards the safe and effective administration of oxygen therapy were described as well as the theoretical framework underpinning this study.

Oxygen Dosage and Delivery Methods

Ensuring timely and appropriate oxygen delivery using the right devices is an important aspect of patient care. In choosing these delivery devices correctly, factors such as the patient's clinical status, dose of oxygen required, efficacy of the device, reliability, and ease of therapeutic application are all taken into consideration (Eastwood et al. 2007). Excluding anaesthetic

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circuits and hyperbaric oxygen chambers, oxygen therapy devices are classified as variable or fixed performance devices (O'Driscoll et al., 2017).

With variable-performance *(low flow system)* devices, the amount of oxygen delivered depends on the oxygen flow rate, patient's inspiratory volumes, respiratory rate and proportion of room air added. Non-rebreathing mask, simple face mask and nasal prongs are few examples of such devices. These types of devices are suitable for patients with minimal respiratory distress who can maintain adequate ventilatory patterns (Olive, 2015).

On the other hand, fixed-performance devices *(high flow systems)* deliver a fixed proportion of air and oxygen, ensuring that an accurate concentration of oxygen is delivered regardless of inspiratory volumes and respiratory rate. Examples of such devices are the venturi masks [also called air-entrainment mask], face tents and high-humidity tracheostomy collars/ masks (Olive, 2015). Fixed-performance devices are known to be suitable for patients at risk of carbon dioxide retention [such as patients with chronic obstructive pulmonary disease (COPD), morbid obesity, cystic fibrosis, obstructive sleep apnoea, those with restrictive chest wall deformities, neuromuscular disorders and those using respiratory depressant drugs] (Olive, 2015).

The selection of the right device can lead to efficient use of resources (thus, oxygen, equipment for oxygen therapy and nursing time); treatment tailored to quality patient needs, health cost savings, and improved patient satisfaction and compliance.

Eastwood and colleagues (2007), published a study in Australia that assessed patients and nurses' perspectives on oxygen therapy. The study

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described patients' preferences and experiences regarding low-flow oxygen therapy via nasopharyngeal oxygen catheter, nasal prongs and face mask, and nurses' perspectives of the factors that influence the administration of low-flow oxygen therapy. Patients involved in the study identified three vital factors that supported their compliance with oxygen therapy: device comfort, ability to maintain daily activities, and therapeutic effect. Furthermore, nurses involved in the study indicated that therapeutic effect, issues associated with compliance, strategies to optimize compliance, familiarity with the oxygen delivery device, and triggers for changing devices were vital to the safe and effective management of oxygen therapy (Eastwood et al., 2007).

Below is a table of the types of oxygen delivery devices and their dosage O'Driscoll et al., (2017)

Table 1: Types of Oxygen Delivery Devices and Their Dosage

DELIVERY DEVICE	OXYGEN %	FLOW RATE(L/min)	POINT OF INTEREST
VARIABLE-PERFORMANCE DEVICES, with these devices the amount of oxygen delivered is dependent on the, oxygen flow rate, patient's inspiratory volumes, respiratory rate and proportion of room air added			
NASAL PRONGS	**22-40**	1-6	It does not interfere with talking or eating. In infants, flow rates should not exceed 2L/minute Humidification not required when flow rate is ≤4LPM
SIMPLE OXYGEN MASK	**35-50**	5-10	Not recommended for long-term use or when titrating oxygen level. **Carefully** used on patients with chronic obstructive pulmonary disease (COPD) and carbon dioxide (CO_2) retention. Low flow rates can cause rebreathing and increased levels of CO_2

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Table 1 continued

PARTIAL REBREATHING MASK	**40-60**	8-10	This bag requires a minimum flow of 8-10 L/minute to prevent bag collapse on inspiration. Failure to ensure that the bag is inflated poses a suffocation hazard
NONREBREATHING MASK	**60-90**	8-15	Designed with a one-way valve between the mask and reservoir bag so that exhaled CO_2 is not re-breathed and oxygen in reservoir bag is not diluted. The reservoir bag provides for extra oxygen when the patient breathes faster or deeper. Ensure reservoir bag remains partially inflated during inspiration.

FIXED-PERFORMANCE DEVICES deliver a fixed proportion of air and oxygen, ensuring an accurate concentration of oxygen is delivered regardless of inspiratory volumes and respiratory rate

VENTURI MASK	**Available in;** **24 – blue** **28 – yellow** **31 -white** **35 -green** **40- pink** **50-orange**	= 2 = 4 = 6 = 8 = 10	It is important for those at risk of hypercapniec respiratory failure and to accurately assess ventilation and gas exchange. It interferes with eating and speaking, not well tolerated by alert patients. High flow rates may cause dehydration of airway and thickened secretions It is used for paediatric patients who have airway inflammation or other respiratory infection.
OXYGEN TENT	**50**	10-15	The oxygen tent provides oxygen, humidification and a cool environment to help control body temperature.

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Assessment and Monitoring

Oxygen is included on the World Health Organization (WHO) list of essential medicines. In its guidelines, the WHO emphasizes the importance of oxygen within the necessary package of providing care for acute and chronic conditions, emergency, anaesthesia and surgical services (WHO, 2017). For a timely identification, prevention and management of hypoxemia or hyperoxaemia, careful assessment and monitoring of treatment are essential. Conversely, evidence shows that assessment and monitoring of patients is often insufficiently done by health care professional including nurses (Adipa et al., 2015; Brokalaki et al., 2004; Ganeshan et al., 2006). In many cases, detection of subjective signs of oxygen deprivation; such as dizziness, headache, restlessness, air hunger, visual changes, auditory changes, tingling, and apprehension as well as objective signs of oxygen deprivation; including increased ventilatory function, unsteady gait, tachycardia (early), dysrhythmias, cyanosis (late), bradycardia and hypertension (late), unconsciousness are inappropriately responded to (Jindal, 2008; Bateman & Leach, 1998). Evidence shows that clinical staff may not always respond appropriately to patients with high or low oxygen saturation levels. One Australian study on patients treated with oxygen after cardiac surgery in the ICU showed that the ICU environment did not protect patients from suboptimal oxygen delivery. The authors highlighted the need for policies to timely initiation of interventions targeted at optimizing blood oxygen levels in cardiac surgical patients in the ICU (Eastwood et al., 2009). In studies conducted in the United Kingdom, Australia, and New Zealand, patients with COPD, neuromuscular disease, or thoracic wall disease were reported to be at

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risk of developing hypercapniec respiratory failure, damage to the alveolar membrane, or respiratory system toxicity such as absorption atelectasis when they received oxygen therapy and had oxygen saturation levels above the recommended oxygen saturation target ranges, SpO_2 of 88 to 92%. In addition, patients with COPD also showed a maladaptive physiological response (Boyle & Wong, 2006; Gunathilake, Lowe, Wills, Knight & Braude, 2014; Rudge, Odedra & Harrison, 2014).

In assessing patients in need of oxygen therapy, a prompt clinical assessment and documentation of the patients' respiratory rate and effort, blood pressure, pulse, skin colour and level of consciousness should be done (Bateman & Leach, 1998;Singh et al., 2001). Additional assessment may include; a detailed medical history, physical examination, ensuring delivery devices are connected to oxygen supply at an appropriate flow rate, checking cylinder level and its duration time and recording of arterial oxygen saturation (SpO_2) 'the fifth vital sign' measured by pulse oximeter (O'Driscoll et al., 2008).

A pulse oximeter is used to measure the percentage of oxygenated haemoglobin in arterial blood. This device also ensures the most efficient use of oxygen therapy and monitors the response to treatment. However, pulse oximeter provides no information on acidity levels or partial pressure of carbon dioxide in arterial blood ($PaCO_2$). Therefore in all critically ill patients and in cases of suspected respiratory acidosis and hypercapnia, blood gas assessment may be considered (O'Driscoll et al., 2008).

Like a double edged sword, oxygen has both biological benefits and toxicity effects (Patel, Goel, Agarwal, Gary, & Lakhani, 2003), hence, the

titration and monitoring of oxygen therapy to achieve optimum oxygen saturation targets and respond to a particular patient's needs is valuable. The toxic effects of oxygen therapy usually involve the central nervous system, the lungs and the eyes. The concentration of the oxygen in use, duration of its exposure, and the susceptibility of the patient are mostly the major factors that affect the onset and severity of the toxicity. Oxygen toxicity is broadly divided into two groups, acute and chronic. Acute toxicity mostly affects the central nervous system and occurs when a patient is exposed to very high concentration of oxygen within a short period of time whiles chronic toxicity occurs when a patient gets exposed to low concentration of oxygen for a long period of time (as cited by Patel et. al, 2003).

As the treatment of oxygen toxicity is purely symptomatic, its avoidance and monitoring for prompt recognition is of great importance (Patel et al., 2003).

Below is a table on the normal ranges of arterial blood gases (O'Driscoll et al., 2017).

Table 2: Normal Ranges of Arterial Blood Gases

Measurement	Ranges	Clinical notes
Acid-bases status (pH)	7.35-7.45	Most important value; detects acidosis or alkalosis
Partial pressure of carbon dioxide (PaCO$_2$)	35-47 mmHg	Measures adequacy of ventilation and respiratory contribution of acid-base abnormality (respiratory acidosis
Partial pressure of oxygen (PaO$_2$) sea level	80-100%	Indicates driving pressure that causes oxygen haemoglobin binding; varies with age and barometric pressure

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Table 2 continued

Bicarbonate (HCO$_3$)	21-28 mEq/L	Measures metabolic contribution to acid base abnormality (metabolic acidosis)
Base Excess (BE)	-2 to + 2	Reflects deviation of bicarbonate concentration from normal
Saturation of haemoglobin with oxygen (SaO$_2$)	96-98%	Indicates abnormality of oxyhemoglobin association and dissociation; may be measured directly from PO2, pH and body temperature

Nurses' and Midwives' Knowledge, Attitudes and Practices towards Safe Administration of Oxygen

In delivering oxygen therapy, nurses make significant contribution to the quality care of patient. Given that oxygen therapy is a common nursing procedure, the sound knowledge, positive attitude and practice of nurses in concordance to evidence-based guidelines are cornerstones for a safe oxygen delivery (Cunningham, 1997; O'Driscoll et al., 2017). Any error in oxygen therapy could lead to worsening patient's status. Also, as a drug, the possibility that "too much" oxygen may be as harmful as "not enough" should be appreciated in its administration. Hitherto, this drug therapy is often delivered without special attention and sufficient knowledge (Bateman & Leach, 1998; Brokalaki et al., 2004; Ganeshan et al., 2006; Eastwood et al., 2007; Goharani et al., 2017).

A report by the National Patient Safety Agency (NPSA) to hospital settings with actions to improve oxygen therapy led to major positive changes in the delivery of safe oxygen in the United Kingdom. Yet, despite these changes, poor practice and variations in practice persist (Davidson, Williams, Baxter, Morris & Restrick, 2011; Lee, McDonnel & Davidson 2013). The reasons for the failure to amend practice in accordance with evidence could be related to the high knowledge gap and fair attitudes among nurses and midwives.

Unlike the western nations, very limited studies have been conducted to assess the competency level of nurses on oxygen therapy in the developing countries such as Ghana. Less emphasis has also been placed on the choice of study location, such as mining communities where rampant use of oxygen has been reported as many patients present with indications for the therapy. Clearly further research in this area is warranted.

In the studies on nurses' knowledge, attitudes and practices, a correlation has been found between certain background characteristics of the nursing clinicians and the knowledge, attitudes and practice of nursing toward oxygen therapy. These background characteristics are related to what the nurses describe, or answer in the questionnaire, rather than their own perspective. The nurses' characteristics include: their level of nursing education, previous training on oxygen therapy, category of nursing profession and professional experience/nursing practice.

For instance, the relationship between nurses and other health care professionals, such as physicians regarding their level of knowledge, attitudes and practices toward oxygen therapy has been inconsistent. Ganeshan et al.

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(2006) and Medford and Bowen (2009) identified the differences between nurses and doctors regarding their knowledge and practice toward safe oxygen therapy. Ganeshan et al.'s (2006) study investigated the knowledge and practices of 30 resident doctors and 53 qualified nurses, all of whom work in the medical and surgical departments of a large district general hospital. The findings indicated that when both medical and nursing clinicians were presented with sample case scenarios, a large proportion (up 97% and 73% of doctors and nurses, respectively) were not able to accurately prescribe the correct dose of oxygen or the appropriate method for administration of oxygen for some scenarios described. Thus, the study demonstrated that in four out of the seven scenarios, nurses' knowledge of the correct delivery device and oxygen prescription was high than that of the doctors. However, the nurses still did not have sufficient knowledge and understanding of oxygen therapy to be able to administer the drug safely.

Similar findings were reported by Medford and Bowen (2009), who implemented a nurse facilitated reminder system, where nurses were empowered to remind doctors to prescribe oxygen therapy. The study demonstrated that there was relatively high rate of appropriate oxygen administration prior to the implementation of the reminder system. This may indicate that in general, nurses are skilled at delivering the appropriate dose of oxygen despite the absence of a prescription.

Despite the above studies identifying that nurses' knowledge on some aspect of oxygen therapy such as identifying delivery devices was higher than that of the doctors, a number of studies conducted globally have reported on practice gap related to high knowledge gap and fair attitudes among nurses

(Bateman & Leach, 1998; Brokalaki et al., 2004; Ganeshan et al., 2006; Eastwood et al., 2007; Goharani et al., 2017). For instance, Brokalaki et al. (2004) invited 105 participants from working in seven hospitals of a large city district of Greece. The results from the questionnaire showed deficiencies in the knowledge of nursing regarding oxygen. From the study significant percent of nursing personnel consider oxygen not as a drug but as a gas that improves patients' breathing. In this same study, significant omission and errors by nurses on decision from oxygen administration, modification, monitoring and discontinuation was recorded.

Similar study conducted by Goharani et al (2017), from the Middle East revealed that the familiarity level of both nurses and doctors with some aspects of oxygen therapy such as its indication, necessary measurements and monitoring during therapy, and identifying delivery devices was fair to weak (< 80%).

