THE KNOWLEDGE ABOUT POSTPARTUM HAEMORRHAGE AMONG MIDWIVES WORKING IN THE MATERNITY DEPARTMENTS OF WINDHOEK CENTRAL AND KATUTURA STATE HOSPITALS IN NAMIBIA

BY

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DECLARATION

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ABSTRACT

Background: Postpartum haemorrhage (PPH) remains the leading direct cause of maternal morbidity and mortality worldwide, with the highest maternal deaths occurring in developing countries. The researcher believed that the presence of a midwife with sufficient knowledge about PPH at every birth, could contribute to decrease the high number maternal deaths caused by PPH. For the purpose of this study, an investigation to determine if midwives working in the maternity departments of Windhoek Central and Katutura state hospitals in Namibia have knowledge about assessing, diagnosing, preventing and managing PPH was therefore carried out. In addition to the objectives, the study was to determine associations between the biographical data and the knowledge scores of the registered midwives and enrolled midwives.

Methods: A quantitative descriptive design was applied in the study. The total population was 127 midwives. However, only 93 midwives were available and consented to participate. A self-administered validated questionnaire was developed to specifically investigate the midwives' knowledge about PPH. The pilot study was conducted to support the reliability and validity of the methodology of the study including the instrument. In addition, the researcher observed face, construct and content validity throughout the research process.

The researcher collected all the data. Ninety-three participants participated in the study and completed the questionnaires in the researcher's presence. Ethical considerations of right to self-determination, right to confidentiality and anonymity as well as right to protection from discomfort and harm were all observed during data collection. Ethics approval was obtained from the Health Research Ethics Committee of Stellenbosch University (S19/08/167). In addition, ethics approval was obtained from the Research Ethics Committee of the Ministry of Health and Social Services in Namibia (17/3/3/HTN) before data collection.

Results: For the purpose of this study, competence was based on a knowledge score of ≥80%. Seventy six (82%) participants obtained a knowledge score of <80%, and were found to be incompetent about PPH. Only 2% of the 93 participants obtained a knowledge score of ≥80% in all four PPH main domains (assessing, diagnosing, preventing and managing PPH). Further results also showed that participants obtained an overall knowledge mean score of <80% in all four PPH domains. The overall mean scores for assessing PPH was 70.7%, diagnosing PPH was 76.9%, preventing PPH was 73.8% and managing PPH was 72.1%. A statistically significant

difference between the professional categories of the participants and their knowledge score in preventing PPH was observed (Levene's Test for Equality of Variances, p=0.009).

Conclusion: The results indicate that 82% of the participants are incompetent and lack sufficient knowledge about PPH. The lack of knowledge among the midwives is also contributing to the high PPH-related maternal morbidity and mortality in the two hospitals. Therefore, it is critical that midwives in the two hospitals are equipped with the necessary PPH knowledge to save maternal lives. The study proposed recommendations to the Ministry of Health and Social Services in Namibia which includes, increasing the number of advanced midwives and introducing skills laboratories.

Key words: Postpartum haemorrhage, knowledge, skilled birth attendants, midwives and maternal morbidity and mortality.

OPSOMMINGS

Agtergrond: Postpartum bloeding (PPB) bly wêreldwyd die belangrikste direkte oorsaak van moedersterftes en morbiditeit, met ‘n hoë moedersterfte-syfer in ontwikkelende lande. Die navorser glo dat dieteenwoordigheid van ‘n vroedvrou met genoegsame kennis oor PPB by elke geboorte, sal bydrae lewer tot ‘n verlaging in die hoë moedersterftes wat deur PPB veroorsaak word. Vir die doel van hierdie studie, is ‘n ondersoek gelas om vas te stel of vroedvroue wat in die kraamafdelings van Windhoeksentraal en Katutura staatshospitale werk, kennis dra van assessering, diagnosering, voorkoming en hantering van PPB. Bykomend tot die doelwitte, het die studie verbande tussen die bibliografiese data en die kennisvlak van die geregistreerde vroedvroue en ingeskrewe vroedvroue bepaal.

Metodes: ‘n Kwantitatiewe, beskrywende studie is hier toegepas. Die totale bevolking is 127 vroedvroue. Nietemin, slegs 93 was beskikbaar en het ingestem tot deelname. ‘n Selfgeadministreerde, gevalideerde vraelys is spesifiek ontwikkel om die vroedvroue se kennis omtrent PPB te ondersoek. Die loodsondersoek is uitgevoer om die betroubaarheid en geldigheid van die metodologie van die studie, insluitende die instrument te onderskraag. Bykomend hiermee, het die navorser sig-, saamvoeging- en inhoudswaarde dwarsdeur die navorsingsproses waargeneem.

Die navorser het al die data ingesamel. Drie-en-negentig deelnemers het aan die studie deelgeneem en het die vraelyste in die teenwoordigheid van die navorser voltooi. Etiese oorwegings van reg tot selfbeskikking, reg op vertroulikheid en anonimiteit asook reg op beskerming teen ongemak en skade is tydens data-insameling waargeneem. Etiese beginsels aangaande respek vir menswaardigheid, begunstigheid en skadeloosheid is gedurende data-insameling waargeneem. Etiese toestemming is verkry van die Gesondheidsnavorsing se Etiekkomitee aan die Universiteit van Stellenbosch (S19/08/167). In aansluiting hiermee, is etiese toestemming voor data-insameling van die Ministerie van Gesondheid en Maatskaplike Dienste in Namibië (17/3/3/HTN) verkry.

Resultate: Vir die doel van hierdie studie is vaardigheid gebaseer op ‘n kennisvlak van ≥80%. Die meeste deelnemers, 82% het ‘n kennisvlak van <80% en is dus onbevoeg aangaande PPB bevind. Slegs 2% van die 93 deelnemers het ‘n kennisvlak van ≥80% in al vier PPB hoofterreine (assessering, diagnosering, voorkoming en hantering van PPB). Verdere resultate dui ook aan dat die deelnemers ‘n algehele gemiddelde kennis van <80% in al vier PPB terreine het. Die

algehele gemiddelde kennisvlak vir assessering van PPB is 70.7%, diagnosering van PPB is 76.9%, voorkoming van PPB is 73.8% en hantering van PPB 72.1%. ‘n Statisties beduidende verskil tussen die professionele kategorieë van die deelnemers en hulle kennisvlak om PPB te voorkom, is waargeneem (Levene’s Test for Equality of Variances, p=0.009).

Gevolgtrekking: Die resultate dui aan dat die meeste (82%) van die deelnemers onbevoeg is en het ‘n gebrek aan genoegsame kennis van PPB. Die gebrek aan kennis onder die vroedvroue dra ook by tot die hoë PPB-verbande morbidite en moedersterftes in die twee hospitale. Dus, dit is van kritieke belang dat die vroedvroue in die twee hospitale toegerus moet word met die nodige kennis oor PPB om moederlewens te red. Die studie beveel aan dat die Ministerie van Gesondheid en Maatskaplike Dienste in Namibië moet help om die gaping in die kennis omtrent PPB onder vroedvroue te sluit, soos om die aantal bekwame vroedvroue te vermeerder en vaardigheidslaboratoriums te vestig.

Sleutelwoorde: Postpartum bloeding, kennis, vaardige geboorte-aanwesiges, vroedvroue, moedersterftes en morbiditeit.

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ABBREVIATIONS

PPH	Postpartum Haemorrhage
WHO	World Health Organization
NMHSS	Namibian Ministry of Health and Social Services
MMR	Maternal Mortality Rates
SPSS	Statistics Package for the Social Sciences
HREC	Health Research Ethical Committee
REC	Research Ethical Committee
ICM	International Confederation of Midwives
UNICEF	United Nations Children's Fund
UNPF	United Nations Population Fund
SBAs	Skilled birth attendants
IVI	Intravenous
IMI	Intramuscular
NICE	National Institute for Health and Clinical Excellence
CCT	Controlled Cord Traction
PT	Prothrombin Time
PTT	Partial Thromboplastin Time
HB	Haemoglobin
RCC	Red Cell Concentrate
FFP	Fresh Frozen Plasma
DIC	Disseminated Intravascular Coagulation
LMICs	Low to Middle Income Countries
MDG	Millennium Development Goal
GDP	Gross Domestic Product
ESMOE	Essential Steps in the Management of Obstetric Emergency
ANOVA	Analysis of Variance
SD	Standard Deviation
SANC	South African Nursing Council
HPCNA	Health Professional Council of Namibia
CPD	Continuous Professional Development

CHAPTER 1:
FOUNDATION OF THE STUDY

1.1 INTRODUCTION

Maternal mortality due to postpartum haemorrhage (PPH) continues to be one of the most important causes for maternal death worldwide (Rath, 2011:421). Postpartum haemorrhage is excessive vaginal bleeding of 500mls or more after a vaginal birth or 1000mls or more after a caesarean section within 24 hours or any blood loss that is sufficient to compromise haemodynamic stability (World Health Organization (WHO), 2016). Postpartum haemorrhage is classified as primary which occurs within 24 hours following a delivery and mainly corresponds to uterine atony, defects in coagulation and retained placenta. Secondary PPH occurs from 12 hours to 12 weeks postpartum and is caused mainly by infection and retained products of conception (Su, 2012:168). In high resource countries such as the Netherlands, PPH is defined as blood loss of 1000ml or more across all births. This is because a woman in good health can tolerate up to one litre of blood loss without showing early signs of shock (Smit, Chan, Middeldorp & Roosmalen, 2014:1). Postpartum haemorrhage is the leading direct cause of maternal mortality and the primary cause of nearly one quarter of all maternal deaths globally (WHO, 2012:1). Ninety-nine percent of these deaths occur in poorly resourced countries or developing countries. The Sub-Saharan region accounts for a high number of maternal deaths (86%) nearly every year (WHO, 2016).

The Namibian Ministry of Health and Social Services (NMHSS) reported that PPH is also the leading direct cause of maternal deaths in Namibia. Postpartum haemorrhage accounts for more than twenty-five percent of all maternal deaths nearly every year in Namibia (NMHSS, 2016:36). Namibia did not also achieve the attained Millennium Development Goal (MDG) number 5 of 2015 established by the WHO. This goal aimed to reduce maternal mortality rates (MMR) including maternal deaths caused by PPH to 140 per 100 000 by 2015. Maternal mortality rate is the number of maternal deaths per 100 000 live births (NMHSS, 2016:25). In 2015 Namibia MMR was 265 per 100 000 (NMHSS, 2016: 25).

Many developing countries in Sub-Saharan are burdened by high MMR specifically caused by PPH (WHO, 2012:1). The burden of these high MMR constitutes a silent emergency in Africa in general and in Namibia in particular (NMHSS, 2014:1).

Effective and efficient approaches are therefore required to prevent and reduce the events of PPH and to improve maternal outcomes. Knowledgeable and competent skilled maternity care providers such as midwives at all births are required, for early recognition, prevention and management of PPH (Rajan & Wing, 2010:165). According to Egenberg, Masenga, Bru, Eggebo, Mushi, Massay and Qian, (2017:2) only access to trained skilled birth attendants (SBAs) and to emergencies obstetric care can save maternal lives from PPH-related deaths. Therefore, it is critical that, midwives possess with adequate knowledge and skills to execute active management in the event of PPH to prevent maternal deaths (Rajan & Wing, 2010:169). A registered or an enrolled midwife is a person who has successfully completed a midwifery education programme and is recognised as a midwife upon successful completion of a midwifery education in the country of origin (International Confederation of Midwives (ICM, 2017).

The availability of PPH guidelines and emergency obstetric training may close the gap in the knowledge about PPH among midwives (Su, 2012:183). A study done in the Netherlands in 2015 stresses the importance of PPH guidelines in the maternity settings to improve maternal health and to guide PPH clinical practices. Postpartum haemorrhage clinical guidelines offers midwives with concise instructions about the management of PPH (Rousseau, Rozenberg, Perrodeau, Deneux-Tharaux & Ravaud 2016:13). Meanwhile, Kato and Kataoka (2017:93) in their study on simulation training in Japan among midwives on PPH emergencies, identified that midwives showed a significant improvement and maintenance of knowledge on PPH emergencies compared to no training.

1.2 RATIONALE

Namibian MMR remains high, with PPH being the major cause (>25%) of maternal deaths. Considering the rapid rate at which PPH is causing maternal deaths, the Government of Namibia has urged, through the Ministry of Health and Social Services, to urgently strengthen the health system to respond effectively to this complication (NMHSS, 2016:36). This puts midwives at a critical point of assisting the reduction of PPH-related maternal deaths in the country, due to the role that they play in the reduction of PPH- related morbidities and mortalities.

The Windhoek Central and Katutura state hospitals receive complicated maternity cases from the thirteen regions of the country. It is expected that midwives working in the maternity departments (antenatal, labour and postnatal) of these hospitals will have the knowledge on the management of PPH. Though, there are many factors that can contribute to the high PPH-related MMR in the

country, for the purpose of this study the researcher focused on the midwives' knowledge about PPH.

1.3 PROBLEM STATEMENT

The Namibian MMR remains high, with PPH being the major cause of maternal deaths (NMHSS, 2016:2). Windhoek Central and Katutura state hospitals receive high risk maternity patients from the thirteen regions of the country. It is expected that midwives working in the maternity departments of the two hospitals are knowledgeable about the management of PPH. However, the midwives' knowledge level about PPH needed to be investigated as one of the factors that may contribute to the high levels of PPH in the country. Thus, the researcher conducted a scientific investigation into the midwives' knowledge about PPH in the two hospitals.

1.4 RESEARCH QUESTION

The question which gave guidance to the study was: What is the knowledge about PPH among midwives working in the maternity departments (labour, antenatal and postnatal) of Windhoek Central and Katutura state hospitals in Namibia?

1.5 RESEARCH AIM

The aim of the study was to investigate scientifically the knowledge about PPH among midwives working in the maternity departments of Windhoek Central and Katutura state hospitals in Namibia.

1.6 RESEARCH OBJECTIVES

The objectives of the study were to determine if midwives working in the maternity departments of Windhoek Central and Katutura state hospitals in Namibia have knowledge about:

- Assessing postpartum haemorrhage
- Diagnosing postpartum haemorrhage
- Preventing postpartum haemorrhage
- Managing postpartum haemorrhage

To determine associations between the biographical data and the knowledge scores of enrolled midwives and the registered midwives.

1.7 CONCEPTUAL THEORETICAL FRAMEWORK

The conceptual theoretical framework for the study was based on Doctor Patricia Benner's theory called Novice to Expert theory. This theory focuses on how nurses acquire knowledge and skills

in the nursing field. The theory describes that the development of knowledge and skills depends on a good nursing educational background and a multitude of experiences. This theory identifies five clinical stages of competence. The stages explain that expertise in the nursing field is a process that is learned over time. A nurse passes through these five stages in knowledge acquisition and skills development. The five stages of clinical competence are novice, advanced beginner, competent, proficiency and expert (Benner, 2013:2-7). The five clinical stages are incorporated into the knowledge scores based on Stellenbosch University tests and examinations: policy and information (2014:2).

Stage 1 Novice: This would be a first-year nursing student. Her behaviour in the clinical environment is very limited and inflexible. The novice midwife has extremely limited knowledge in predicting what could happen in a particular patient's condition. A novice midwife can only recognize a PPH event if she has previously encountered a patient with similar PPH signs and symptoms (Benner, 2013:2). Given a PPH questionnaire for evaluation of knowledge a novice midwife might get less than 50%. According to Stellenbosch University tests and examinations: policy and information (2014:2), this is seen as a fail.

Stage 2 Advanced beginner: This would be a newly graduated midwife in her first job. This midwife has experiences that enable her to identify meaningful components of a patient's situation. Although the midwife has the know-how knowledge of PPH, she still does not have adequate in-depth knowledge (Benner, 2013:3). An advanced beginner midwife can obtain a minimum of 50% in a PPH questionnaire which is a pass according to Stellenbosch University tests and examinations: policy and information (2014:2).

Stage 3 Competent: The competent midwife is able to demonstrate efficiency, can coordinate and has confidence in her/his actions. A competent midwife can rely on advanced planning and organizational skills. The competent midwife can recognize patterns and nature of clinical situations quickly and more accurate than advanced beginners. A competent midwife has the ability to recognize a PPH event and execute emergency treatment, while also calling for assistance from other members of her team (Benner, 2013:3). In this study, competency is recognized when a midwife obtains ≥80% in a PPH knowledge evaluation questionnaire. This is because the Departments of Nursing and Midwifery Sciences for both Stellenbosch University and the University of Namibia requires postgraduate midwives and nurses to obtain ≥80% in clinical practices to be declared competent. Stellenbosch University, Department of Nursing and Midwifery (2014) & University of Namibia (2018:29).

Stage 4 Proficiency: The proficiency midwife has a deeper understanding of the situation. The midwife understands the situation as a whole and can perceive its meaning related to long-term goals. A proficient midwife understands a PPH event from the assessment, pathophysiology, prevention and management and the long-term effect that the condition has on the affected woman (Benner, 2013:4).

Stage 5 Expert: The expert midwife has an intuitive grasp of every situation. The expert midwife demands for the availability of required resources to be used in situations to achieve goals. The expert midwife no longer relies on rules to guide his/her actions under certain situations, but performs whatever is needed to be done in a situation (Benner, 2013:4). The expert midwife will obtain 80% and more in a PPH knowledge evaluation questionnaire.