Evidence has shown the significant effect of educational programs on oxygen therapy on the level of knowledge, attitudes and practices of nurses and midwives in the safe delivery of oxygen. The reviewed literature revealed some published studies that explored the effects of educational programs on oxygen therapy in changing knowledge level and attitudes of nurses and midwives in its safe delivery (Considine, Botti & Thomas, 2005; Considine, Botti & Thomas, 2006; Kavitha & Patil, 2015).

The first reviewed study was conducted by Considine et al. (2005). The study demonstrated that the use of supplemental oxygen was improved as a result of educating nurses and midwives in the acute setting, and that increased knowledge was identified as a predictor of independent decision

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making. The quasi-experimental design set out to test the assumption that an increase in nurse's knowledge, though a self-learning package, improved clinical decisions. Pre-test scores were comparable ($p = 0.091$) whilst post-test scores between the experimental and control group showed a statistically significant improvement (19.31 ± 3.56 vs 13.05 ± 3.76; $p = <0.001$). Eighty-seven percent of nurses in the study reported making clinical decisions about oxygen therapy on a daily basis (91% of those decisions were autonomous). The caliber of these decisions clearly has the potential to influence patient outcomes and therefore it is important to consider factors that influence the acquisition of the knowledge.

A further study by the same Australian group (Considine et al., 2006) explored specifically the effect of education on clinical decisions regarding emergency oxygen therapy. Utilizing a similar design this smaller study of 20 emergency department nurses tested nurses' decision-making skills, rather than knowledge, following completion of the educational intervention. The results from this study were variable with some changes in hypothetical management of patients seen, in particular device selection, but in other aspects (for example the parameters used for assessment) no change was demonstrated.

Similar findings were reported by Kavitha & Patil (2015), who investigated 28, 30 and 22, paediatric staff nurses, 3rd year BSc Nursing and post basic BSc Nursing student respectively. The study was aimed to assess effectiveness of need based training on knowledge regarding oxygen therapy in children. The results revealed that 40% of participants had poor knowledge and 57.5% scored average and none had excellent knowledge during pre-test.

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The post-test however, shows that 27.5% of participants had good knowledge, 66.25% scored average and 5% of people had poor knowledge. Comparison between pre-test and post-test knowledge scores using paired "t" test showed significant difference between pre-test and post-test knowledge score on oxygen therapy. The study concluded that to update the knowledge of staff nurses, need based training is essential and should be incorporated in their working schedule (Kavitha & Patil, 2015).

It is apparent from the literature that educational programs on oxygen therapy for nurses and other healthcare professionals are important as they enhance knowledge, attitude and practice in the safe delivery of the drug.

Furthermore, it has been demonstrated in literature that a pivotal role in the safe administration of the oxygen include contextual factors such as availability of resources for the therapy in terms of staff training, logistics and funds. A number of studies examined the influence of availability of resource on nurses' and midwives' knowledge, attitudes and practices (Lemma, 2015; Adipa et al., 2015).

An Ethiopian study done at emergency departments of one federal and three regional hospitals, Lemma (2015) reported that the facilities had lack of training and evidence of   no guidelines or protocols on oxygen therapy despite the existence of several international guidelines for proper oxygen therapy, as well as shortage of oxygen supply and delivery devices (Lemma, 2015). Lemma (2015) concluded that availability of resources in terms of logistics and funds was a factor significantly predictive of the nurses' knowledge, attitudes and practices in the delivery of safe oxygen.

Furthermore, as one of the key integral part of patient's assessment is their oxygen saturation levels , it is important to kept oxygen saturation monitors in all point of care where oxygen is being administered (Moga & Chojecki, 2016). However, a study in Ghana conducted by Adipa et al (2015) reported that the lack of pulse oximeter in some facilities to assess the oxygen saturation before and during the administration of oxygen compromised the adequate way of assessing and monitoring patients on the therapy. In the same study, no protocol to guide oxygen therapy in some units was recorded. Hence, nurses either use discretion or previous knowledge in administering oxygen to either commence or discontinue the therapy (Adipa et al., 2015).

Conclusion

The literature is not very forthcoming in enlightening the competency of nurses in environment where oxygen therapy is rampant such as the mining communities. It is proposed that this missing perspective may serve to illuminate the baseline information about the nursing clinicians and a significant step in the process of positively enhancing patient's safety.

From the literature it can be deciphered that knowledge affects clinical practice with regards to oxygen therapy. Transfer of this knowledge of or education to patients is part of the therapeutic relationship and consequently compliance to therapy, but it can be contested as beneficial if that information is not ground in evidence but in erroneous beliefs and misconception.

Interestingly, most methodological studies rely on survey as means of data collection. Response rates are recorded as low, despite strategies to increase returns. The fundamental survey approach of gathering information

can overlook some of the more deep-seated roots of beliefs, culture and practice that may inform the seemingly resistant adoption of evidence-based practice in relation to oxygen

Conceptual Framework

A conceptual framework defines the relevant variables for a study and maps out how they relate to each other (Adom, Hussein, & Agyem, 2018). In this study, the conceptual framework used was an adaptation from Roelens et al., (2006). They built upon Cabana et al's (1999) behaviour framework to come up with a predictive model to assess current barriers working through knowledge and attitudes to influence the physicians' practice of screening for intimate partner violence in settings where neither clinical guidelines nor specific recommendations with regards to abuse have been instigated. Roelens et al (2006) further affirm that barriers fit into the three major categories depending on whether they affect physician's knowledge, behaviour or practice.

This study zeroes on the safe delivery of oxygen among nurses and midwives by espousing the idea that their level of knowledge, attitudes and practice in oxygen therapy are critical factor in assessing patient's safety. The researcher adapted the framework (figure 1) from Roelens et al., (2006) to depict the complex phenomenon in the interrelation and influencing factors on Knowledge, Attitude and Practice (KAP) toward safe oxygen therapy. It can be seen from Figure 1 that the background characteristics of the respondents such as their previous training on oxygen therapy, working experience and category of nursing profession can shape the knowledge, attitude and practices

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of the respondents on oxygen therapy. In addition, the framework concurs with literature that the lack of essential resources for oxygen therapy such as guidelines and staff training on the delivery of O_2 and logistics and funds for O_2 in the health institutional may significantly influence knowledge, attitudes and practices of nurses and midwives on safe delivery of O_2. As the availability of resources plays a pivotal role in the safe delivery of O_2.

Additional, as shown in Figure 1, it is possible to speculate that any decrement in knowledge among the nursing clinicians might lead to their non-compliance with recommended guidelines on oxygen delivery while performing patient care activity. This non-compliance may lead to inappropriate delivery of oxygen. In summary, it is possible to postulate that adequate knowledge on oxygen therapy promotes safe practices, ensuring that the detrimental effect of under or over oxygenation are prevented.

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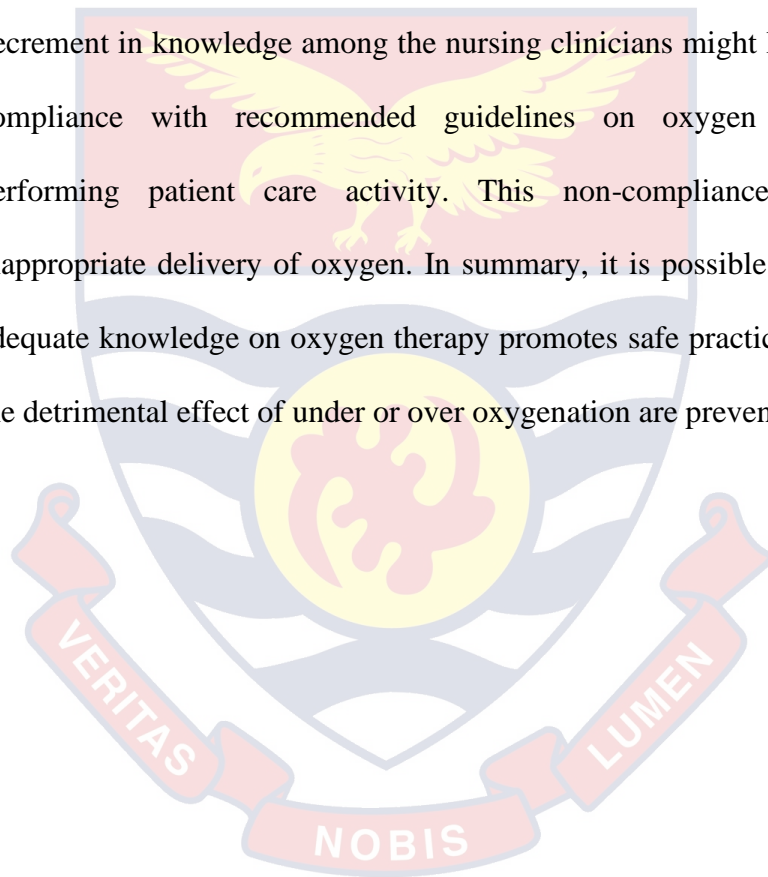
Figure 1: Conceptual framework knowledge, attitudes and practices of nurses and midwives towards oxygen administration to patients in three hospital at the Tarkwa Nsuaem Municipality

Availability of Resources
• Guidelines and staff training on O_2 therapy
• Logistics and funds for O_2 therapy

DEMOGRAPHIC VARIABLES	**KNOWLEDGE**	**ATTITUDE**	**PRACTICE**
• Age	• Indication for O_2 therapy	**Agreement and outcome expectancy**	• Selecting right delivery device for patient need
• Gender		•Positive and negative attitudes on compliance to protocols on O_2 therapy	
• Category of nursing profession	• Familiarity with O_2 delivery devices		• Triggers for changing devices and flow rate
• Educational level		**Motivation**	
• Working experience	• Target O_2 saturation per condition	•Sense of responsibility to document observations during O_2 delivery	• Estimated duration time of O_2 source (e.g.: cylinder) in use
• Any training on O_2 therapy		**Perceived self-efficacy**	
		•Confidence and skill to deal prevent under or over oxygenation	

SAFE OXYGEN THERAPY

Source: Adapted from Cabana, Rand, Power, Wu, Wilson, Abboud and Rubin (Cabana et al.,1999) and Roelens, Verstaelen,

Egmond and Temmerman (Roelens et al., 2006)

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Theoretical Constructs Used in the Study

Knowledge attainment on oxygen therapy is critical in this era of evidence-based practice. Knowledge refers to attaining, retaining, and use of information or practice (Badran, 1995). Knowledge is accruing from both education and experience. Lack of knowledge among nurses on oxygen therapy refers to their lack of understanding on oxygen physiology, normal and abnormal values as well as unable to use the pulse oximeter to determine oxygen saturation; inability to discuss the indications for oxygen and the potential risks unawareness of, lack of understanding of expert guidelines/policy; unfamiliarity with delivery devices and the inability to use oxygen equipment safely, including an unawareness of fire risks and cylinder use, etc. Increased knowledge on oxygen among nurses improves the practice of quality care (Kane, 2013).

The attitude of nurses towards safe and effective administration of oxygen therapy refers to the value related to the safe and effective administration and preconceived ideas towards the therapy. Attitude is defined by Eagly and Chaiken (1993) as "psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour". Attitude is used to express positive or negative feelings about a person, topic, or item. Thus, when a person holds a positive attitude towards an issue, it increases the chance of performing a caring behaviour related to that issue and vice versa (Bandura, 1971).

Practice of nurses toward oxygen therapy refers to the way nurses demonstrate their knowledge and beliefs through their action (Kaliyaperumal, 2004). The practice of nurses in regards to oxygen therapy refer to their ability

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to anticipate the need for oxygen therapy, correctly select delivery device based on necessary flow rate, demonstrate proper administration, titration, weaning of oxygen as appropriate, documentation and monitoring of oxygen, to ascertain that all equipment (prescription, oxygen supply; piped or cylinder, reduction gauge, flow meter, tubing) for the therapy are available and functioning and the duration of the oxygen supply (cylinder) in used in order to know when it must be replaced (Stucky et al., 2010)

CHAPTER THREE

METHODOLOGY

Introduction

The purpose of this chapter is to introduce the tools and methods used in this study. It includes information on research design, setting, study variables, study population, inclusion and exclusion criteria, sample and sampling procedure, data collection tool, pretesting, data collection and data analysis as well as ethical considerations.

Research Design

In this study, a descriptive, cross-sectional hospital-based survey was used as the researcher did not attempt to control or manipulate the variables under study, but rather observe, describe and document how the variables varied with respect to each other (Polit & Hungler, 1999). A descriptive research was also chosen by the researcher as it involves gathering data that describe events and then organizes, tabulates, depicts, and describes the data collection. It often uses visual aids such as graphs and charts that aid the reader in understanding the data distribution as well as reducing the data obtained to manageable form. Cross-sectional studies on the other hand, provides appropriate descriptive information to describe the status of phenomena at a specific point in time as well as to examine the relationship between all variables of interest as they exist in a defined population (Polit & Beck, 2008).

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Overview of the Study Area

Tarkwa Nsuaem forms part of the twenty-two (22) Metropolitan, Municipalities and Districts in the Western Region of Ghana. Tarkwa Nsuaem is located between Latitude 4º5' and Longitude 5º5'. The Tarkwa Nsuaem Municipality was created from the former Wassa West District under Legislative Instrument (LI) 1886 in 2007 (Ghana Statistical Service, 2014). It shares boundary with Prestea, Huni- Valley to the north, to the south by Ahanta West, to the West by Nzema East and to the East by Mpohor Wassa East. The Municipality has a total land area of 2354 km^2 subdivided into 6 local administrative areas known as Urban/Area Councils, namely Benso, Simpa, Nsuta, Dompim, Nsuaem and Tarkwa Urban Councils (Ghana Statistical Service, 2014).

The population of Tarkwa Nsuaem Municipality, according to the 2010 Population and Housing Census, is 90,477 with relatively more males (51.6%) than females (48.4%). The population of the Municipality is youthful with about two-fifth (38.1%) aged below 15 years and elderly persons (aged 60 years and older) in smaller proportion (4.4%).

Tarkwa Nsuaem municipal is richly endowed with human and natural resources, particularly soil and timber species, mineral deposits, tourist attraction sites, good climatic conditions, oil palm and rubber plantations. The district also has the Region's only public university, the University of Mines and Technology.