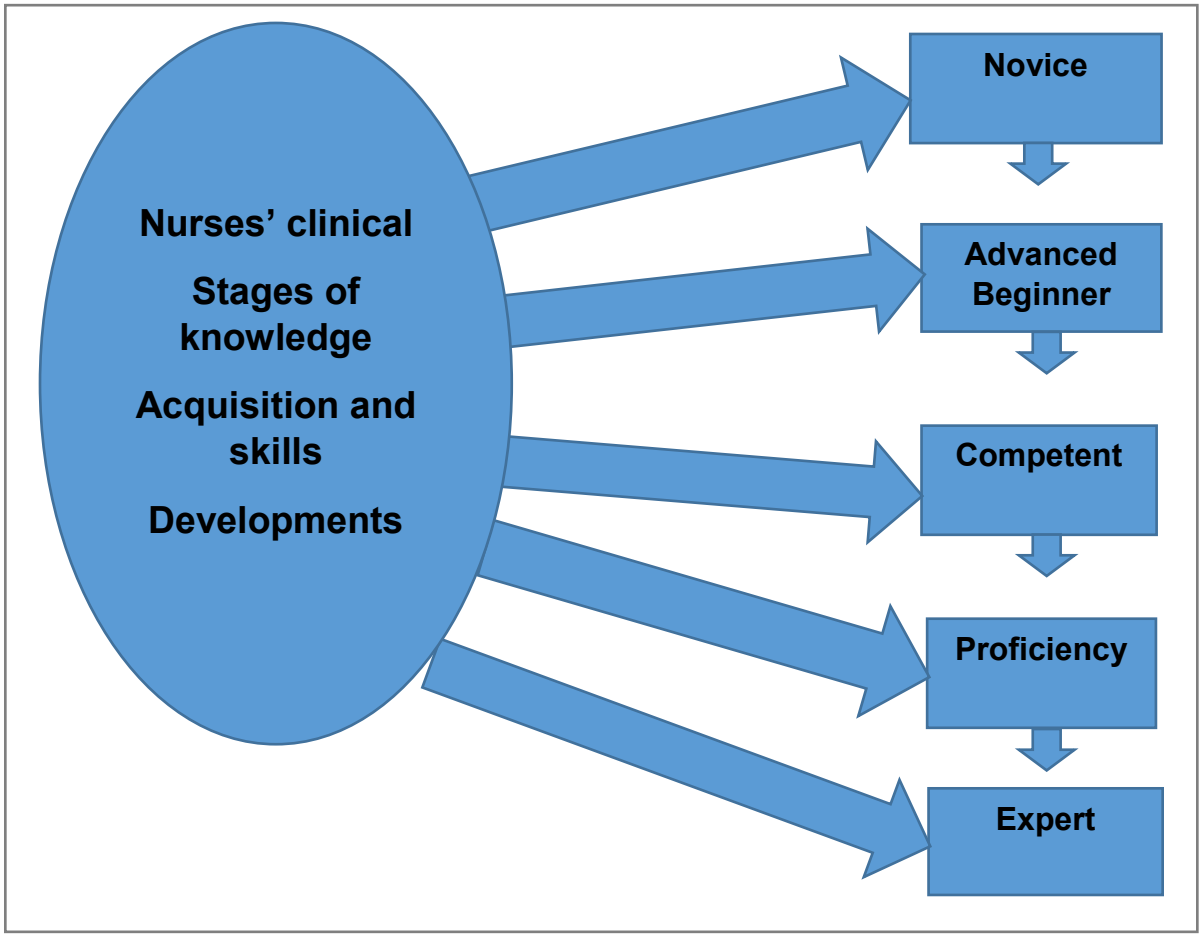

Figure 1.1: Conceptual theoretical framework: Based on Doctor Patricia Benner theory of Novice to Expert

(Benner, 2013:2-7)

1.8 RESEARCH METHODOLOGY

A brief overview of the research methodology is provided in this chapter.

1.8.1 Research design

A quantitative descriptive research design was applied to determine the knowledge about PPH among midwives working in the maternity departments (antenatal, labour and postnatal) of Windhoek Central and Katutura state hospitals in Namibia.

1.8.2 Population and sampling

The target population of this study was all the registered midwives and enrolled midwives working in the maternity department of Windhoek Central and Katutura state hospitals in Namibia.

1.8.2.1 Inclusion criteria

All permanent registered midwives and enrolled midwives working in the months of data collection in the maternity departments of Windhoek Central and Katutura state hospitals in Namibia were eligible to participate in this study.

1.8.2.2 Exclusion criteria

No midwives were excluded to participate in the study.

1.8.3 Instrumentation

A structured self-administered validated questionnaire (Annexure 6) was used to scientifically investigate the knowledge about PPH among midwives working in the maternity departments of Windhoek Central and Katutura state hospitals in Namibia.

1.8.4 Pilot study

The pilot study was conducted in the maternity departments (antenatal, labour and postnatal) of Windhoek Central and Katutura state hospitals prior to the main study from 11 to 16 December 2019. The results from the pilot study were excluded from the main study.

1.8.5 Reliability and validity

Cronbach's alpha reliability test could not be done as it was not suitable for the multiple-choice questions contained in the questionnaire. The pilot study was conducted prior to the main study to support the reliability of the instrument.

Face, content and construct validity was maintained by the researcher to support the validity of the instrument.

1.8.6 Data collection

The researcher personally collected all the data for the study. Data collection took place from 17 December 2019 to 16 February 2020. The return rate was 100%.

1.8.7 Data analysis

The researcher used a Microsoft Excel worksheet to capture the data from the paper-based questionnaire. The Statistics Package for the Social Sciences (SPSS) version 26 was applied by a qualified biostatistician from the Biostatistics unit of Stellenbosch University to analyse the data.

1.8.8 Ethical consideration

Ethical approval preceding the commencement of the study was obtained from the Health Research Ethical Committee (HREC) of Stellenbosch University (Annexure 1). In addition, ethical approval was also obtained from the Research Ethical Committee (REC) of the NMHSS (Annexure 2). The study was conducted observing the following ethical principles.

1.8.8.1 Right to self determination

The right to self-determination was applied in the study informing the participants that participating in the study was entirely voluntary and that they are free to withdraw at any stage. Autonomy was observed in the study by providing the participants with the information leaflet (Annexure 5) with all the risks and benefits of participating in the study, as well as obtaining written informed consent prior to participation. Justice was maintained by respecting the participants' choice of freely participating in the study and not forcing them to participate.

1.8.8.2 Right to Confidentiality and anonymity

The right to confidentiality was observed by keeping the information of the participants private. The questionnaire used in the study did not indicated the name of the participants thus, enduring that their identity are protected. The questionnaire was numbered so that the researcher could not link the responses to any particular participant. Furthermore, the data obtained from the study was accessed only by the researcher, supervisor and the biostatistician. The data was stored in their personal computers encrypted with a password to restrict access to the data by any unauthorized personnel or person.

1.8.8.2 Right to protection from discomfort and harm

The principle of beneficence was observed by considering the participants. The researcher ensured that data collection took place at the times participants were free to complete the questionnaires and were not forced to complete the questionnaires at the researcher's time. This was done for the study not to negatively impacts on the daily work routines.

The principle of non-maleficence was applied by the researcher to ensure that no physical or emotional harm was caused to the participants in the study. The researcher did not physically or emotionally abuse a participant in the study.

1.9 OPERATIONAL DEFINITIONS

Midwife: A midwife is a person who has successfully completed a midwifery education programme that is based on the International Confederation of Midwives (ICM), essential competencies for basic midwifery practice and the framework of the ICM global standards for Midwifery education. Furthermore, a midwife is recognised when a qualification in Midwifery is successfully completed that is recognised in the country of origin and is legally licensed to practise midwifery (ICM, 2017).

Registered midwife: Includes a person authorised under section 62 (4) of the Namibian Nursing Act 8 of 2004 to practise as a midwife (Government Gazette of the Republic of Namibia No 6836, 2019:2). A registered midwife is someone who holds the following qualifications:

- A Four-Year Diploma in Comprehensive Nursing and Midwifery Science or
- A Four -Year Bachelor's Degree in Nursing or
- A Three- and- a Half Year Diploma in General Nursing and Midwifery or a three-year Diploma in General Nursing and Midwifery
  or
- A One-Year Diploma in Midwifery (Government Gazette of the Republic of Namibia No 4068, 2008:6).

Enrolled midwife: An enrolled midwife is someone who pursues a two-year Certificate training in Enrolled Nursing and Midwifery and is registered as an enrolled midwife with the Nursing Council of Namibia (Nursing Act No.8 of 2004).

Knowledge: In this study knowledge refers to information that allows an individual to have adequate understanding of a subject with the ability to use it for a specific purpose (ICM, 2017:19).

Competency: In this study competency is defined as a combination of knowledge, communication and decision-making skills that enables an individual to perform specific tasks to a defined level of proficiency (WHO, 2011:5).

Skilled birth attendant (SBA): A SBA is an accredited health professional such as a midwife, doctor or nurse. Furthermore a SBA is educated and trained in the skills needed to manage normal pregnancies, childbirth and the immediate postnatal period and to identify, manage and facilitate referral of complications in women and new-borns (NMHSS, 2016:32).

1.10 CHAPTER OUTLINE

Chapter 1: In this chapter a brief introduction, the rationale of the study, problem statements, aims and objectives of the study, as well as a brief overview of the methodology are described.

Chapter 2: The literature review of PPH based on the objectives is described in this chapter.

Chapter 3: The detailed research methodology applied in this study is described in this chapter.

Chapter 4: Data analysis and interpretation are described in this chapter.

Chapter 5: Chapter 5 provides the discussion, recommendations and conclusions based on the scientific evidence obtained in the study.

1.11 SUMMARY

This chapter introduced PPH as a leading direct cause of maternal deaths globally and in Namibia. The research aims, question and objectives of the study were provided. An explanation was provided on the background, significance and importance of doing the research. The conceptual framework on which this study was based was also described in the chapter. A brief overview of the research methodology and ethical considerations that were observed in conducting this study were described. Operational definitions of terms such as midwife, knowledge and competence were also provided. The chapter concluded with the research thesis chapter outline.

1.12 CONCLUSION

The presence of a midwife at all births with adequate knowledge about PPH was proposed as one of the solutions to address high MMR arising from PPH. Reasons were provided to support the scientific investigation into the midwives' knowledge about PPH in the two hospitals. In the next chapter a literature review presents a detailed discussion about PPH.

CHAPTER 2:
LITERATURE REVIEW

2.1 INTRODUCTION

LoBiondo-Wood and Haber (2014:50) describe a literature review as a systematic and critical appraisal of the literature which is known as a topic. This chapter provide information aligned to the objectives of the study namely: assessing, diagnosing, preventing and managing PPH. The chapter also provides the information based on PPH from international and Namibian perspective and the scope of practice of registered and enrolled midwives.

2.2 REVIEWING AND PRESENTING THE LITERATURE

The researcher conducted an international and national review about PPH more especially on articles published in Sub-Saharan Africa. The researcher could however only find one published study done on PPH in Namibia. The literature review included studies published between 2010 and 2020.

The review of the literature was done by searching the databases namely: Medline, EBSCOhost, ScienceDirect and Wiley Online Library. The key words used to search the databases were “midwives”, “skilled birth attendants”, “knowledge”, “postpartum haemorrhage”, “maternal deaths”, “assessment”, “diagnosing” “prevention”, “management” and “direct causes of maternal deaths”.

2.3 THE ASSESSMENT OF POSTPARTUM HAEMORRHAGE

Globally, PPH remains the major cause of maternal deaths (WHO, 2012:1). According to Ononge, Mirembe, Mandambwa and Campbell, (2016:1) many low-and middle-income countries (LMICs), have a scarcity of information about the magnitude of risk factors for PPH among midwives. This contributes to poor assessment of PPH potential risks. Therefore, it is important to understand the relative contributing risk factors for PPH. Risk factors that causes PPH are known as the four T’s which are: tone, tissue, trauma and thrombin (Envensen, Anderson & Fontaine, 2017:444).

2.3.1 Tone (Uterine atony)

The major cause of PPH is uterine atony (Mclintock & James, 2011:1441). Uterine atony was found to be the primary cause of PPH in nearly 70% of all studies (Mountufar-Roueda, Rodriques, Jarquin, Barbaza, Bustillo, Marin, Ortiz & Estrada, 2013:1). Uterine atony occurs when the uterus

fails to contract sufficiently after delivery, resulting in severe bleeding (Rajan & Wing, 2010:167). Ngwenya (2016:648) conducted a study at a referral hospital in Bulawayo, Zimbabwe which showed that 82.4% of cases who develop PPH were because of uterine atony. Similarly, Egenberg et al. (2017:2) indicated that 70%-80% of PPH cases in their studies were due to uterine atony. Sultana, Irum and Karamat (2018:966) identified conditions that contribute to poor uterine atony such as a large foetus, multiple pregnancies and a high parity of more than four children. Parity refers to the number of viable births including foetuses born after foetal viability, whether alive or stillborn (Dippenaar & Da Derra, 2018:224). These conditions overstretch the uterus, which reduces the uterine tone, leading to PPH. Khireddine, Le-Ray, Do Pont, Rudigoz, Bouvier-Colle and Deneux-Tharaux (2013:6) discovered in their study that induction of labour and labour augmentation also increases the risk of PPH by affecting the uterine tone after a vaginal birth and therefore must only performed when indicated.

2.3.2 Tissue

Envensen et al. (2017:445) reported that products of conception, namely placenta tissues and blood clots inhibit the uterus from contracting after births to achieve optimal tone thereby predisposing a women to develop PPH. It is thus important that midwives inspect for retained products of conception in the cervical and vaginal canal of a woman following a vaginal birth to prevent PPH (Mclintock & James, 2011:1445). A study conducted at a teaching hospital in Nigeria found retained placenta contributing to 48% of all PPH cases in that hospital. A contributing factor was a lack of knowledge among midwives about the active management of the third stage of labour to promptly deliver the placenta to prevent PPH (Ajenifuja, Adepiti & Ogunniyi, 2010:73). However, Oyetunde and Nkwonta (2015:26) in their study conducted in Nigeria found midwives having good knowledge about the third stage of labour to prevent PPH.

2.3.3 Trauma

Trauma to the board ligaments, uterine rupture, as well as tears to perineal, vaginal and cervical areas are all associated with an increased blood loss at a normal vaginal delivery causing PPH (Chia & Huanga, 2010:514). A study conducted in Cameroon indicated that trauma to the women's genital tract after vaginal births contributed to 37.7% of all PPH cases (Halle-Ekane, Emade, Bechen, Palle & Folumu, 2016:10). A further study conducted in Pakistan identified that the PPH that resulted from genital tract injury was 16.5%. The researchers in this study warned SBAs to reduce interventions that contribute to genital tract trauma at vaginal births such as the use of forceps that can cause injury to vaginal and perineal walls of a woman to decrease the incidences of PPH (Khaskheli, Baloch & Baloch, 2012:97). In addition, Oyetunde and Nkwonta

(2015:20) further stated that unnecessary use of episiotomies at vaginal births should be eliminated to reduce PPH. An improved birthing initiative to prevent PPH is rather for a woman to sustain a perineal tear rather than to cut an episiotomy. Gupta and Saini (2018:2) warned that caesarean sections should be reduced to decrease the incidences of PPH because of the risks of trauma to the internal organs that can occur during the surgery.

2.3.4 Thrombin

Normal pregnancy poses significant challenges to haemostasis, with a significant drop in platelet count with nearly 20% by the end of pregnancy (Moiz, 2017:123). Erhabor, Izaac, Muhammad, Abdulrahaman, Eziman and Adias (2013:285) noted that the platelet count decreases in normal pregnancy, due to an increased destruction of red blood cells and haemodilution. Erhabor et al. indicate that haemodilution occur in pregnancy due to an increase in the blood volume with not enough blood cells. This exposes pregnant women to develop PPH at birth. James, Mclintock and Lockhart (2012:17) identified predisposing conditions such as pre-eclampsia that can influence coagulation functions in pregnancy leading to PPH at birth. According to Haram, Mortensen and Nagy (2014:1) women with pre-eclampsia may develop HELLP syndrome. HELLP syndrome is a condition characterized by haemolysis, elevated liver enzymes and low platelet count. Haram et al. indicate that HELLP syndrome predispose a woman to develop PPH at birth also due to the destruction in the coagulation factors. However, James et al. noted that although the risk factors for PPH can be identified in the antenatal and intrapartum period, most women who develop PPH do not present with any identifiable risk factors. Thus, every pregnant woman could be at risk of developing PPH. Substantiated further by Lockhart (2015:133) indicated that many PPH events do not have identifiable risk factors prior to haemorrhage. Thus, midwives should plan and ensure that the necessary resources and personnel are available at every delivery for effective PPH response and management.

2.4 THE DIAGNOSING OF POSTPARTUM HAEMORRHAGE

Diagnosing PPH will be discussed under subheading of postpartum blood loss assessment

2.4.1 Postpartum blood loss assessment

Diagnosing PPH begins with an accurate estimation of postpartum blood loss made by a midwife, which also provide a guide toward the management of PPH (Weeks, 2014:207). A study conducted in Iran in 2013 found that most of the PPH-related deaths were due to late diagnosis that led to late PPH management (Golmani, Khaleghinezhad, Dadgar, Hashempor & Bahararian, 2014:11). If excessive blood loss is identified early, interventions to help stem the blood flow can

be started sooner, to improve maternal outcome. Thus, it is important to find the best methods to accurately measure or estimate blood loss after giving birth (Diaz, Abalos & Garroli, 2018:2). Several studies reported global inaccuracy in postpartum blood loss assessment methods, which increase maternal risks. Studies done on postpartum blood loss report a tendency in overestimation and underestimation of blood loss after birth. Large volumes of blood are usually underestimated more than small volumes of blood (Withanathantrige, Goonewardene, Danteniya, Gunatilake & Gamage, 2016: 54). A systematic review which was conducted on postpartum blood loss assessment, confirmed the extent of underestimation as blood loss volumes increase. Six out of eight studies conducted reported an underestimation when blood volumes increased (Hancock, Weeks & Lavender, 2015:4).

According to Al-kandri, Dahlawi, Airan, Elsherif, Tawfeer, Mokhele, Brown and Tamin, (2014:1) the methods that exist globally to measure blood loss after delivery include visual estimation, drape estimation and the weighing method. Visual estimation is the most widely used method to measure postpartum blood loss after birth, because it is relatively easy and inexpensive. However, although visual estimation is the commonly used method, it is also the most unreliable and inaccurate method of estimating postpartum blood loss (Schorn, 2010:20). Drape estimation is reported to provide more accurate results than others (Diaz et al., 2018:2). Nevertheless, Al-Kandri et al. stated none of the methods that exist to assess postpartum blood loss have been proven accurate to guarantee patient safety. Thus, Dippenaar and Da Serra (2018:329) recommend maternity units to develop accurate standards to measure blood loss within 24 hours after birth to decrease the lower threshold in diagnosing PPH.

2.4.1.1 Postpartum grades

Royal Cornawall hospital NHS trust (2018) identified PPH grades as follow:

Minor primary postpartum haemorrhage

- The loss of 500mls to 1000mls of blood from the genital tract within 24 hours of the birth of the baby.

Major primary postpartum haemorrhage

- The loos of over 1000mls of blood from the genital tract within 24 hours of the birth of the baby.

Massive primary postpartum haemorrhage

- Blood loss >2000mls or rate of blood loss of 150ml/min or 50% blood loss volume within 3hours.