The mineral's contribution to the municipality is a factor of the region earning the accolade the "best comes from the West. The municipality could be said to be the first-place mining activities started in the country. Many of

the communities have huge mineral deposits which are economically viable. These are gold, manganese, iron-ore and bauxite. The municipal capital Tarkwa hosts three large-scale mining companies; there are Goldfields Ghana Limited, AngloGold Ashanti, and Ghana Manganese Company (Ghana Statistical Service,2014).

Figure 2: District Map of Tarkwa Nsuaem Municipality showing district capitals and towns (Ghana Statistical Service, 2014)
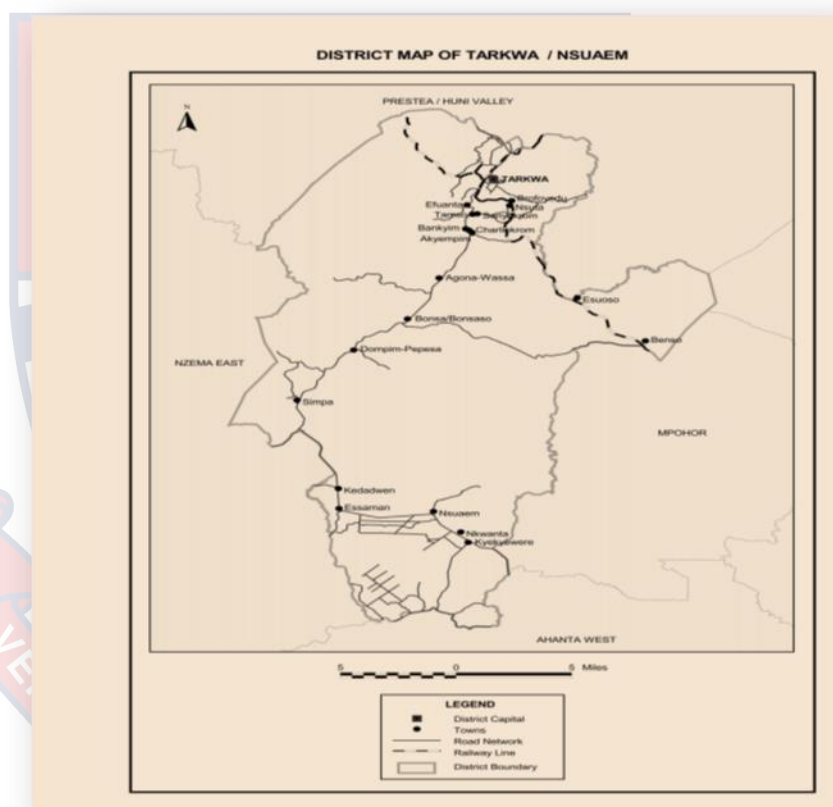
Study Setting and Period

The study was conducted over a period of 1 month, from the 1st to 27th of February, 2018, in three randomly selected hospitals in the Tarkwa Nsuaem Municipality. The municipality has 8 hospitals, which 3 were randomly selected prior to obtaining the minimal sample size. For confidentiality reasons, the three randomly selected hospitals were coded for easy

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identification in this study. They have been named Hospitals **X, Y** and **Z**. The details about the size, type of hospital and service offered are outlined below:

- Hospital X is classified as a medium hospital with 150-bed capacity, which provides secondary health services and owned by the government. The hospital averagely admitted 42 patients per day and has 18 nurses working per shift.

- Hospital Y has a 98 bed- capacity, provides secondary health services and owned by the government. Averagely, the hospital per day has 15 nurses working per shift and 36 admitted patients.

- Hospital Z is corporate owned with a 45 bed-capacity. In a day, the hospital averagely has 8 nurses working per shift, 28 patients admitted and offers secondary health services.

Generally, all the selected hospitals provide most clinical services: medicine, surgery and anaesthesia, emergency services, obstetrics and gynaecology, paediatric and out-patient services. Also, they all have facilities for oxygen therapy and patients admitted to these hospitals are frequently given oxygen. As at 2018, a total of 341 professional nurses were in these hospitals, among which 156 were found in Hospital X, 130 in Hospital Y and 55 in Hospital Z.

Study Population

Polit and Beck (2004) define a population as the entire aggregation of cases that meet a designated set of criteria. In this study, the target population were all nurses and midwives working as staff in the 3 selected hospital ward

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settings in the Tarkwa Nsuaem Municipality as well as those fulfilling the inclusion criteria.

Eligibility Criteria

Inclusion criteria were all nurses and midwives working as staff in the selected hospital ward settings and were willing to participate and available during the study period.

Exclusion criteria were all unqualified and orientation/student nurses and midwives, nurses and midwives not working in the ward settings.

Sample Size

The sample size was determined by using a single population proportion formula and considering the following assumptions: prevalence **(P)** of knowledge of oxygen therapy 27.8%, **Z** = standard normal distribution value at 95% confidence level of **Zα/2 = 1.96** and margin of error (*d*) **= 5%:**

$$n = \frac{(Z\alpha/2)^2\ P\ (1-P)}{d^2}$$

$$n = \frac{(1.96)^2 \cdot 0.278\ (1 - 0.278)}{(0.05)^2}$$

$$n = 305$$

Therefore, *the initial sample size is* **305**

To determine the **minimal sample size**, the correction formula was used:

$$n_f = \frac{n_o}{[1 + n_o/N]}.$$

Where, n_f is the minimal sample size, n_o is the initial sample size, thus **305**, and **N = 489,** the number of nurses working in the hospitals within the Tarkwa Nsuaem Municipality:

$$n_f = \frac{n_o}{1 + n_o/N}.$$

$$n_f = \frac{305}{1 + 305/489}.$$

$$n_f = 188$$

Considering a 10% non-response rate, the total sample was

$$\frac{10}{100} \times 188 = 15$$

Therefore, 19 + 188 = 207

Hence, **207** are the number of participants (nurses and midwives) needed to minimize sampling errors and have enough for generalization of data.

Sampling Procedure

This study used random cluster sampling, a form of probability sampling technique, to select respondents. This is supposed to be the best approach to ensure rigour, resulting in a more representative sample that can be used for generalization. Sampling is the process of selecting a portion or subset of the designated population to represent the entire population (LoBiondo-Wood & Haber, 2017; Burns & Grove 2005). The sample is drawn from a sampling frame that represent a full list of members of a population from which the study respondents will be drawn (LoBiondo-Wood & Haber, 2017; Jennings, 2001). Also, random cluster sampling involves dividing the study population into groups usually geographical. Some of the groups are then randomly selected and the sample is drawn for each of the clusters based on defined sampling frame. Similarly, for this study based on administrative boundaries, an initial random sample of eight (8) hospitals was selected from the sampling frame of fourteen (14). At the second stage, three (3) hospitals providing secondary health services

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were randomly selected from a list of eight (8) hospitals. The third and fourth stages involved obtaining the number of respondents in each selected hospital using the proportional allocation to size (PAS) formula. Finally, a list of all respondents in the inclusion criteria was produced. The final sample of 207 respondents was randomly drawn from this list.

Figure 3: The schematic presentation of sampling procedure to select study participants from hospitals within Tarkwa Nsuaem Municipality
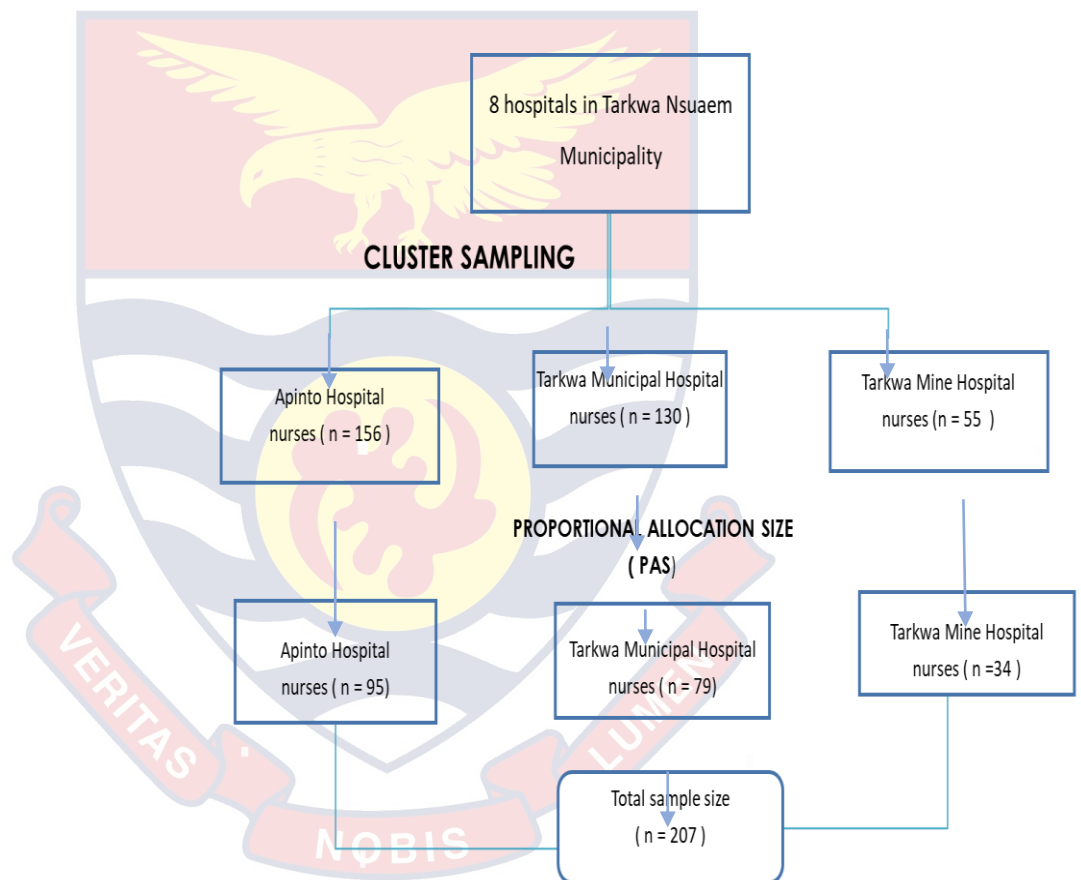
Recruitment

The recruitment process began from the beginning of February, 2018, and continued through to the end of February, 2018. After obtaining all ethical approvals the procedure for collection of data was as follows:

- Formal letters were sent to the directors of nursing at the selected three hospitals seeking approval for data collection. Copies of ethical approvals and a summary of the study were also attached to the request.

- The researcher then contacted the ward in-charge nurses and midwives in each selected hospital separately to organise the data collection process and clarify any issue related to the study. Also, the researcher reviewed with all ward in-charge nurses and midwives regarding the purpose of the study, the method of data collection, the time required to participate, and the criteria of registered nurses and midwives required for inclusion in the study. In addition, the steps required to distribute the survey questionnaire was discussed.

- The ward in-charge nurses and midwives then helped in preparing the list of nurses' and midwives' names. Names were then screened for their eligibility to participate and the study sample was known.

Data Collection Instrument

A self-administered questionnaire, developed by the researcher was used in this study. The questionnaire was constructed from themes reviewed in research articles similar to the study (Adipa et al., 2015; Bateman & Leach, 1998; Brokalaki et al., 2004; O'Driscoll et al., 2016; Eastwood et al., 2007;Ganeshan et al., 2006;Goharani et al., 2017;Kavitha & Patil, 2015;Mahmoud, Alseed, Awad, Ahmed, & Elhussein, 2016) and also guided by expert guidelines on oxygen therapy(Beasley et al., 2015; O'Driscoll et al., 2008; O'Driscoll et al., 2017). The developed tool consisted of topics on oxygen therapy that all nurses and midwives are expected to have undergone in

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education and training courses. In developing the questionnaire, words were well defined to minimize misinterpretation of questions and to ensure that each question was measuring a single idea (Fowler, 1995). The questionnaire consisted of five sections.

Section One: Socio-Demographic Characteristic of the Respondents

There were 7 questions on this part that included: Gender, age, level of education, category of nursing profession, ward, working experience and any prior training on oxygen therapy. For age and gender, respondents were asked to tick by their appropriate category. For the category of nursing profession; respondents fall into two categories namely: General nurse and Midwife. The ward in which the respondents work was also classified into: Male Medical/Surgical, Female Medical/Surgical, Paediatric and Labour.

Section Two: Knowledge of Nurses and Midwives on Oxygen Delivery

In this section, the knowledge of respondents on oxygen therapy were assessed with closed ended questions using the following parameters: O_2 as a drug, Indication for O_2 delivery, Targeted O_2 saturation per patient condition and Familiarity with delivery devices. A "YES" or "NO" questions were used, a score of 0 was given for each wrong answer while 1 point was given for each correct respond. Maximum score was 28 while minimum score was 0. The overall knowledge of the study respondents was assessed using the sum score of each outcome based on Bloom's cut-off point. The scores were categorized into three levels as follows: Bloom's cut off point, Adequate knowledge were 20-28 points (80% - 100%); Fairly adequate knowledge score fell between 13 – 19

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points (60% - 79%) and knowledge score below 13 points ($\leq$ 59%) was inadequate.

Section Three: Practice of Nurses and Midwives in the Delivery of Oxygen

The questionnaire on practice was based on three parameters: Selection of the right delivery devices for patient need; Triggers for changing delivery devices and flow rate; and Estimated duration time of the oxygen source (e.g. O_2 cylinder) in use. This section had a total of four closed ended and YES" or "NO" questions. A score of 0 was given for each wrong answer and 1 point given for each correct respond. The scores were categorized into three levels as per Bloom's cut off point: $\leq$ 59% was considered inadequate practice, 60% - 79% fairly adequate practice and $\geq$ 80 % adequate practice.

Section Four and Five: Attitude of nurses toward oxygen therapy and Availability of resources for oxygen therapy in the various hospitals

Section four assessed the nurses' and midwives' attitude on oxygen therapy. In order to obtain respondents degree of agreement with a statement, a psychometric response scale was used. Respondents were given the option to select on a 1- to 4 – point scale from "strongly disagree", "agree", "disagree" and "strongly agree". The responses were summed up and a total score for each respondent obtained on a percentage scale. Per Bloom's cut off point: $\leq$ 59% was considered unsatisfactory attitude, 60% - 79% fairly satisfactory attitude and $\geq$ 80 % satisfactory attitude.