2.5 THE PREVENTION OF POSTPARTUM HAEMORRHAGE

2.5.1 Prevention in the antenatal period

According to Dippenaar and Da Serra (2018:329), the primary prevention of PPH includes good antenatal care with improved nutritional status of pregnant women and routine supplementation of iron and folic acid to prevent anaemia. Iron deficiency anaemia affects generally 66% to 80% of the world's population and severe anaemia increases the risk of PPH- related morbidity and mortality (Walvekar, Virkud & Majumder, 2012:539). To correct iron deficiency anaemia in pregnant women, Milman (2011:50) suggested an iron prophylaxis dose of 30 to 40mg daily from early pregnancy till delivery. This dose will ensure sufficient iron levels among pregnant women with a big possibility that moderate to excessive haemorrhage at birth and after delivery will be tolerated. Api, Breyman, Demir & Tevfir (2015:176) added that intravenous iron (IVI) therapy can be used in the second and third trimester of pregnancy. However, this treatment therapy is only recommended in women who cannot tolerate oral treatment, experience inadequate response to oral treatment and where anaemia should be resolved urgently.

Mclintock and James (2011:1443) added that women with underlying bleeding disorders such as pre-eclampsia are more at risk of severe bleeding at birth and after delivery due to changes in coagulation as discussed in paragraph 2.3.4. Therefore, recommending that these women deliver in hospitals where a specialists in high-risk obstetric care and a blood bank are found.

2.5.2 Prevention in the intrapartum and postnatal period

2.5.2.1 Reducing certain obstetric interventions

A study conducted in Norway in 2011 indicates that certain interventions done in the intrapartum period increase the risks of PPH (Nyflot, Sandven, Stray-Pedersen, Pettersen, Al-Zirgi, Rosenberg, Jacobsen & Vangen, 2017:5). These interventions include induction of labour and labour augmentation with oxytocin. Nyflot et al. recommend that these interventions be minimized to reduce the incidences of PPH. In addition, Gupta and Saini (2018:2) also supported Nyflot et al. on the higher risks of PPH caused by labour augmentation and induction of labour. Gupta and Saini further indicate that the risks of PPH resulting from caesarean section births are three times higher compared to vaginal births, due to an increase in blood loss and possible trauma at

caesarean section births. Thus, caesarean sections should be limited only to valid indications. Van Stralen, Altenstadit, Bloemenkamp, Roosmalen and Hukkelhoven (2016:1105) also supported the PPH risk factors identified by Nyflot et al. as well as Gupta and Saini. Van Stralen et al. additionally reported that the higher incidences of PPH in their study were also due to a lack of training in emergency obstetrics among midwives leading to rendering poor emergency obstetric care.

2.5.2.2 Third stage of labour

The third stage of labour is the period that begins when the baby is delivered and ends when the placenta and membranes are completely delivered (Dippenaar & Da Serra, 2018:371). Cohain (2010:348) identified the active management of the third stage of labour. The active management of the third stage of labour is a recommendation from WHO whose aim is to reduce the high rate of PPH resulting from uterine atony. The active management of the third stage reduces the risks of PPH by permitting the delivery personnel to facilitate the separation of the placenta. This also enhances effectiveness of the uterine contractions to shorten the duration of the third stage of labour to prevent PPH. Several trails in a meta-analysis proved that the active management of the third stage of labour reduces PPH incidence by 60% (Deneux-Tharaux, Sentilhes, Maillard, Closset, Vardon, Lepercy and Goffinet, 2013:2). World Health Orgainization (2009:1) therefore, recommends the active management to be offered to all women during childbirth to prevent PPH incidences. The active management of the third stage of labour involve three steps: (i) administering uterotonic drugs, (ii) cord clamping and (iii) controlled cord traction to deliver the placenta.

2.5.3.1 Administering uterotonic drugs

According to Begley, Gyte, Devane, McGuire, Weeks and Biesty (2019:8) administering prophylactic uterotonic drugs are done just before, with, or immediately after the birth of the baby. The different uterotonic drugs include IVI or intramuscular (IMI) oxytocin, ergometrine, syntometrine and misoprostol which are available in a tablet form and can be given orally or rectally. Recent guidelines from WHO (2012) and National Institute for Health and Clinical Excellence (NICE) (2014) recommend oxytocin 10 IU IMI as the first line PPH drug of choice. However, studies by Shretha, Dongol, Chawla and Adhikari (2011:8) and Rushwan (2011:1) recommend misoprostol 600mcg to 1000mcg to be the first line PPH drug of choice in poorly-resource countries because it is stable at ambient temperatures and inexpensive.

2.5.3.2 Cord clamping

Raju (2013:2) indicated delayed cord clamping (waiting up to 3 minutes) method increases the haemoglobin level in infants which reduces the frequency of iron-deficiency anaemia at 4-6 months of age. According to Raju evidence is not available whether the cord clamping method reduces the incidence of retained placenta which causes excessive bleeding after childbirth. However, WHO (2014:1-3) reported that delayed cord clamping is one of the actions included in the package to reduce the incidences of PPH. Thus, WHO is recommending birth attendants to wait up to 3 minutes to cut the umbilical cord to prevent PPH and to improve neonatal outcome.

2.5.3.3 Controlled cord traction

Controlled cord traction (CCT) is done by the midwife with one hand holding the cord after cord clamping and by placing another hand just above the woman's pubic bone to deliver the placenta. By applying counter-pressure during controlled cord traction it stabilizes the uterus. The midwife ensure slight tension on the cord and waits 3 minutes for a strong uterine contraction. With a strong uterine contraction, the midwife then encourage the women to push, while the midwife very gently tries to pull on the cord downward to deliver the placenta (Lalonde, 2013:609). A study done in France in 2011 showed no significant effect on PPH when CCT is applied compared to the passive management (waiting for signs of spontaneous placenta separation) to deliver the placenta (Deneux-Tharaux et al. 2013:11). Deneux-Tharaux et al. further report that the third stage of labour is shorter when CCT is applied compared to passive management. Substantiated further by Hofmeyer, Mshweshwe and Gulmezolgu (2015:1-2) found that there was no significant difference in the risks of blood loss when CCT is applied. However, Hofmeyer et al. still suggest that midwives deliver the placenta by CCT and that CCT remains a core competence of midwives.

2.5.2.3 Ensuring adequate drugs and medical supplies

The shortage of essential drugs and medical supplies for the provision of quality maternal health is a challenge in many health systems of LMICs according to Mkoka, Goicolea, Kiwara, Mwangu and Hurtig (2014:182). The shortage of essential drugs and supplies contribute to poor quality maternal health care services leading to a high number of avoidable maternal deaths. Mpemba, Kampo and Zhang (2013:779) conducted a literature review on the factors associated with persistent high PPH maternal deaths in Sub-Saharan Africa. They found that only a few health centres are sufficiently equipped with essential drugs and medical supplies such as vacoliters and intravenous cannulas to provide basic emergency obstetric care. Thus, the quality of rendering maternal health care is extremely poor. They further reported that many health systems in Africa depend on traditional medicine which cannot be trusted.

Another challenge identified by Puchalski-Richie, Khan, Moore, Timmings, Van Lettow, Vogel, Khan, Maburu, Mrisho, Mugerwa, Uka, Gulmezoglu and Straus (2016:235) in LMICs is inadequate funding toward the provision of health care. The inadequate funding directly affects the procurement of essential medications, suppliers and equipment in those countries, consequently leading to high maternal deaths. Savedoff (2003:5) indicated that WHO recommendation is for every country to spend 5% of its Gross Domestic Product (GDP) on health. However, countries are not limited to the 5% and should take into consideration the health challenges they face toward maintaining and improving the health status of their inhabitants. Many Sub-Saharan states such as Angola, Democratic Republic of Congo, Eritrea, Ethiopia and many more spent less than 5% of their country's GDP by 2017 (The World Bank, 2019).

In Mali and Senegal most of the women were anaemic pre-delivery, due to the shortage of anaemic testing equipment and anti-anaemia drugs, which predisposes them to PPH after birth (Tort, Rozenberg, Traote, Fournier & Dumont, 2015:8). Schartz-Dunn and Nour (2011:87) reported limited access to safe blood transfusion services in many Sub-Saharan African states which is critical in the treatment of PPH. Schartz-Dunn and Nour identified contributing factors for low blood supply in Sub-Saharan Africa as a low number of blood donors, a lack of testing equipment to make blood products safe, as well as a lack of refrigerators to store the blood. Schartz-Dunn and Nour reported that annually 26% of all maternal deaths are a direct consequence of the lack of blood transfusion services in the Sub-Saharan region.

2.5.2.4 Increasing the number of midwives

It is estimated that around the world, one third of the births take place at home without the assistance of a SBA (Baral, Lyons, Skinner, Teijlingen, 2010:325). Walvekar et al. (2012:539) reported that most of PPH-related maternal deaths in the developing countries occur in hospitals without the assistance of a midwife. Substantiated further by Oyesene and Ananth (2010:148) as well as Tindell, Garifinkel, Abu-Haydar, Ahn, Burke, Konn and Eckardt (2013:5) reported that the rates of PPH are high in Africa and this is attributed to a lack of adequately trained midwives. Mpemba et al. (2013:5) reported that in 2010, 65% of deliveries were assisted by untrained birth personnel in Kenya. Only 18% of deliveries were attended to by a SBAs in Kenya, due to a critical shortage of SBAs in that country.