Ultimately, in the fifth section, the questionnaire determined the availability of resource for oxygen therapy in the various hospitals. This

section was developed based on the researcher's experience and themes identified from similar researches (Adipa et al., 2015; Eastwood et al., 2007) to evaluate whether the availability or unavailability of resources need in the delivery oxygen influences the knowledge, attitude and practices on nurses and midwives in the provision of oxygen. The availability of resources in the hospitals was assessed on a scale of 100%, under four main categories: Guidelines, Staff training, Logistics and Funds.

Validity and Reliability

To ensure that the tool is measuring what is supposed to measure, the questionnaire was developed to the current study. A pretesting of the instrument was conducted with 10 nurses from one of the hospitals in the Tarkwa Nsuaem Municipality not included in the study. This hospital shared similar characteristics with the area under study. Participants for the pretesting were asked to comment on the applicability and appropriateness (validity) of the questionnaire. In addition, the participants were also helpful in determining the time require to complete the questionnaire.

Internal consistency among on Knowledge, Attitude and Practice of nurses and midwives in O_2 therapy were 0.82, 0.78 and 0.72 Cronbach's alpha(α), respectively, which was considered within the acceptable range.

Data Collection Procedure and Quality Control

To accomplish this research fruitfully, the provision of appropriate instruments as well as human resources such as assistants were undeniably vital. The survey was carried in three randomly selected hospitals in the Tarkwa Nsuaem Municipality over a period of 1 month from 1st to 27th of

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February, 2018. Data was collected daily in two shifts. Data collectors, one from each selected hospital received a half day training on issues regarding the questionnaire (on the objective of the study, ways of approaching the participants, how to administer and collect the questionnaires on time).

Consequently, the questionnaire was revised before dissemination to the actual data collection sites. Confidentiality of the study participants was kept during distribution and data collection periods. Above all, ethics, coding and entry were maintained throughout the process. Participants were allowed to fill the 10-15 minutes questionnaire themselves.

Data Analysis

Data from the study questionnaire were checked and coded manually, using the corresponding codebook as a guide (Pallant, 2010). All data were entered into the Statistical Package for Social Sciences (SPSS) software, version 20 (IBM Corporation, 2011). Descriptive statistics, Inferential statistics (ANOVA), and Multivariate regression model were used. Descriptive statistics was used to analyse the demographic features of respondents and also analyse the first and second research objectives of this study using frequency distribution (counts and percentages). As the total scores were normally distributed, inferential statistics (ANOVA) was used (Cronk, 2012) to compare the level of knowledge, attitudes and practices of nurses and midwives and also compare the availability of resources in the three selected hospitals. ANOVA has been chosen as it allows to test the average score differences more than two groups. The multivariate regression model was used to assess the effect of demographic characteristics and availability of resources

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on the nurses' and midwives' level of knowledge, attitude and practice with regards to safe oxygen delivery.

Ethical Considerations

The principles of beneficence, justice, non-maleficence, autonomy and confidentiality were used to ensure that the study is ethically acceptable. After Institutional review board (IRB) approval from the University of Cape Coast. Introductory letters from the University was obtained to the institutions where the study was carried out. Verbal consent was obtained from all the participants prior to the study. Research assistants signed consent forms before they were trained to ensure protection of confidentiality of materials of subject's information.

Summary

This chapter gave an overview of the study area and in addition presented the tools and methods used to carry out this study. The chapter described cross sectional descriptive hospital-based survey as the chosen methodology and a questionnaire as the data collection instrument. How sample size was determined was also discussed. The entire data collection process was also described in detail as well as the various statistical test employed in answering the research questions. Finally, the chapter ended with the ethical considerations for the study. Results and discussion of findings are presented in Chapter 4.

CHAPTER FOUR

RESULTS

Introduction

This cross-sectional and descriptive study investigated the Knowledge, Attitude and Practices of nurses and midwives with regard to oxygen therapy. It also examined if a predictive relationship exists between availability of resources and the level of nurses' and midwives' knowledge, attitude and practices. The survey was completed by nurses and midwives aged 20 years and older recruited from 3 hospitals randomly selected in Tarkwa Nsuaem Municipality, Western Region of Ghana. A total of 207 responses were received. Of the 207 survey responses received, 25 were incomplete thus leaving a total of 182 valid surveys for analysis with descriptive and inferential statistics using the SPSS version 20 (IBM Corporation, 2011). This chapter presents the results from the data collection. Results are displayed in tables and bar charts.

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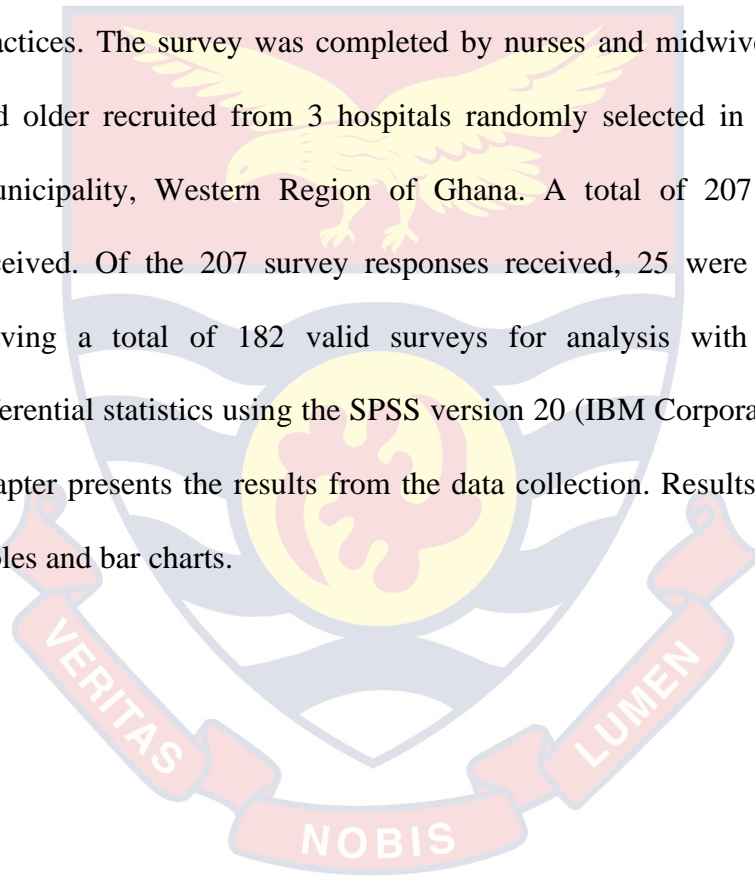
Description of the Study Participants

Table 3: Demographic Characteristics of the Respondents

	Frequency	Percent
Sex		
Male	86	47.25
Female	96	52.75
Facility Code		
X	74	40.66
Y	74	40.66
Z	34	18.68
Age in years		
20 – 29	122	67.03
30- 39	33	18.13
40 – 49	23	12.64
≥ 50	4	2.20
Category of nursing		
General nurse	170	93.41
Midwife	12	6.59
Educational level		
Diploma	147	80.77
Bachelor degree	34	18.68
Masters' degree	1	0.55
Ward		
Male medical	55	30.56
Female medical	89	49.44
Male surgical	16	8.89
Female surgical	2	1.11
Pediatric	6	3.33
Labor	12	6.67
Speciality area		
Critical care	3	1.69
Midwifery	11	6.18
Pediatric	37	20.79
None	127	71.35
Working experience		
≤ 1	11	6.04
2 – 5	88	48.35
6 – 9	75	41.21
10 – 13	4	2.20
≥ 14	4	2.20
Any training on O_2 therapy?		
Yes	104	57.14
No	78	42.86

Source: Field Data (2018)

This study included a total of 182 valid surveys of nurses and midwives, out of which 74 (40.66%) were from **Hospital X,** 74 (40.66%) from **Hospital Y** and 34 (18.68%) from **Hospital Z**. Over two-thirds (84.07%) of the respondents were within 20–29 years age bracket. General Nurses (93.41%) were the dominating nursing professionals. Diploma nurses 80.77% of the overall sample. Majority (71.35%) of the nurses sampled had no speciality area with most of them having 2 to 5 years (48.35%) of working experience. Table 3 gives details of background characteristics of the nurses and midwives

Measuring Knowledge of Nurses and Midwives on Oxygen Delivery

Figure 4: Various Areas of Knowledge on Safe and Effective O_2
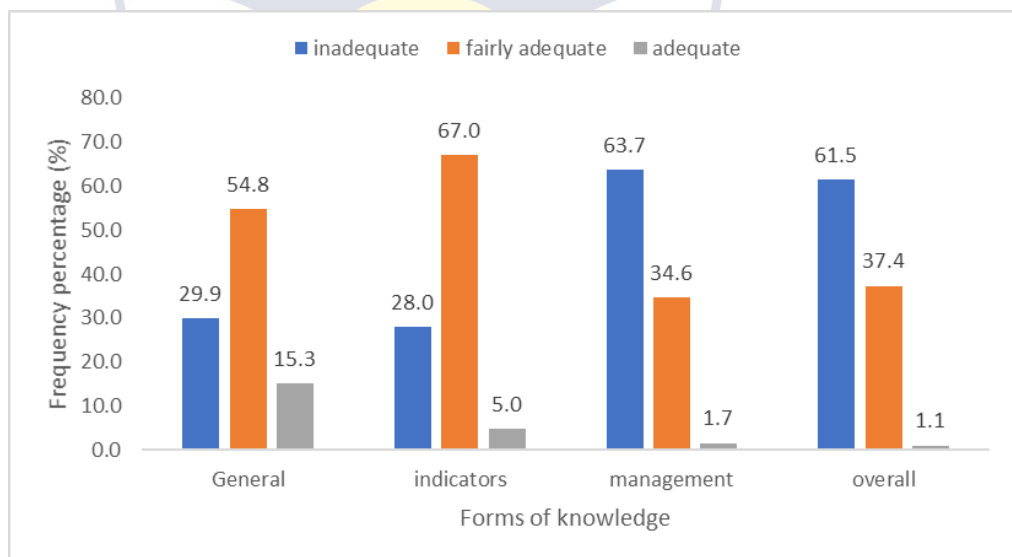
Source: Fieldwork (2018)

In measuring knowledge level of nurses and midwives on safe oxygen therapy, three areas, namely: General knowledge, knowledge on indications and knowledge on management of oxygen therapy were considered. Scoring them on a scale of 100%, 54.80% of the respondents were classified to have

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fairly adequate in the General knowledge on oxygen therapy and 15.3% of respondents with adequate General knowledge. On indications for oxygen therapy, the proportion of respondents who had fairly adequate knowledge was 67.00%. Average knowledge score on indications for oxygen therapy was 50.41%. Knowledge on management of oxygen therapy was averaged at 42.28%. It was the least performed category of knowledge as majority (63.70%) of the nurses and midwives had inadequate insight on management of oxygen therapy, despite, 57.14% of the respondents purportedly trained on oxygen therapy. Of the 182 nurses and midwives sampled, the proportion of nurses and midwives that had adequate knowledge on safe and effective oxygen therapy ($\geq$ 80%) was just 1.10%, fairly adequate knowledge (60% - 79%) was 37.36% while those with inadequate knowledge (had $\leq$ 59%) constituted 61.54%. Figure 4 provides a visual representation of the data. It depicts the proportional values of the responses for each item in the areas of knowledge.

Measuring Attitude of Nurses and Midwives Toward Oxygen Therapy

Figure 5: Attitude of Nurses and Midwives toward O$_2$ Therapy
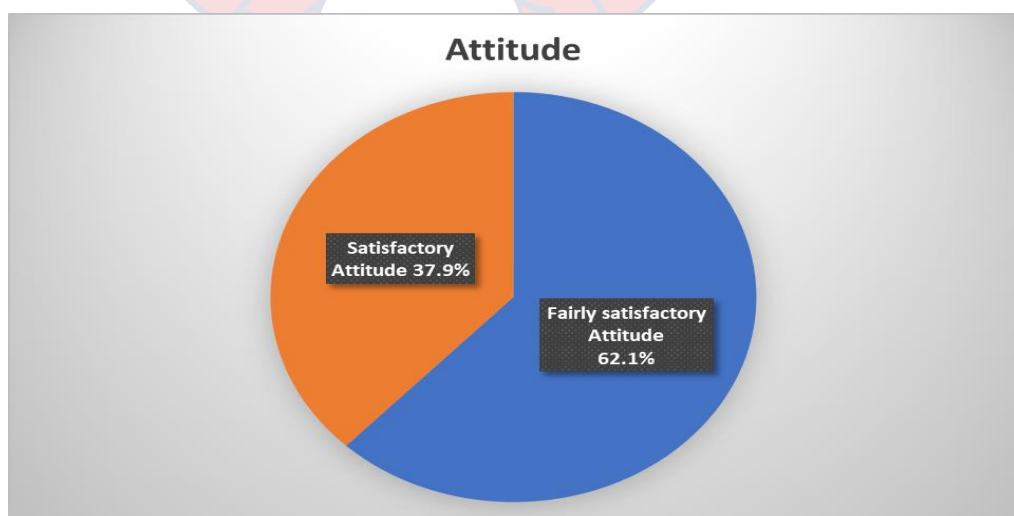
Source: Fieldwork (2018)

In evaluating the attitude of nurses and midwives toward oxygen therapy on a percentage scale, the mean percentage knowledge score toward attitude of the sampled nurses and midwives toward oxygen therapy was 75.93%. The minimum score was 55.00% and a maximum of 95.00%. Approximately four out of every ten (37.91%) selected nurses had satisfactory attitude ($\geq$ 80%) towards oxygen therapy while the remaining 62.09% of them had fairly satisfactory attitude (60% – 79%) on oxygen therapy. None of the nurses and midwives had unsatisfactory attitude ($\leq$ 59 %) towards the therapy. Figure 5 provides a visual representation of the data.