The presence of a midwife at every delivery is therefore promoted to address the high maternal morbidity and mortality in developing countries (Nyango, Mutihir, Labees, Kigbu & Buba, 2010:131). Nyango et al. emphasised that not only the presence of a midwife at every birth is

critical, but ensuring that at all levels, midwives have adequate knowledge and skills to perform all the core functions of PPH. Substantiated further by Ajenifuja et al. (2010:73) stated that to reduce the morbidity and mortality caused by PPH, every midwife at a birth needs to have the knowledge about PPH. Ajenifuja et al. further added that midwives need skills and clinical judgment to carry out the active management of the third stage of labour. Tort et al. (2015:7) suggest that every maternity unit must have a gynaecologist - obstetrician specialist available. They indicate that the availability of a specialist in gynaecology and obstetrics in labour and delivery suites have shown a significant decrease in PPH-related maternal mortality. Tort et al. found general practitioners with inadequate training in emergency obstetric care in-charge of many maternity units in Mali and Senegal. They reported that most of the general practitioners' knowledge was limited and this led to delay in diagnosing PPH and rendering appropriate care.

Prata, Passano, Rowen, Bell, Walwish and Plotts (2011:88) reported that the expansion of midwives at all births is critical but, many midwives remain working in urban areas. Meanwhile, a high number of maternal deaths occur in rural areas especially in Sub-Saharan Africa and Northern Asia. Sri Lanka and Malaysia are among some countries that had managed to deploy midwives in rural areas, which significantly reduced their maternal morbidity and mortality. According to Prata et al. countries need to develop rural infrastructures and services to ensure the retention of midwives in those areas. Nepal, one of the few countries that have achieved the fifth MDG also increased the number of midwives even in the most difficult areas of the country and this innovation helped Nepal to reduce their maternal mortality by 50% (Malla, Giri, Karki & Chaudhary, 2011:63).

The most important components that are vital in enriching the knowledge of midwives about PPH according to Smit et al. (2014:1) is training and the availability of PPH guidelines in the maternity units.

2.5.4.1 Training

According to Rath (2011:422) lack of adequate education and training among midwives is one of the contributing factors to the progression of severe PPH. This is substantiated further by Pavord and Mayburg (2015:2759) who recommended continuous training and education among midwives to enhance their knowledge about PPH. The hospitals can use simulation exercises and practical drills to keep their staff up to date with the current information. Egenberg et al. (2017:2) conducted a study on simulation training at the two hospitals in Tanzania and participants in this study showed an improvement performance in identifying and managing PPH incidences.

Egenberg et al. support the use of simulation training to educate midwives about PPH because it is cost effective and it ensures patient's safety as no harm is caused to the patient.

Su (2012:183) supported the innovation of applying obstetric drills in the maternity departments as a way of improving the knowledge and skills of midwives which assists optimizing better outcomes after PPH. He indicated that applying practical drills help in identifying obstacles encountered and errors made in the management of obstetric emergency settings that lead to delayed appropriate care. El Ayadi, Robinson, Geller and Miller (2013:531) added that running drills allow for identification of system weaknesses and strengths. Drills also provide opportunities to test procedures and policies of haemorrhage management and help improve team work among midwives.

Nilsson, Sorensen, and Sorensen (2014:517) suggested African nations to make use of video platforms as another method to provide training about PPH on the midwives. They indicated that Africa has shown an increase in the availability of internet access, the use of smart phones and other mobile technologies. Therefore, video conferencing is ideal even in peripheral areas which are difficult to reach with conventional training programmes.

2.5.4.2 Availability of PPH guidelines in the maternity settings

The availability of PPH guidelines and emergency obstetric training may close the gap in the knowledge about PPH among midwives (Su, 2012:183). A study conducted in the Netherlands in 2015 stresses the importance of PPH guidelines in the maternity settings to improve maternal health and guide PPH clinical practices. PPH clinical guidelines offer midwives with concise instructions about the management of PPH. In this study low usage of PPH clinical guidelines was reported although the guidelines were available, which resulted in the midwives rendering sub-standard care (Rousseau et al. 2016:13). Woiski, Scheepers, Liefers, Lance, Middeldorp, Lotgering, Grol and Hermens (2015:1119) also supported Rousseau et al. about ensuring that all maternity settings have PPH guidelines available. They indicate that the availability of PPH guidelines mitigate the impact of rendering substandard care by providing midwives with information regarding the best available evidence-based care. This increases the effectiveness of care and reduces variations in performance between professionals and hospitals.

2.6 THE MANAGEMENT OF POSTPARTUM HAEMORRHAGE

Management of postpartum haemorrhage will be discussed under four actions which are communication, first line treatment, second line treatment, and third line treatment.

2.6.1 Communication

Communication is the first step in the management of PPH which involves alerting the other members of the team (Rousseau et al. 2016:2). Substantiated further by Allard, Green and Hunt (2014:178) adding that effective communication among midwives in event of PPH is critical to optimize the outcomes. They suggested that each maternity unit should have a communication protocol in place which consists of a consultant obstetrician, anaesthetist, midwifery staff and member of multidisciplinary teams such as laboratory technician. Ahonen, Stefanovic and Lassila (2011:1175) also added that good communication about PPH diagnoses in the delivery suite is important to respond to the event and recommending that every maternity unit must be ready and prepared at all times.

2.6.2 First line treatment (establishing cause)

The first line treatment measures occur simultaneously (Addul-Kadir, Mclintock, Ducloy, Refaey, England, Federici, Grotegut, Halimen, Herman, Hofer, James, Kouides, Paidas, Peyvandi & Winikoff, 2014:1762) This involves the midwife establishing the cause of bleeding, directing more treatment toward atony, administering uterotonic drugs and fluids resuscitation. In the event of PPH, a midwife massages the uterus to stimulate uterine muscle contractions, emptying the urinary bladder with an indwelling catheter and administering uterotonic drugs such as oxytocin, syntrometrine or ergometrine and misoprostol. In addition, establishing the cause of bleeding including inspecting the genitals for trauma and suturing tears or an episiotomy. Delivery of a retained placenta or removal of other retained products of conception must be performed to prevent further bleeding (Ahonen et al. 2011:1164). WHO (2009:6-8) recommends the administration of uterotonic drugs as follows:

2.6.2.1 Oxytocin (First line PPH drug treatment)

Intravenous 20 units of oxytocin is the recommended PPH first drug of choice in the management of PPH.

2.6.2.2 Ergometrine or Syntometrine (Second line PPH drug treatment)

A 0.2mg IMI or IVI slowly of ergometrine or syntometrine (whatever drug is available) is recommended if bleeding does not respond to oxytocin. Syntometrine is a fixed dose combination of ergometrine 0.5 mg and oxytocin 5 units.

2.6.2.3 Misoprostol (third line PPH drug treatment)

Misoprostol can be used as a third line PPH drug treatment if bleeding persists. However, there is uncertainty on the dose of misoprostol due to the side effects especially when a high dose is used, especially more than 1000mcg (WHO, 2009:8). Winikoff, Dabash,Nguyen, Nhu, Ceon, Raghavan, Medhat, Chi, Barrera and Blum (2010:211) identified misoprostol dose of 600mcg to 1000mcg to be effective and provide minimal side effects.

2.6.3 Second line treatment (Non-surgical measures)

If bleeding fails to be controlled by uterotonic drugs several other non-surgical measures are suggested:

2.6.3.1 Bimanual compression of the uterus

Bimanual compression of the uterus is performed when bleeding persists and uterotonic agents have failed to control bleeding as a result of an atonic uterus. However, in low resource-settings where the availability of uterotonic drugs are unavailable, bimanual compression of the uterus might be the only option to control haemorrhage to save maternal lives (Andreatta, Gans-Larty, Debpuur, Ofosu & Perosky, 2011:1276). Bimanual uterine compression is performed by the midwife placing one hand in the vagina and pushing against the body of the uterus while the other hand compresses the fundus from above through the abdominal wall. The posterior aspect of the uterus is massaged with the abdominal hand and the anterior aspect with the vaginal hand (Su, 2012:171).

2.6.3.2 Balloon tamponade

According to Gronvall, Tikkanen, Tallberg, Paavonen and Stefanovic (2013: 433-435), uterine balloon tamponade has been added to the treatment of persistent PPH before surgical interventions like B-Lynch sutures can be considered. Balloon tamponade has reported to provide 86% successful rate in treating PPH resulting from uterine atony or from trauma of lower uterine segment. Different balloons used include simple condoms, foley, rusch catheters and barki balloon. The barki balloon is the only balloon designed exclusively for uterine and vaginal tamponade.

According to McQuivey, Block and Massaro (2018:58-60) the device consists of two inflatable balloons; the upper balloon inflated inside the uterus and the lower balloon which is inflated inside the vagina. The balloons have lumens to enable inflation, irrigation and drainage. Inflation of these balloons can be done with isotonic intravenous fluids such as ringers lactate or normal

saline. Maximum recommended fill volumes are 300ml for vaginal balloons and 750ml for uterine balloons. The uterine balloons allow the device to be placed in the uterus to provide tamponade, hence controlling the bleeding. An irrigation can be done, if the need arises to drain blood from the uterus by connecting a collecting bag to the balloon lumen. These uterine balloons should not be left for indwelling for more than 24 hours. Haemostasis is noted to be usually achieved within 2 to 6 hours. Tindell et al. (2013:11) reported that condom catheters (foley, rusch) can be used in poor-resource countries because they are inexpensive.