Measuring Practices of Nurses and Midwives Towards Safe Oxygen Therapy

Figure 6: Practice of nurses and midwives toward oxygen therapy
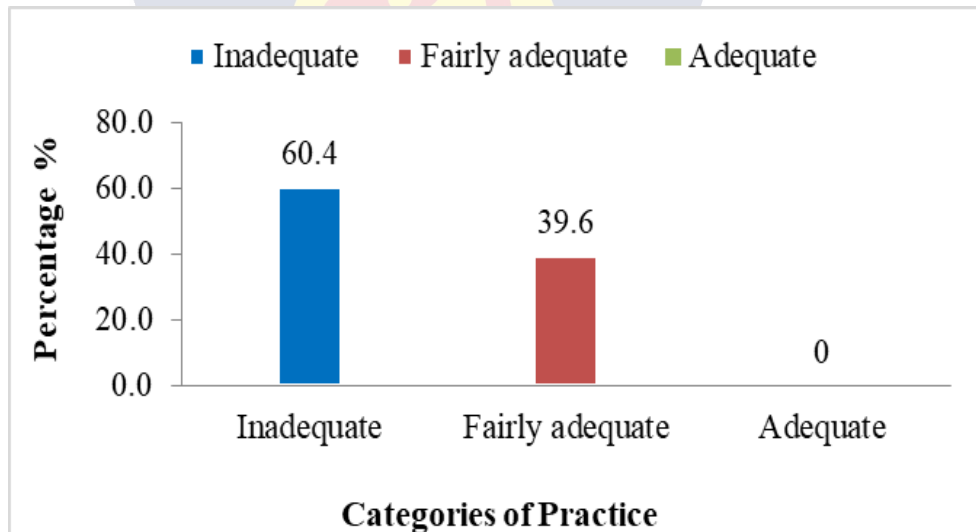
Source: Fieldwork (2018)

In assessing the kind of oxygen therapy practices carried out by the nurses and midwives at their various hospitals, the average percentage score recorded by the nurses and midwives was 36.26% with a minimum score of 5% and maximum of 75%. Based on their percentage scores, 60.40% were

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classified to have inadequate practice (≤ 59 %) while the remaining 39.60% of them were classified to have fairly adequate practice (60% – 79%). None of the nurses and midwives could be categorised to have adequate practice (≥ 80%). The distribution practice scores obtained from evaluating nurses and midwives' practices on oxygen therapy among the three hospitals is shown in Figure 6.

Resource Availability for O_2 Therapy in the Selected Hospitals

Figure 7: Resource Availability for O_2 Therapy in the Selected Hospitals
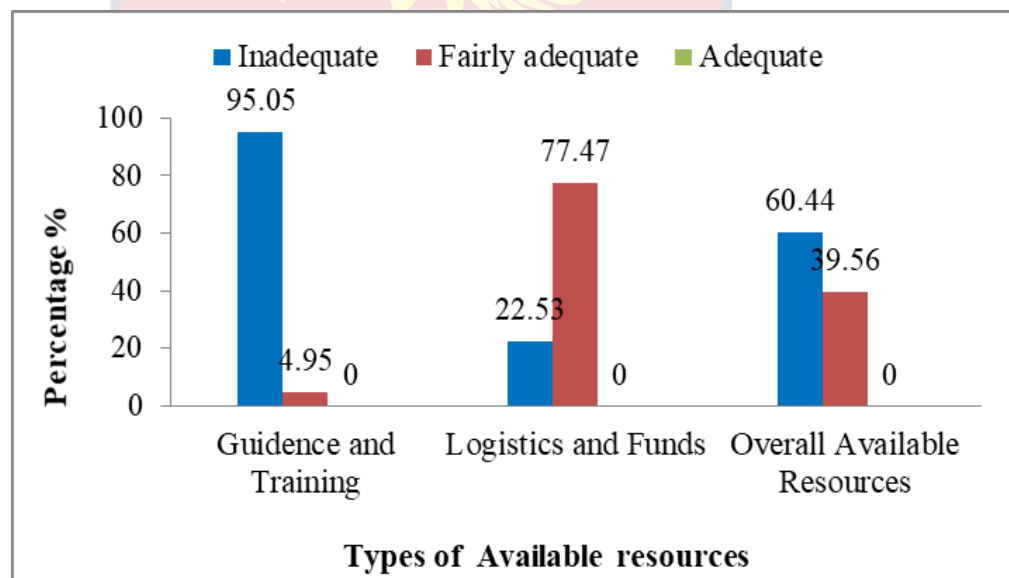
Source: Fieldwork (2018)

Resources available to nurses and midwives in the three hospitals in was assessed on a scale of 100% under four main categories "Guidelines", Staff training", "Logistics" and "Funds". Scoring them on a scale of 100%, the overall average resource available on oxygen therapy in the selected hospitals was 48.95% with a lowest score of 38.75% and highest of 63.75%. Thus, most (60.44%) of the nurses and midwives reported not to have adequate resources in their facility.

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In the quest of evaluating the level of guideline and staff training given by the facilities to boost the capacity of staffs to deliver oxygen therapy in a safe and effective manner, the mean score on guidelines or protocols and training on oxygen therapy recorded by the nurses was 39.21%. Almost all (95.0%) the respondents reported their hospitals had inadequate guidelines or protocols and staff training on oxygen therapy. Also, in respect to logistics and funds for safe and effective on oxygen therapy, the mean score observed was 54.19% with a least score of 40.38% and maximum of 73.08%. More than half (77.47%) of the nurses and midwives reported that their facilities had fairly adequate (60% – 79%) logistics and funds. Finally, according to the report from the nurses and midwives, none of the hospitals had adequate resources available towards oxygen therapy (Figure 7).
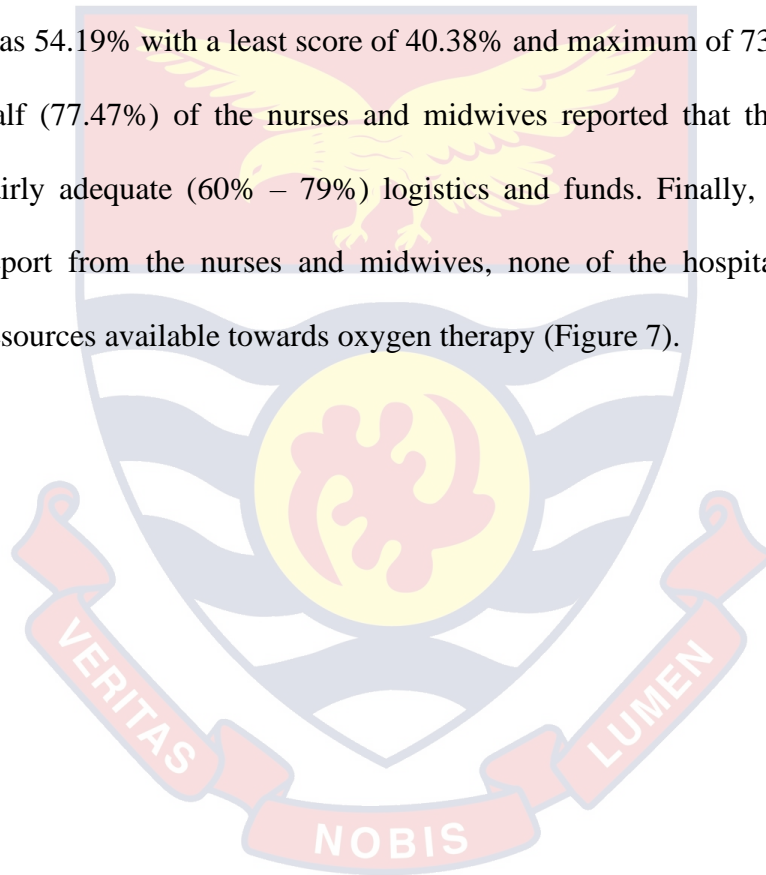
Nurses' and Midwives' Knowledge, Attitude and Practice in O₂ therapy, and Availability of Resources in the Three Selected Hospitals

Table 4: Nurses' and Midwives' Knowledge, Attitude and Practice in O2 Therapy, and Availability of Resources in the Three Selected Hospitals

	Health Facility			F	P-value
	X	Y	Z		
Percentage Knowledge score (Mean ± SD)	47.23 ± 10.86	44.68 ± 10.03	55.41 ± 12.93	11.29	<0.001
Percentage Practice score (Mean ± SD)	33.45 ± 13.9	33.45 ± 15.08	48.53 ± 18.4	13.45	<0.001
Percentage Attitude score (Mean ± SD)	73.51 ± 6.91	76.35 ± 5.05	80.29 ± 7.06	13.98	<0.001
Percentage Guidelines and staff training score (Mean ± SD)	35.67 ± 4.75	41.60 ± 3.98	41.70 ± 6.01	35.03	<0.001
Percentage Logistics and funds score (Mean ± SD)	51.30 ± 4.88	52.42 ± 4.46	64.37 ± 4.62	10.5	<0.001

F = frequency, SD= Standard Deviation

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In order to address the question whether there are significant differences in Knowledge, Attitudes and Practices regarding the safe delivery of oxygen among the nurses and midwives in the 3 selected hospitals and to know the level of resources available in each facility as reported by the nurses and midwives, participants were asked to rate their level of agreement with survey statements under each category. As mentioned earlier, of the 182 respondents, (40.66%) were from **Hospital X**, another (40.66%) from **Hospital Y**, the remaining (18.68%) were from **Hospital Z**.

Knowledge level (knowledge percentage score) on safe and effective oxygen therapy among the sampled nurses and midwives was compared using one-way ANOVA test as shown in Table 4. From the test, average knowledge scores by nurses were significantly different across the three hospitals (F=11.29, p<0.001). Nurses and midwives from **Hospital Z** had the highest average (55.41%) knowledge score on safety and effective oxygen therapy. Nurses and midwives from **X** and **Y** hospitals had average Percentage Knowledge score of 47.23% and 44.68% respectively.

Attitude of nurses and midwives towards oxygen therapy in the three hospitals were significantly different (F = 13.98, p<0.001). Nurses and midwives from **Hospital Z** had the best attitude on oxygen therapy compared to the nurses from the other hospitals. Nurses and midwives from **Hospital Z** had the highest average score of 80.29% while **X** and **Y** nurses and midwives had 73.51% and 76.35% respectively.

Comparing the practice on oxygen therapy among nurses and midwives from the three hospitals using their percentage scores, nurses and midwives from **Hospital Z** recorded the best average practice score of 48.53%

while nurses and midwives from **X** and **Y** hospitals had the same score 33.45% and this difference was statistically significant (F = 13.45, P<0.001).

Availability of resources in terms of guidelines, training, logistics and funds were classified into two groups namely "guidelines and staff training" and "logistics and funds". Availability of guidelines and staff training was better in hospitals **Z** and **Y** compared to **Hospital X** as they had significantly high average scores (F = 35.03, <0.001). However, in terms of logistics and funds, **Hospital Z** was most resourced to deliver oxygen therapy than **X** and **Y** hospitals. Thus, from the ANOVA **Hospital Z** had significantly higher score among all the other facilities (F=100.5, p<0.001). Table 4 shows details of the ANOVA test.

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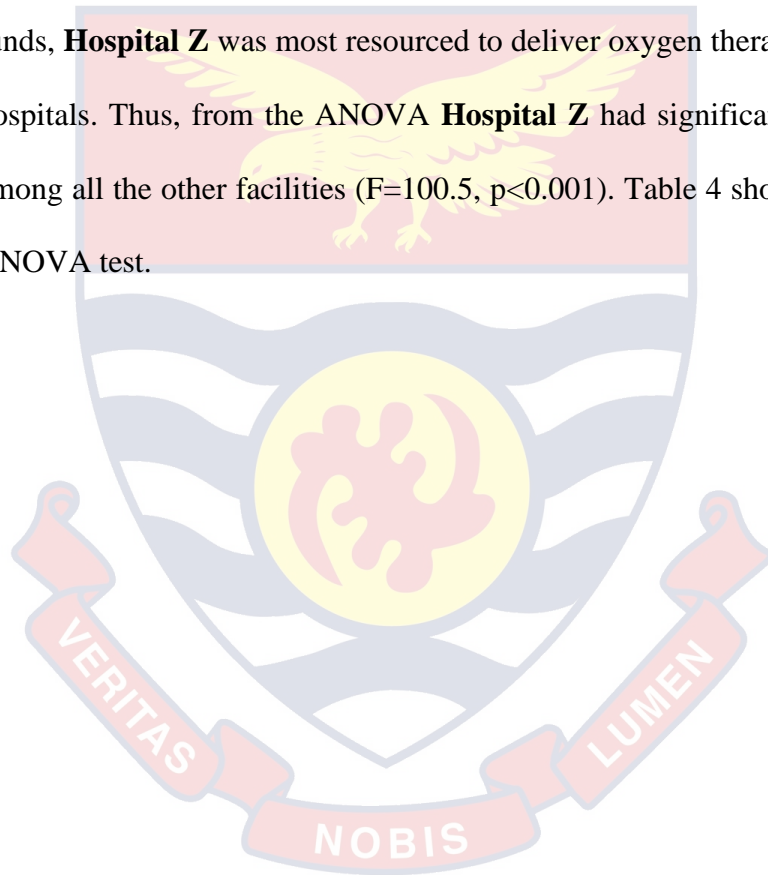
Factors Influencing Nurses' and Midwives' on their KAP on Safe and Effective Oxygen Therapy

Table 5: Multivariate Regression Analysis of factors influencing Nurses' and Midwives' KAP toward Safe and Effective O2 Therapy