2.6.3.3 Coagulation screen, blood product transfusion and fibrinogen supplementation

According to Gillissen, Van den Akker, Caram-Deelder, Henriquez, Bloemenkamp, De Maat, Van Roosmalen, Swart, Eikenboom and Van der Bom (2018:2433) there are important blood tests to be done in the event of PPH. These blood tests include the level prothrombin time (PT), activated partial thromboplastin time (PTT), platelet count, fibrinogen and haemoglobin (HB). Gillssen et al. indicate that these blood tests may be used simultaneously because there is no high-level evidence on the best strategy. However, the tests assist to enable timely treatment to prevent coagulopathy, through haemostasis therapy. Adukauskiene, Verkuitiene, Adukauskaite, Veikutis and Rimaitis (2010: 561) added that administration of blood products and haemostatic agents are critical to save maternal lives in case of massive haemorrhage. The significant blood products according to Adukauskiene et al. include red cell concentrate (RCC) which is used to correct low HB. Red Cell Concentrate importantly keeps adequate oxygen-carrying capacity of blood and avoids tissue hypoxia. In the event of disseminated intravascular coagulation (DIC), low PTT and PT, fresh frozen plasma (FFP) transfusion is indicated, while the transfusion of platelets is done to correct low platelets count. Disseminated intravascular coagulation is a disorder associated with significant cellular injury with the aetiology mainly due to severe pre-eclampsia (Toh, Alhamdi & Abrahams, 2016:505).

The levels of PT and PTT of <1.5; platelet count of <100 x 109L; fibrinogen <1.5 g/dL and haemoglobin level of <8 g/dL are regarded as critically low and require interventions. Supported further by Claroni, Avergano and Frigo (2018:13-14) transfusion HB level must be between 7-9 g/dl and PT and PPT count of <1.5 need transfusion with plasma. Meanwhile Yooh (2019:371) identify that fibrinogen < 2 g/dL needs transfusion with cryoprecipitate.

2.6.4 Third line treatment (surgical measures)

If bleeding failed to be controlled by conservative treatment measures, surgical measures namely B-Lynch sutures, uterine embolization and a hysterectomy can be considered.

2.6.4.1 B-Lynch sutures

B-Lynch sutures are brace sutures used to mechanically compress an atonic uterus in the face of severe PPH (Diemerk, Ortmeyer, Hollwitz, Lotz, Somville, Glosemeyer, Diehl & Hecker, 2012:e1). Diemerk et al. noted in some events that balloon tamponade is used in combination with B-Lynch sutures to control the bleeding. However, they report that with or without balloon tamponade the B-Lynch sutures are still an effective approach for the treatment of severe PPH. Zyang, Liu and Guo (2014:431) indicate that the B-Lynch sutures have showed a 75% successful rate to arrest bleeding in many controlled trial studies. Thus, recommending maternity settings to use this method to avoid postpartum hysterectomies in many women.

2.6.4.2 Uterine artery embolization

According to Pinto, Niola, Brunese, Pinto, Losco and Romano (2012:102-106) uterine artery embolization can be considered for persisted bleeding if all the aforementioned measures have been taken and the woman is hemodynamically stable. Pinto et al. added that the procedure is done by a radiologist specialist guided by pelvic angiography done to visualize the bleeding vessels. A gelatine sponge, coils or glue is then placed into the bleeding vessels to arrest bleeding.

2.6.4.3 Hysterectomy

An emergency postpartum hysterectomy (removal of the uterus) is considered the final resort for the treatment of unresolved PPH according to Michetel, Ricbourg, Gosme, Rossignol, Schurando, Barranger, Mebazza and Gayat (2015:774). However, Michetel et al. reported that the emergency hysterectomy is highly associated with post-traumatic stress disorders, psychosocial morbidity and anxiety. Michetel et al. therefore advise strict follow up of women who have undergone this procedure that includes psychological support. Some complications of a postpartum hysterectomy includes sepsis, injury to the organs and impaired wound healing (Diemert et al. 2012:e1).

2.7 INTERNATIONAL PERSPECTIVE FOR PREVENTING AND MANAGING POSTPARTUM HAEMORRHAGE

The wide number of measures recommended in many countries to prevent PPH such as increasing the number of midwives, ensuring the availability of PPH guidelines and investing in training among midwives are all discussed in the section 2.5. Further, high preference is given to the use of misoprostol as a first line PPH drug treatment for PPH in LMICs (Winikoff et al. (2010:210); Shretha et al. (2011:8) & Rushwan (2011:1).

According to Winikoff et al. (2010:210) oxytocin remains the drug of choice to prevent and treat PPH. However, the use of oxytocin might not be feasible in many poorly resourced countries. Winikoff et al. therefore recommend the use of misoprostol compared to oxytocin in poorly resourced countries because of its storage requirements. Oxytocin requires to be stored in refrigerators which might not be available in many maternity settings. Misoprostol can be stored at room temperature and does not require maintenance of cold chain which can be easily accessed.

A study conducted in Nepal in 2010 supported the use of misoprostol as a first line PPH drug treatment in poorly resourced countries. Oxytocin and most of uterotonic agents are administered intramuscularly or intravenously. The researchers in this study reported that misoprostol is administered postpartum sublingual or rectal because it is available in a table form. Thus, the administration of misoprostol is cost effective compared to oxytocin as it does not require sterile syringes and needles which may not be available in many poorly resourced countries (Shretha et al. 2011:8). Rushwan (2011:1) added that misoprostol can be a first line PPH drug of choice in poorly resourced countries because it is relatively inexpensive compared to oxytocin and can be administered by a non-trained midwife. Many low-resource settings lack midwives to provide safe maternal care. He further added that the efficacy and safety of rectal misoprostol have proven to prevent and treat PPH and is effective as IVI oxytocin. Thus, low-resource settings can consider misoprostol to be their first line PPH drug of choice if oxytocin is not feasible in their settings.

2.8 THE NAMIBIAN POSTPARTUM HAEMORRHAGE PERSPECTIVE

It was identified that only one study was published in Namibia on obstetric emergencies including PPH conducted in 2017 by Nsangamay and Mash (2019:2). This study was conducted to assess and improve the quality of care for women with PPH at Onandjokwe district hospital in Namibia.

The NMHSS reported that PPH is the leading direct cause of maternal deaths in Namibia (NMHSS, 2016:36). Namibia is among the countries which did not achieve the fifth MDG by 2015. In 2015 the Namibian MMR was 265 per 100 000, while the goal was to reduce MMR by 140 per 100 000 by 2015 (NMHSS, 2016:25).

The specific approaches that the NMHSS introduced to combat PPH-related maternal deaths are to ensure that all health facilities especially hospitals have in place a protocol for the management of PPH. Additionally, every midwife must be knowledgeable in managing PPH and finally have all the required emergency drugs and equipment available at all times (NMHSS, 2016:36). Nsangamay and Mash (2018:6) further just recommend that the Department of Obstetrics and Gynaecology in Namibia should motivate for the implementation of well-structured training offered in countries like South Africa such as “Essential Steps in the Management of Obstetric Emergencies (ESMOE)”. This training enhances the knowledge and skills of midwives and doctors in dealing with obstetrics emergencies including PPH.

2.9 SCOPE OF PRACTICE

The registered midwives or accoucheurs and enrolled midwives or accoucheurs in Namibia are required by the law to be registered with the Nursing Council of Namibia before they can practise as registered midwives/ or enrolled midwives/accoucheurs (Namibian Nursing Act 8, 2004:1). **Accoucheur** refers to a male midwifery provider (Nursing Act 8, 2004:2).

2.9.1 The scope of practice of a registered midwife or accoucheur

A scope of practice means the parameters within which a nurse, midwife or accoucheur must practise his or her profession (Nursing Act 8, 2004:3).

The scope of practice of a registered midwife or accoucheur according to the Namibian Nursing Act 8 of 2004, Section 59 is as follow:

(1) The scope of practice of a registered midwife or accoucheur includes the scientific application of the principles of midwifery and providing assistance and medical care to a patient undergoing labour and childbirth. The practice of a midwife or accoucheur includes scientifically based physical, psychological, social and educational means applicable to healthcare practice relating to a patient during pregnancy, labour and the puerperium.

(2) When practising his or her profession, a registered midwife or accoucheur, subject to the midwifery regimen and subregulation, may –

(a) Assess and diagnose a health need in a patient, prescribe, provide and execute a nursing or midwifery regimen to meet the needs of a patient. However, if necessary refer the patient to any other registered person or a person registered under the Medical and Dental Act.

(b) Prevent diseases, including diseases related to pregnancy, labour and puerperium and may promote health by teaching and counselling of persons.

(c) Identify and manage high risk factors and emergency conditions in a patient during labour, delivery and the postnatal period.

(d) Monitor the progress of the pregnancy, labour and puerperium including the vital signs of the patient, as well as the reaction of the mother and child to disease conditions, trauma, stress, anxiety, medication and treatment.

(e) Prevent complications relating to pregnancy, labour and puerperium.

(f) Perform an episiotomy and suture first and second-degree tears.

(g) Institute, maintain and supervise the fluid, electrolyte and acid base balance of a patient.

(h) Render life-saving interventions in an emergency.

2.9.2 Scope of practice of an enrolled midwife or accoucheur

(1) In this regulation, a “patient” includes a mother or a child, or a mother and a child. The scope of practice of an enrolled midwife or accoucheur includes the scientific applications of the principles of nursing and midwifery. This is part of the midwifery regimen planned and initiated by a registered nurse, midwife or accoucheur and the acts specified by subregulation.

(2) The acts referred to in the subregulation that may be performed by an enrolled midwife or accoucheur under the direct or indirect supervision of a registered nurse, midwife or accoucheur, include the following:

(a) Identifying of a health need and promoting the health of patient during pregnancy, labour and puerperium.