	Percentage knowledge score		Percentage practice score		Percentage Attitude score		Joint Effect
	β (95% CI)	p-value	β (95% CI)	p-value	β (95% CI)	p-value	F- statistic, p-value
Facility Code		0.1483		0.0869		0.0362*	3.86, 0.0105
X	Ref		Ref		Ref		
Y	-3.54 (-7.82, 0.74)		0.10 (-5.91, 6.12)		1.80 (-0.59, 4.19)		
Z	1.79 (-6.43, 10.01)		12.22 (0.67, 23.78)		5.88 (1.29, 10.47)		
Sex		0.570		0.710		0.156	0.86, 0.4649
Male	Ref		Ref		Ref		
Female	-1.03 (-4.62, 2.55)		-0.95 (-6.00, 4.09)		1.45 (-0.56, 3.45)		
Age in years		0.159		0.420		0.391	1.06, 0.3691
18 – 30	Ref		Ref		Ref		
31 – 50	3.96 (-1.56, 9.49)		3.18 (-4.59, 10.95)		1.34 (-1.74, 4.43)		
Category of nurse		0.063		0.181		0.155	0.93, 0.4276
Midwife	Ref		Ref		Ref		
General nurse	11.07 (-0.60, 22.73)		11.15 (-5.24, 27.55)		-4.71 (-11.23, 1.80)		
Level of qualification		0.1546		0.1097		0.3295	0.73, 0.5331
Diploma	Ref		Ref		Ref		
Bachelor degree	0.62 (-4.26, 5.51)		3.41 (-3.46, 10.27)		2.03 (-0.69, 4.76)		
Master's degree	23.26 (-0.40, 46.93)		32.94 (-0.32,66.21)		-0.87 (--14.08,12.35)		
Ward		0.8045		0.0811		0.0493*	0.69, 0.5623
Male medical	Ref		Ref		Ref		
Female medical	-1.61 (-5.53, 2.30)		-4.33 (-9.83, 1.18)		1.55 (-0.64, 3.74)		
Male surgical	0.20 (-6.53, 6.93)		1.80 (-7.66, 11.26)		4.71 (0.95, 8.47)		
Female surgical	-5.36 (-21.43, 10.72)		-12.59 (-35.19, 10.00)		-3.80 (-12.78, 5.17)		
Paediatric	-3.24 (-14.27, 7.80)		-18.98 (-34.49, --3.47)		-4.14 (-10.30, 2.02)		
Labour	-6.25 (-18.52, 6.02)		-5.11 (-22.36, 12.14)		3.41 (-3.45, 10.26)		

Table 5 (Continued) - *Multivariate Regression Analysis of factors influencing Nurses' and Midwives' KAP toward Safe and Effective O2 Therapy*

	Percentage knowledge score	Percentage practice score	Percentage Attitude score	Joint Effect

	β (95% CI)	p-value	β (95% CI)	p-value	β (95% CI)	p-value	F- statistic, p-value
Area of Specialty		0.1455		0.5316		0.1907	1.50, 0.2175
Critical care	Ref		Ref		Ref		
Midwifery	-3.79 (-20.98, 13.39)		-3.93 (-28.09, 20.24)		-5.16 (-14.76, 4.44)		
Paediatric	-13.88 (-28.49, 0.73)		-5.19 (-25.72, 15.35)		2.47 (-5.69, 10.63)		
None	-13.14 (-27.05, 0.77)		-8.75 (-288.31, 10.80)		1.22 (-6.55, 8.98)		
Working experience in years		0.8928		0.4322		0.1364	0.88, 0.4545
≤ 1	Ref		Ref		Ref		
2-5	-1.31 (-8.77, 6.16)		7.64(-2.85, 18.13)		-4.77 (-8.94, -0.61)		
6-9	-0.36 (-7.90, 7.19)		4.98 (-5.63, 115.58)		-4.24 (-8.45, -0.03)		
≥ 10	2.01 (-10.64, 14.67)		8.38 (-9.41, 26.17)		-6.49 (-13.55, 0.58)		
Had any oxygen therapy training		0.668		0.142		0.454	1.01, 0.3899
No							
Yes	0.76 (-2.75, 4.27)		-3.68(-8.62, 1.25)		-0.74 (-1.22, 2.70)		
Percentage on Guidelines and Staff training	0.30 (-0.09, 0.70)	0.134	-0.10 (-0.65, 0.46)	0.729	0.12 (-0.10, 0.34)	0.290	1.49, 0.5388
Percentage on Logistics and Funds	0.38 (0.02, 0.75)	0.039*	0.51 (-0.002, 1.02)	0.051	-0.05 (-0.25, 0.15)	0.617	2.18, 0.0021
Model Performance							
Coefficient of determination (R-squared)	**23.63%**		**25.95%**		**29.52%**		
F, p-value	**2.28, 0.0022**		**2.59, 0.0005**		**3.09, <0.0001**		

In Table 5, a multivariate linear multiple regression model was used to present results of factors such as demographic characteristics and availability of resources (Guidelines and Staff training; Logistics and Funds) influence nurses and midwives' knowledge, attitude and practices toward safe and effective oxygen therapy. From the models, the only factor significantly predictive of nurses' and midwives' knowledge on safety and effective oxygen therapy was the availability of resources in terms of logistics and funds. Thus, every 1% increase in logistics and funds availability score leads to a corresponding 0.38% (95% CI: 0.02 - 0.75%, p-value <0.05) holding other covariates fixed. The multivariate linear multiple regression model showed that place of work as well as and ward were significantly associated with nurses' and midwives' attitude (score) toward on oxygen therapy (p<0.05). Nurses and midwives from **Z** and **Y** hospitals scored 5.88% (95% CI: 1.29 - 10.47%) and 1.80% (95% CI: -0.59 - 4.19%) respectively higher in attitude score compared to nurses from **Hospital X**. While nurses and midwives from the Female medical, Male surgical, Labour ward performed 1.55% (955 CI: -0.64 - 3.74), 4.71% (95% CI: 0.95 – 8.47) and 3.41% (95% CI: -3.45 – 10.26) respectively higher in attitude scores than nurses at the male medical ward, those at Female surgical and Paediatric wards had -3.80% (95 CI% : -12.78 - 5.17) and -4.14% (95% CI: -10.30 – 2.02) respectively lower attitude scores than nurses at the male medical ward. None of the demographic characteristics, guidelines and staff training of the respondents was significantly predictive of the nurses' percentage practice score (p>0.05).

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CHAPTER FIVE

DISCUSSION

Introduction

Oxygen is considered as a double-edged sword having both positive biological benefits and toxicity effects. Thus, this drug therapy has the potential to cause great harm to patients and even death if administered and managed in appropriately (Poole,2011; Howell,2001). Patients must receive this therapy in an appropriate, safe and comfortable manner and this depends on an understanding of why oxygen is being administered, familiarity with the oxygen delivery devices, triggers for changing device and flow rate and nursing needs of the patients receiving it (Mahmoud et al., 2016).

In this regard, the aim of this study was to assess of knowledge, attitude and practices of nurses and midwives in selected group of hospitals in Tarkwa Nsuaem Municipality, Western Region in Ghana on safe administration of oxygen to patients. It also aims to examine if a predictive relationship exists between availability of resources and the level of nurses' and midwives' knowledge, attitude and practices.

The respondents were made up of 182 registered nurses and midwives, with 55 nurses from the Male medical ward, 89 from the Female medical, 16 from Male medical, 2 from the Female surgical, 6 nurses from the Paediatric and 12 midwives from the Labour ward. The socio demographic trends show that the majority of the respondent were within 20-29 years age bracket. In terms of gender, slightly more than 50% of the participants in this study were females. The reason behind this may that women have always vastly outnumbered men in the nursing profession through the efforts of Florence

Nightingale in the mid-nineteenth century, nursing was recognized as a women's profession. In regards to the employment profile, 48.35% of respondents indicated that they had an average of 2 to 5 years working experience and 71.35% respondents with no speciality area. General Nurses (93.41%) were the dominating nursing professionals and 80.77% of the overall sample were diploma nurses.

Knowledge of Nurses and Midwives Toward Oxygen Delivery

Assessment of nurses' knowledge on oxygen therapy was mainly focused on consideration of oxygen as drug, indications of oxygen therapy, targeted oxygen saturation per condition and familiarity with delivery devices. Although the procedure of oxygen therapy is common in nursing practice, many errors are observed originating from the entrenched culture in practice of many nurses and other health professionals' that 'more oxygen is better' or 'more oxygen won't hurt'. Many also do not realise that oxygen is a drug. This study documented that there was little or no insight among the respondents on the serious adverse effects on oxygen therapy associated with its inappropriate under- or- over use, as over two- thirds of the respondents believed that oxygen can be given in breathless but non-hypoxemic state, a situation where oxygen is not indicated. Also, more than 50% of the respondents believe that the oxygen flow rate for a simple face mask can be less than 5 LPM, where in this state a flow rate less than 5 L/minute may cause rebreathing of carbon dioxide and result in life-threatening hypercapnia (higher than normal levels of carbon dioxide in arterial blood). Overall, the findings in this study showed that knowledge level of respondents on O_2 therapy in aspects such as

indication, assessment, monitoring and management of patients on the therapy was fairly adequate to inadequate ($< 80\%$). A similar observation was made in previous studies (Ganeshan et al., 2006; Adipa et al., 2015; Lemma, 2015; Mahmound et al., 2016; Goharani et al., 2017), which taken together found knowledge gap among nurses, midwives and other health professionals on areas including the indication of oxygen therapy, normal oxygen saturation, oxygen delivery devices and flow rate. This suggests a need to integrate periodic retraining on O_2 therapy into clinical nursing practice to enhance competent management. As nurses and midwives are often responsible for the administration of oxygen therapy, it is imperative for them to have awareness on the principles of O_2 therapy as well as understanding and adhering to expert guidelines on O_2 therapy.

Attitude of Nurses and Midwives Towards Oxygen Delivery

Attitudes of nurses and midwives towards oxygen therapy from the three selected hospitals for this study were significantly different (F = 13.98, p<0.001). Overall, about four out of every ten (37.91%) selected nurses had favourable attitude ($\geq 80\%$) towards oxygen therapy while the remaining 62.09% of them had fairly favourable attitude (50.00 – 79.99%) on oxygen therapy. It is possible to link this negative behavioural attribute to the high knowledge gap reported by the registered nurses and midwives who participated in this study. The fairly favourable attitudes that appear to be present in the majority of the respondents in this survey, suggest that proper information, sufficient knowledge on O_2 therapy is needed, which may influence the willingness of the nurses and midwives on the need to practice in

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concordance to the evidence-based physiological principles and guideline on this drug therapy.

Practices of Nurses and Midwives on Oxygen Delivery

Like most previous studies, this study showed that the overall practice on oxygen therapy by nurses and midwives was fairly adequate to inadequate (Lemma, 2015). However, the practice on oxygen therapy differed among the nurses and midwives from the three selected hospitals for this study, this difference was statistically significant (F = 13.45, P<0.001). The evidence of discrepancy in clinical practice among respondents from the selected hospital with an overall high practice gaps could be related to the high knowledge gap, fair attitudes of respondents and reported limited needed resources for oxygen therapy in the three selected hospitals in this study. Therefore, it is recommended that proper training, regular auditing and review of safe and effective clinical practice on the therapy should be done to curb the conflicts and confusion on the entire area of this drug therapy. However, attention also needs to be given to barriers that may make it difficult to incorporate competent measures needed for the practice of safe patient care and will need to be addressed.

Availability of Resource in the Selected Hospitals

The availability of resources needed for oxygen therapy was evaluated to aid in predicting whether this factor influences the knowledge, attitude and practices of nurses and midwives in the provision of oxygen. In this study, differences in the availability of resources in terms of guidelines, staff training, logistics and funds were observed among the selected hospitals in this

study. Out of the 182 respondents in this study, 114 representing 62.6% of respondents never had the privilege to attend any training on oxygen therapy. Approximately 48.9% of the respondents strongly disagreed while 51.1% disagreed when asked about availability of written guidelines on oxygen therapy in their facilities. Evaluating the overall availability of resources in the selected hospitals, most (60.44%) of the nurses and midwives reported not to have adequate resources in their facility. Similarly, studies by previous authors revealed lack of protocol to prescribe oxygen in the ward, staff training and shortage of oxygen supply and delivery devices in the various hospitals (Lemma, 2015; Goharani et al., 2017). Among the numerous factors that may influence the quality and outcome of oxygen therapy, adequate availability of resources provided by health facilities cannot be excluded. Health facilities must put in place measures to ensure safe and effective administration of oxygen therapy by providing and mandating all nursing personnel and other health professionals in participating in training programs on O_2 therapy, adhering to expert protocols and guidelines on O_2 therapy (Brokalaki et al., 2004) and providing adequate delivery systems among other resources.

As the availability of needed resources is central to oxygen therapy and may influence the knowledge, attitude and practices nurses, its shortage should be discouraged. In this study, reports from most of the respondents working in the government hospitals revealed that O_2 delivery devices are mostly procured by patients' relatives, not covered by National Health Insurance Scheme (NHIS) and perceived to be very expensive which contributes to the re-usage of disposable devices and the usage of wrong delivery devices for a specific patient condition leading to spread of nosocomial infections and other

complications related to the wrongful use of O_2 delivery devices. Hence, it is advocated that delivery devices should be subsidized to enable patients' family to afford or the cost of the devices should be covered by the NHIS.

CHAPTER SIX

MAIN FINDINGS, CONCLUSION AND RECOMMENDATION

Introduction

Oxygen therapy is not risk free and has detrimental effects on patients and even death if not administered and managed appropriately (Howell, 2011). Failure in considering oxygen as a drug, wrongly prescription of oxygen and flow rate, improper monitoring of patient, lack of right delivery devices, and equipment failure such as empty or disconnected oxygen supplies, or accidental connection to air outlets instead of oxygen outlets are some common global issues contributing to the inappropriate administration of this therapy. Ensuring safe and effective delivery of oxygen therapy is an important aspect of patient care and vital to the nursing profession. This study sought to identify the depth of knowledge, attitude and practices on oxygen therapy among nurses and midwives in three selected hospitals in Tarkwa Nsuaem Municipality, Western Region of Ghana.

Main Findings

The appropriate recognition of the need for oxygen and its efficient administration using the right delivery device can have a significant impact on treatment tailored to quality patient needs. Selecting the right device can also lead to efficient use of resources; thus, oxygen, equipment for oxygen therapy and nursing time. However, in the selection of the right device with an appropriate flow rate can be challenging as most healthcare professionals are unfamiliar with the oxygen delivery devices coupled with a lack of practical information on oxygen therapy.

The main findings from this study reported that the overall level of knowledge of respondents on O_2 was fairly adequate to inadequate. 1.10% of the respondents were considered to have adequate knowledge ($\geq$ 80%), 37.36% had fairly adequate (50-79.99%) and 61.54% with inadequate knowledge (<50%). About 4 out of 10 (37.91%) selected nurses and midwives had satisfactory attitude ($\geq$ 80) toward O_2 therapy, while the remaining 62.09% had fairly satisfactory attitude. None of the respondent had unsatisfactory attitude toward the therapy. Also, none of the nurses and midwives could be categorized to have adequate practice ($\geq$80%), with 60.40% classified to have inadequate practice (<50%). In addition, majority of the respondent reported not to have adequate resources (*guidelines & staff training, logistics & funds*) in their facility. 57.14% of the respondents purportedly trained on O_2 therapy. Furthermore, the average Knowledge, Attitude and Practice scores by the nurses and midwives were significantly different across the three selected hospitals (F=11.29,13.45 and 3.98 respectively, p<0.001). Nurses and midwives from Hospital Z had the highest average scores on knowledge, attitude and practice (55.41%, 48.53% and 80.29% respectively) compared to the nurses from other hospital. Also, availability of guideline and staff training was better in Hospitals Z and Y (F=35.03, <0.001) compared to Hospital X. The facility and ward were significantly associated with nurses' and midwives attitude score in O_2 therapy(p<0.05). Resource availability in terms of *logistics and funds* was the only factor significantly predictive of the respondents' level of knowledge on O_2 therapy (*p-value of 0.039*).

Conclusions

Based on the findings, the following conclusions were drawn:

1) Majority of the respondents had knowledge and practice gap on oxygen therapy.

2) The most reported errors on oxygen therapy in this study were that majority of the respondents

- did not consider oxygen as a drug

- could not select the right delivery device per patient's need

- could not select specific dose of oxygen to meet the patient's need

- could not estimate duration of oxygen cylinder in use

- had poor monitoring and assessment skills.

3) Adherence to evidence-based guidelines help to achieve optimal blood oxygen levels for all patients and thus reducing the serious adverse effects that are associated with inappropriate under- or over-use of oxygen

4) Furthermore, the expensive prices on oxygen delivery devices which are disposable with no insurance coverage contributes to the re-usage and / or wrong usage of the devices in most of the hospitals under study

5) Most of the hospitals were under resourced in terms of guidelines on oxygen therapy, staff training, logistics and funds.

6) Evidence of discrepancy in the clinical practice gaps among respondents from the selected hospitals with an overall high practice gap could be related to the high knowledge gap, fair attitudes of

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respondents and reported inadequate availability of resources for the therapy.

Recommendations

Based on the findings and the conclusions adduced, the following recommendations were made:

In-service unit should

a) Have periodic retraining on oxygen therapy in the form of training courses and workshops to enhance their attitude and knowledge on oxygen therapy and also to ensure standard quality of nursing practice in this area.

Nurses and midwives should

a) Practice in concordance to the evidence-based physiological principles and guidelines on oxygen therapy.

To Health Service Managers should

a) Ensure that all logistics needed to render quality patient care in oxygen administration are available and functional

b) Ensure guidelines on O_2 therapy are accessible to every staff.

c) Display educational posters that consist of causes of oxygen toxicity, signs and symptoms of oxygen toxicity including simple, practical and evidence-based recommendations on optimal oxygen therapy boldly on every ward (flow charts) to increase knowledge and practice of the all staff.

d) As oxygen therapy is noted to be very expensive and most hospitals globally have a user-pays health system, health service managers

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should collaborate with policy makers in ascertaining a financing scheme to make oxygen more affordable.

For nursing education

a) Nursing and midwifery instructors should incorporate sound curriculum and educational strategic designs that may prepare graduates to be competent, in terms of knowledge and clinical skills on oxygen therapy, which are required for practice of safe patient care.

For further research

a) Research could be done involving other health professional who administer and/or prescribe oxygen therapy using a triangulation approach to provide holistic understanding to the oxygen therapy phenomena.

b) Other future studies could focus on nurses' and other health providers' knowledge on airway management. As airway patency is critical in oxygen therapy.

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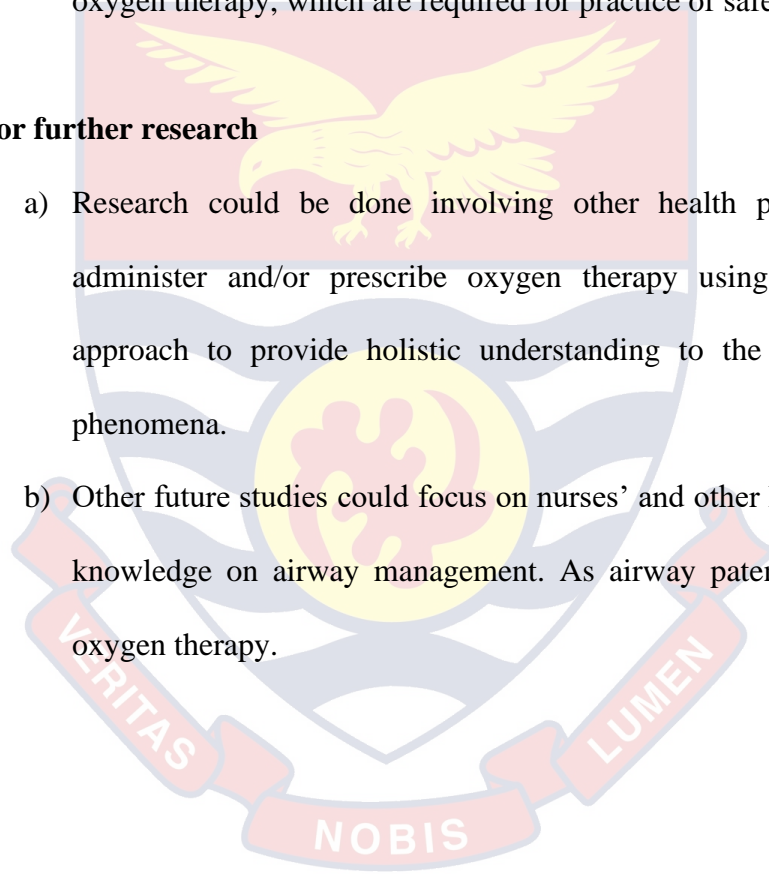
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APPENDICE

Appendix A

Data Collection Instrument

Self-Administered Questionnaire for Nurses and Midwives

Safe and Effective Oxygen Therapy Delivery: Assessing Knowledge, Attitude

and Practice of Nurses Working in Selected Hospitals, Tarkwa Nsuaem

Municipality

This is a self-administered research questionnaire designed for nurses and midwives who are currently working in the hospital ward settings to assess their knowledge, attitude and practices on safe and effective administration of oxygen.

Your active participation in this study will aid significantly in identifying the gaps as well as help develop possible solutions and recommendations.

Filling this questionnaire will take about 10-15 minutes to complete. I would kindly like to emphasis that your involvement is **VOLUNTARY** and to maintain your **ANONYMITY** please do not put any identifying information on the survey. Thank you.

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Hospital code: ……………………

SECTION A: DEMOGRAPHICS DATA

The purpose of this section of the survey is to establish your background information. Please answer all of the following questions.

Please tick where appropriate

1. **Gender**

   A) Male   [   ]

   B) B) Female   [   ]

2. **Age**

   A) < = 20 years   [   ]

   B) 21–30 years   [   ]

   C) 31-40 years   [   ]

   D) 41-50 years   [   ]

   E) > 50 years   [   ]

3. **Category of nursing profession**

   A) General nurse   [   ]

   B) B) Midwife   [   ]

4. **Educational level**

   A) Diploma   [   ]

   B) C) Master's degree   [   ]

   C) Bachelor degree   [   ]

5. **Ward**

   A) Male medical   [   ]

   B) Female surgical   [   ]

   C) Female medical   [   ]

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D) Paediatric   [   ]

E) Male surgical   [   ]

F) Labour   [   ]

6. **Speciality area**

A) Critical care   [   ]

B) Midwifery   [   ]

C) Paediatric   [   ]

D) Other ……………

7. **Working experience**

A) < = 1 year   [   ]

B) 2-5 years   [   ]

C) 6-9 years   [   ]

D) D) 10-13 years   [   ]

E) E) > = 14 years   [   ]

8. **Have you had any training on oxygen therapy?**

A) Yes   [   ]

B) No   [   ]

SECTION B

Table 6- *Knowledge on oxygen therapy*

To complete this section, please write "X" according to your response				
No.	**Statements**	**Yes**	**No**
9.	Oxygen can be classified as a drug.		
10.	Oxygen should be prescribed with a target saturation range.		

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11.	Oxygen needs to be prescribed in all situations except for immediate emergency management.		
12.	Bluish colour seen around the mouth is a sign of respiratory distress		
13.	SpO$_2$ greater than 98% is a sign of respiratory distress.		
14.	Breathless but non-hypoxemic state is an indication for oxygen therapy		
15.	Dizziness, headache, restlessness and tingling are signs of oxygen loss.		
16.	Twitching of perioral and small muscles of the hand are not signs of oxygen toxicity.		
17.	A nurse cannot change the amount of oxygen administered, up or down, to maintain target saturation		
18.	The recommended target saturation for patient at risk of type 2 respiratory failure is 94-98%.		
19.	Patients with chronic obstructive pulmonary disease (COPD), morbid obesity, cystic fibrosis and those using respiratory depressant drugs are not at risk of type 2 respiratory failures.		
20.	If 40% oxygen concentration is needed, using the nasal prongs the flow rate should be 3 LPM.		
21.	The oxygen flow rate should not exceed 6 LPM when using nasal prongs.		
22.	When using a simple face mask on a patient, the oxygen flow rate can be less than 5 LPM.		
23.	The flow rate for a non rebreather mask should range between 4-8LPM.		
24.	Uncontrolled administration of oxygen can cause damage to vital organs in the body.		
25.	Engaging patient/family in understanding the procedure of oxygen therapy increases compliance		
26.	Oxygen is not a flammable gas but it does support combustion.		

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27.	The image of the oxygen delivery device shown above is nasal prongs		
28.	The image of the oxygen delivery device shown above is simple face mask		

SECTION C

Table 7- *Practices on oxygen therapy*

To complete this section, please write "X" according to your response			
No.	**Statements**	**Yes**	**No**
29.	Pulse oximetry estimates the arterial oxygen saturation of haemoglobin		
30.	A patient in your ward is on oxygen therapy at 10 LPM and the amount of oxygen in cylinder in used is currently 460 L, hence the oxygen cylinder may last for 36 minutes.		
31.	Your patient is on oxygen at 4 LPM, and the oxygen cylinder is 1500 litres. Is there sufficient oxygen supply for the patient for 30 minutes treatment and 2 hours travel time?		
32.	Venturi mask delivers precise FiO_2		

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SECTION D

Table 8- *Attitude towards oxygen therapy*

No	Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
33.	Using expert guidelines or protocols on oxygen therapy is advantageous as opposed to intuition.				
34.	Using the guideline on oxygen therapy is not complex.				
35.	It is important to document all observation made during oxygen deliver.				
36.	It is important to monitor patient's reaction to oxygen.				
37.	Oxygen therapy procedure is a worthwhile learning experience.				

The table heading row:

To complete this section, please write "X" according to your response

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SECTION E

Table 9- *Availability of resource*

To complete this section, please write "X" according to your response				
Statement	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
GUIDELINES				
38. There is a written guideline on O_2 therapy in my ward				
39. Guidelines or protocols on O_2 therapy are used by all staffs				
40. Guidelines on O_2 therapy are accessible				
41. Guidance on O_2 therapy are displayed boldly on every ward (flow charts)				
42. Guidelines on O_2 therapy are reviewed periodically				
STAFF TRAINING				
43. Staffs are trained on O_2 therapy in the facility				
44. Staffs are sponsored to have training on oxygen therapy				
LOGISTICS				
45. Oxygen cylinders are the main models for oxygen supply in the facility				
46. Concentrators are the main models for oxygen supply in the facility				
47. The main models for oxygen supply in the facility is a central source				
48. Every ward has its own model for oxygen supply (cylinder, concentrator, etc.)				
49. Oxygen is always available in the facility				

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50.	We have at least one pulse oximeter per ward				
51.	Faulty equipment for O_2 therapy is readily replaced or repaired				
52.	When treating acutely ill patient, our facility has access to the simple face mask				
53.	When treating acutely ill patient, our facility has access to a 24% Venturi mask				
54.	When treating acutely ill patient, our facility has access to a non rebreather mask				
55.	When treating acutely ill patient, our facility has access to a nasal prongs				
FUNDS					
56.	Administration of oxygen is covered by NHIS				
57.	Patient buy their own oxygen delivery devices				

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Appendix B

Staff confidential statement

I promise to keep all information regarding data collection private. I shall not discuss or reveal any information obtained to anyone other than the researcher and other staff in this project.

Name……………………………………

Date…………………………………………….

Signature…………………………………….

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Appendix C

Table 10- **Nurses' and Midwives' Responses to Knowledge Questions on Oxygen Therapy**

No.	Statements	Correct n (%)	Incorrect n (%)
9.	Oxygen can be classified as a drug.	94(51.65)	88(48.35)
10.	Oxygen should be prescribed with a target saturation range.	81(44.51)	101(55.49)
11.	Oxygen needs to be prescribed in all situations except for immediate emergency management.	77(42.31)	105(57.69)
12.	Bluish colour seen around the mouth is a sign of respiratory distress.	86(47.25)	96(52.75)
13.	SpO_2 greater than 98% is a sign of respiratory distress.	62(34.07)	120(65.93)
14.	Breathless but non-hypoxemic state is an indication for oxygen therapy.	70(38.46)	112(61.54)
15.	Dizziness, headache, restlessness and tingling are signs of oxygen loss.	74(40.66)	108(5934)
16.	Twitching of perioral and small muscles of the hand are not signs of oxygen toxicity.	69(37.91)	113(62.09)
17.	A nurse cannot change the amount of oxygen administered, up or down, to maintain target saturation.	61(33.52)	121(66.48)

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18.	The recommended target saturation for patient at risk of type 2 respiratory failure is 94-98%.	63(34.62)	119(65.38)
19.	Patients with chronic obstructive pulmonary disease (COPD), morbid obesity, cystic fibrosis and those using respiratory depressant drugs are not at risk of type 2 respiratory failures.	59(32.42)	123(67.58)
20.	If 40% oxygen concentration is needed, using the nasal prongs the flow rate should be 3 LPM.	98(53.85)	84(46.15)
21.	The oxygen flow rate should not exceed 6 LPM when using nasal prongs.	74(40.66)	108(59.34)
22.	When using a simple face mask on a patient, the oxygen flow rate can be less than 5 LPM.	77(42.31)	105(57.69)
23.	The flow rate for a non rebreather mask should range between 4-8LPM.	82(45.05)	100(54.95)
24.	Uncontrolled administration of oxygen can cause damage to vital organs in the body.	84(46.15)	98(53.85)
25.	Engaging patient/family in understanding the procedure of oxygen therapy increases compliance	63(34.62)	119(65.38)
26.	Oxygen is not a flammable gas but it does support combustion.	84(46.15)	98(53.85)

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27.

69(37.91)   113(62.09)

The image of the oxygen delivery device shown above is nasal prongs

28.

62(34.25)   119(65.75)

The image of the oxygen delivery device shown above is simple face mask

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Table 11- *Nurses' and Midwives' Responses to Practices Questions on oxygen therapy*

| No.	Statements	Correct n (%)	Incorrect n (%)
29.	Pulse oximetry estimates the arterial oxygen saturation of hemoglobin	124(68.13)	58(31.87)
30.	A patient in your ward is on oxygen therapy at 10 LPM and the amount of oxygen in cylinder in used is currently 460 L, hence the oxygen cylinder may last for 36 minutes.	62(34.07)	120(65.93)
31.	Your patient is on oxygen at 4 LPM, and the oxygen cylinder is 1500 liters. Is there sufficient oxygen supply for the patient for 30 minutes treatment and 2 hours travel time?	53(29.12)	129(70.88)
32.	Venturi mask delivers precise FiO2	25(13.74)	157(86.26)
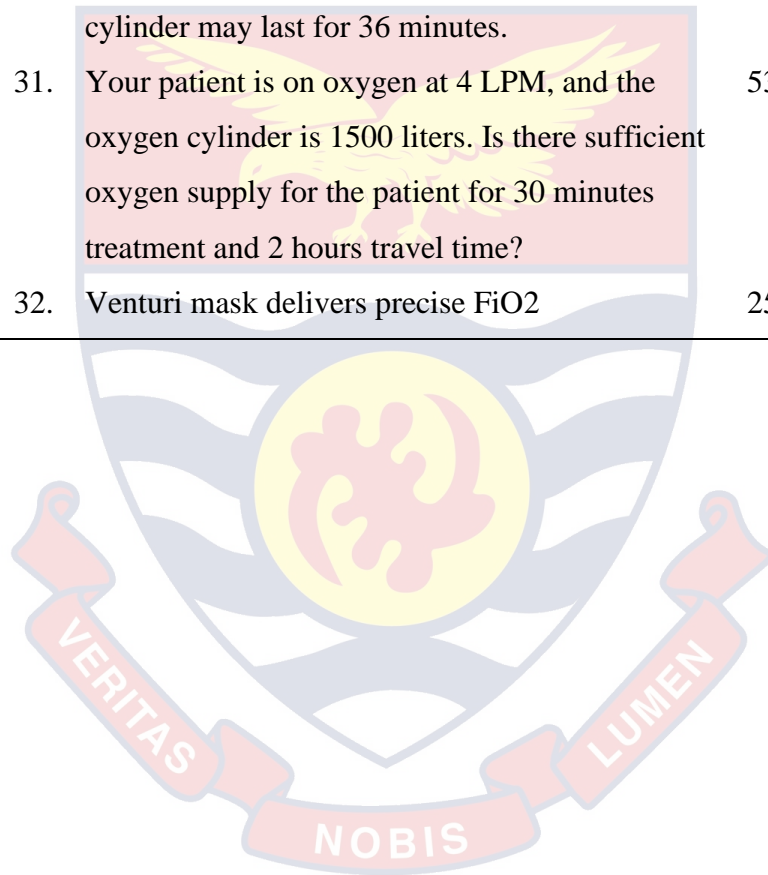
Table 12- *Nurses' and Midwives' Responses to Attitude Questions toward oxygen therapy*

No.	Statement	Strongly Disagree	Disagree	Agree	Strongly Agree

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		1	2	3	4
		n (%)	n (%)	n (%)	n (%)
33.	Using expert guidelines or protocols on oxygen therapy is advantageous as opposed to intuition.	1(0.55)	63(34.62)	98(53.85)	20(10.99)
34.	Using the guideline on oxygen therapy is not complex.	0	84(46.15)	87(47.8)	11(6.04)
35.	It is important to document all observation made during oxygen deliver.	0	10(5.49)	102(56.04)	70(38.46)
36.	It is important to monitor patient's reaction to oxygen.	0	13(7.14)	113(62.09)	56(30.77)
37.	Oxygen therapy procedure is a worthwhile learning experience.	0	15(8.24)	103(56.59)	64(35.16)

Table 13- *Nurses' and Midwives Responses to Availability of Resources in the selected hospitals*

Statement	Strongly Disagree	Disagree	Agree	Strongly Agree
	1	2	3	4
	n (%)	n (%)	n (%)	n (%)
GUIDELINES				
38. There is a written guideline on O_2 therapy in my ward	89(48.9)	93(51.1)	**0**	**0**
39. Guidelines or protocols on O_2 therapy are used by all staffs	63(34.62)	117(64.29)	2(1.1)	**0**
40. Guidelines on O_2 therapy are accessible	69(37.91)	69(37.91)	69(37.91)	**0**
41. Guidance on O_2 therapy are displayed boldly on every ward (flow charts)	33(18.13)	145(79.67)	4(2.2)	**0**

| 42. | Guidelines on O_2 therapy are reviewed periodically | 93(51.1) | 89(48.9) | **0** | **0** |

STAFF TRAINING

| 43. | Staffs are trained on O_2 therapy in the facility | 114(62.64) | 68(37.36) | **0** | **0** |
| 44. | Staffs are sponsored to have training on oxygen therapy | 96(52.75) | 86(47.25) | **0** | **0** |

LOGISTICS

45.	Oxygen cylinders are the main models for oxygen supply in the facility	20(10.99)	109(59.89)	36(19.78)	17(9.34)
46.	Concentrators are the main models for oxygen supply in the facility	69(37.91)	112(61.54)	1(0.55)	**0**
47.	The main models for oxygen supply in the facility is a central source	80(43.96)	79(43.41)	22(12.09)	1(0.55)
48.	Every ward has its own model for oxygen supply (cylinder, concentrator, etc.)	48(26.37)	91(50)	16(8.79)	27(14.84)
49.	O_2 is always available in the facility	46(25.41)	86(47.51)	28(15.47)	21(11.6)
50.	We have at least one pulse oximeter per ward	43(23.63)	92(50.55)	21(11.54)	26(14.29)
51.	Faulty equipment for O_2 therapy is readily replaced or repaired	16(8.79)	95(52.2)	50(27.47)	21(11.54)

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52. When treating acutely ill patient, our facility has access to the simple face mask	36(19.78)	100(54.95)	27(14.84)	19(10.44)
53. When treating acutely ill patient, our facility has access to a 24% Venturi mask	62(34.07)	106(58.24)	13(7.14)	1(0.55)
54. When treating acutely ill patient, our facility has access to a non-rebreather mask	3(1.65)	82(45.05)	76(41.76)	21(11.54)
55. When treating acutely ill patient, our facility has access to a nasal prong	13(7.14)	19(10.44)	122(67.03)	28(15.38)
FUNDS				
56. Administration of oxygen is covered by NHIS	73(40.11)	109(59.89)	**0**	**0**
57. Patient buy their own oxygen delivery devices	25(13.74)	13(7.14)	131(71.98)	13(7.14)

Appendix D

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Introductory Letter

12/11/2017

The Dean

School of Nursing and Midwifery

University of Cape Coast

Dear Sir,

<u>APPLICATION FOR AN INTRODUCTORY LETTER</u>

I am Theresa Dede Tisei, a final year Master of Nursing student of School of Nursing and Midwifery. I and currently undertaking research on the topic: **Assessing Knowledge and Practice of Nurses on Safe and Effective Oxygen Therapy Delivery: A Study at Tarkwa**

The objective of this letter is to kindly request an introductory letter from the school to the selected hospitals in Tarkwa where my study will be done. As part of my requirement for data collection in the selected hospitals, I am required to present a letter from the school.

I look forward to your usual cooperation.

Thank you.

Yours Sincerely,

………………..

Theresa Dede Tisei

Appendix E

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Letter for Ethical Clearance

12/12/2017

The Chairman

Institutional Review Board

University of Cape Coast

Cape-Coast

Dear Sir,

<u>Application for Ethical Clearance</u>

I am Theresa Dede Tisei, a registered nurse working at the Tarkwa Mines Hospital, Tarkwa. Currently I am a student of School of Nursing and Midwifery, University of Cape Coast undertaking Master of Nursing research thesis with the index number **SN/MNS/16/0004.**

The aim of the study is to assess "Knowledge and Practice of Nurses on Safe and Effective Oxygen Therapy Delivery: A Study at Tarkwa – Nsuaem Municipality".

The participants will be registered nurses working as staff in the ward settings in three randomly selected hospitals at Tarkwa Nsuaem Municipality. Data will be collected using structured self-administered questionnaire with closed ended questions developed by the author.

The researcher anticipates that findings of the study will help make several noteworthy contributions to nursing practice, education, policy and research and in the long run it will aid in the improvement of the quality of care of patient as a result of knowledge gained. The study may serve as evidence information that could sensitize nurses on their limitations in regards to oxygen therapy and the need to have retraining periodically on oxygen

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therapy. It may also inform instructors to put emphasis on evidence-based physiological principles and expert guidelines of oxygen administration in the nursing curricula. Furthermore, the study may inform policymakers of missed opportunities worthy of consideration in the implementation of policies in the area of oxygen therapy as well as indicate to policymakers the importance of regular auditing and review of clinical practice and practice gap. Ultimately, the study may be used as a stepping stone for further studies on this subject area.

I am kindly requesting for permission and ethical clearance to conduct the research in the selected hospitals in Tarkwa, Western Region.

Thank You.

Yours faithfully

Theresa Dede Tisei

Appendix F

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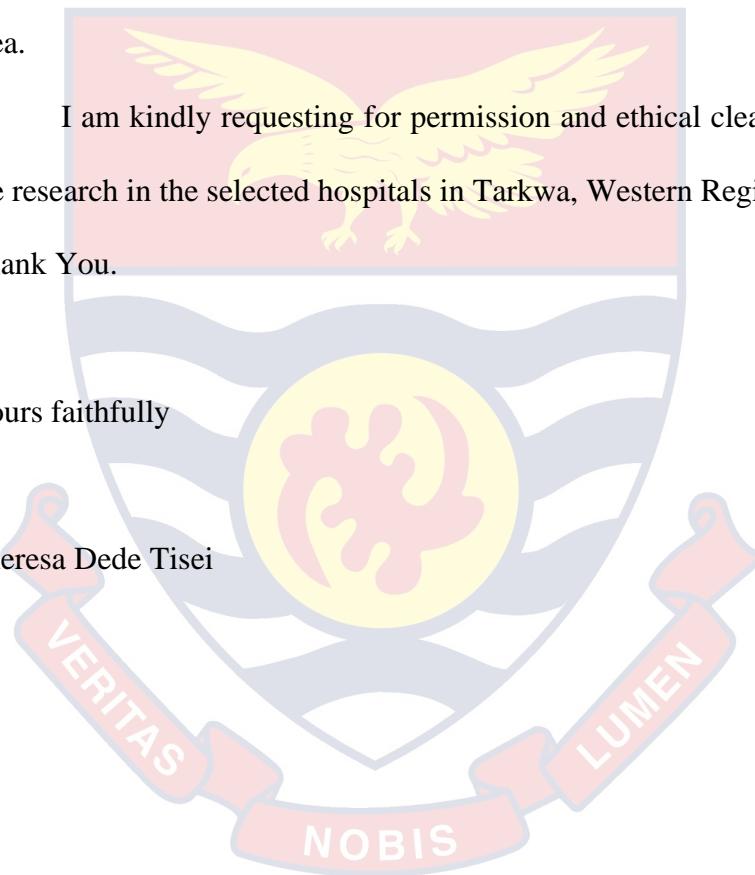
Prenotice Letter

8/1/2018

Dear Colleagues,

I am writing to ask for your help with an important study being conducted by myself- Theresa Tutu (née Tisei), Registered General Nurse (GRN) currently working at Tarkwa Mine Hospital, Tarkwa.

In the next few days, you will kindly receive a request to participate in a study by completing a questionnaire, designed to obtain your perspectives of your knowledge, attitude and practice on the safe and effective delivery of oxygen therapy.

Oxygen therapy is essential to life. Oxygen deficiency has been linked to preventable deaths, avoidable cardiac arrest, failed resuscitation after cardiac arrest, and unplanned intensive care unit (ICU) admission. But, just like a double – edged sword, oxygen has both positive biological benefits and toxicity properties. Hence, ensuring appropriate delivery of oxygen is vital, because there is potential for serious harm if oxygen is administered and managed inappropriate (O'Driscoll et al., 2008). In this era of evidence based practice, the benefits and potential complications of oxygen therapy are well recognised. Yet, studies have shown that this drug therapy is often delivered without special attention and sufficient knowledge among most health professionals regardless of several expert guidelines and protocols on oxygen therapy available. There is increasing evidence that in the developed countries as well as teaching hospitals in the developing countries, where lot of researches on oxygen therapy have been done, multiple interventions to improve the administration of this drug therapy have been proposed and tested

as well as regular auditing and review of clinical practice and practice gaps have been performed record significant limitations in the area of oxygen therapy. What then is the situation in hospitals within Tarkwa-Nsuaem Municipality, where oxygen is also frequently used but, its safe and effective administration have not been fully assessed. Could the situation be the same, better or worse? This questionnaire is important. The findings of this study may have important implication for nursing practice, education, policy and research in both national and international context; with the ultimate aim being to develop nursing interventions to improve the quality of care to patient on oxygen therapy.

Full ethical approval for this study has been obtained from University of Cape Coast Institutional Review Board (UCC-IRB). The Director of Nursing Services of this institution has also endorsed this study.

Thank you