(b) Rendering of midwifery care to fulfil the needs of a patient or a group of patients, including the mother and child.

(c) Executing of a midwifery care plan for a patient.

(d) Monitoring the progress of pregnancy, labour and puerperium and vital signs of mother and child.

(e) Preventing complications related to pregnancy, labour and puerperium.

(f) Performing an episiotomy.

(g) Suturing first and second-degree tears or episiotomy.

(i) Instituting, maintaining and supervising of the fluid, electrolyte and acid base balance of a patient.

2.9.3 Midwifery care and scope of practice

Midwifery care plays a critical role in the survival, health, and wellbeing of childbearing women and new-born infants (Hoope-Bender, De Bernis, Campbell, Downe, Fauveau, Fogstad, Hormer, Kennedy, Matthews, Fadder, Reinfrew & Van Lerberghe (2014:1226-1228). They further added that midwives are the driving force behind the continuum of care across reproductive, maternal and new-born health, provided that they are well educated and supported. Hoope-Bender et al. reported that the scope of midwifery practice combines both technical interventions and family planning, providing a substantial return on investment that is enhanced further by appropriate and timely referral to specialist care. Meanwhile Casey, Fealy, Kennedy, Hegarty, Prizeman, McNamara, Reilly, Bady and Rodhe (2015:1230) reported that the scope of professional practice is strongly associated with concepts of professional conduct and accountability, self-governance and expanded practice. Casey et al. further indicated that the scope of practice offers rules and principles of the profession that are expected to regulate its members and demonstrate its responsibility to society.

Sharma, Johansson, Prakasamma, Mavalankar and Christensson (2013:630-635) reported that although, the scope of practice is there to guide midwifery practice and to provide boundaries between different categories of midwives, this is not always practised in the clinical environment. Sharma et al. specifically referred to the midwifery scope of practice of enrolled nurses in their study, in which they found that their training and education were limited compared to the actual work they carried out in clinical settings, which possess risks. In this study enrolled nurses without midwifery education were found conducting deliveries alone, due to the unavailability of trained midwives or doctors.

2.10 SUMMARY

This chapter provides detailed information from the reviewed literature regarding assessing, diagnosing, preventing and managing PPH. The chapter provided the measures to be considered in preventing and managing PPH from an international perspectives as well as the Namibian perceptive. The chapter concluded with the midwifery care and scope of practices of registered

midwives, enrolled midwives and accoucheurs. In the next chapter a detailed research methodology that was applied in this study is discussed.

2.11 CONCLUSION

Postpartum haemorrhage remains the leading cause of maternal deaths worldwide. The literature review showed that most maternal deaths associated with PPH could be prevented with timely diagnosis and management. Midwives therefore need to have the knowledge and skills to identify risk factors for PPH to respond effectively to PPH events and to save maternal lives.

CHAPTER 3:
RESEARCH METHODOLOGY

3.1 INTRODUCTION

Chapter 2 described the literature review based on the objectives of the study. In this chapter a detailed research methodology that was applied to investigate the knowledge about PPH among midwives working in the maternity departments (antenatal, labour and postnatal) of Windhoek Central and Katutura state hospitals in Namibia is described. The following are described in this chapter: research design, population and sampling, instrumentation, pilot study, validity and reliability, data analysis and conclusion.

3.2 RESEARCH DESIGN

A research design is a blueprint for conducting a study and is important to maximize control over factors that could interfere with the validity of the study design (Grove, Burns & Gray, 2013:214). A quantitative descriptive design was applied in this study to gain more information among midwives on their knowledge about PPH. Furthermore, a quantitative design was used to obtain information about statistical associations between the biographical data and the knowledge scores of enrolled and registered midwives. Quantitative research is conducted to define new events, scrutinize relationships among variables and conclude the success of treatments (Grove, Gray & Burns, 2015:212). A descriptive design was used to achieve the objectives of the study by obtaining the critical information about the knowledge of PPH among the midwives. A descriptive design is used to identify problems with current practice, make judgements or determine what others in similar situations are doing (Grove et al. 2013:215). The researcher chose the quantitative descriptive research design for this study to ensure that the results from the study are valid and reliable.

3.3 POPULATION AND SAMPLING

According to Grove et al. (2015:250) a population is a particular group of individuals or elements who are the focus of a research study. The target population of this study was all the enrolled midwives and registered midwives working in the maternity departments (antenatal, labour, postnatal) of Windhoek Central and Katutura state hospitals in Windhoek, Namibia. According to the statistics provided by the relevant authorities in May 2019 of the two respective hospitals, the total number of midwives (enrolled and registered) working in the maternity departments was 170. The biostatistician was consulted to determine the sample size for this study and proposed that

100 midwives would be a sufficient sample size for this study. However, it was decided that the total population of 170 midwives would be included in the study to allow for the pilot study and for participants who may be on leave or not granting permission to participate in the study. Thus, based on a population of 170 it was planned that 153 midwives would participate in the actual study and 17 (10%) of the midwives would participate in the pilot study. Prior to collecting the data, the final number of midwives available in the two hospitals were determined. It was then found that the numbers had decreased to 127 as shown in table 3.1. The final population was therefore 127 midwives.

Table 3.1: Total population

Hospital	May 2019	December 2019
1. Windhoek Central Hospital	90	68
2. Katutura State Hospital	80	59
3. Total population	N=170	N=127

3.3.1 Inclusion criteria

Grove et al. (2015:251) state that inclusion sampling criteria are the characteristics that the subject or element must possess to be part of the target population. In this study all permanently employed registered midwives and enrolled midwives working in the maternity departments of Windhoek Central and Katutura state hospitals were eligible to participate.

3.3.2 Exclusion criteria

According to Grove et al. (2015:251) exclusion sampling criteria are those characteristics that can cause a person or element to be excluded from the target population. This study did not have any exclusion criteria.

3.4 INSTRUMENTATION

A paper-based self-administered validated questionnaire (Annexure 6) was used to collect data for this study. A questionnaire is a self-report designed to produce information through written or verbal responses from the subject (Grove et al. 2015:304). In this study a self-administered questionnaire was designed to collect data among midwives working in the maternity departments of the two hospitals. The questionnaire was developed based on the objectives of the study, intensive literature review, input from the supervisor, biostatistician, clinical experts (obstetricians and an experienced midwife), as well as the researcher's clinical experience. The involvement of

the experts was important for the validation of the questionnaire. The questionnaire comprises of 38 items distributed in five sections A, B, C, D and E.

Section A: Comprised of nine biographical questions such as gender, age, qualification and professional category. It also included questions pertaining to participants' training and experiences relevant to PPH. This section addressed the objective of the study referring to associations between the biographical data and the knowledge scores of enrolled midwives and the registered midwives.

Section B: Comprised of six true and false questions based on the assessment of a woman in relation to PPH. This section addressed the study objective on assessing PPH.

Section C: Comprised of five true and false questions based on diagnosing PPH. This section addressed the study objective on diagnosing PPH.

Section D: Comprised of nine true and false questions on the prevention of PPH. This section was based on the study objective of preventing PPH.

Section E: Comprised of nine multiple-choice questions about the management of PPH. This section was based on the study objective of managing PPH.

The questionnaire was printed in English only and was completed in 30 minutes. The researcher was 100% confident that all the participants who are midwives are all English speaking as their day-to-day communication in the clinical environment takes place in English as the medium of communication. English is the official language in Namibia (Republic of Namibia, 1990:10).

3.5 PILOT STUDY

A pilot study is a smaller version of a proposed study that is conducted to refine the methodology (Grove et al. 2013:46). A pilot study was conducted prior to the main study in the maternity departments of the two hospitals (Windhoek Central and Katutura) from 11 to 16 December 2019. Based on the total population of 127 it was planned to have 13 (10%) of midwives participating in the pilot study. Unfortunately, only nine (7%) midwives participated in the pilot study. The pilot study assisted in determining the practicality and feasibility of the proposed study. This included testing the research methodology which included testing whether data collection could take place during working hours and if participants could complete the questionnaire in presence of the researcher. The content of the questionnaire was appropriate and the time frame was adequate

for the participants to complete the questionnaire. The results from the pilot study were excluded from the main study.

3.6 VALIDITY AND RELIABILITY

3.6.1 Validity

Validity of an instrument defines the degree to which it replicates or is able to measure the construct being examined (Grove et al. 2013:393). Grove et al. further added that the validity of a design of a study is central to acquiring quality results and findings from a study. The most important types of validity that the researcher maintained for the research tool was face, content and construct validity.

3.6.1.1 Face validity

Face validity refers to the researchers' subjective assessments of the presentation and relevance of the measuring instrument as to whether the items in the instrument appear to be relevant, reasonable and clear (Masuwai, Tajudin & Saad, 2016:13). The clinical experts in obstetrics and gynaecology, an experienced registered midwife, biostatistician and my supervisor reviewed the questionnaire prior to the commencement of the study. This was to ensure that the instrument measured the knowledge about PPH among midwives. The pilot study conducted also supported the face validity of the instrument.

3.6.1.2 Content validity

According to Grove et al (2015:291) content validity examines the extent to which the measurement method or scale includes all the major elements to the construct being measured. The content of the questionnaire was based on the current literature on the assessing, diagnosing, preventing and managing PPH. In addition, two clinical specialists in obstetrics and gynaecology, an experienced registered midwife who is involved in conducting training in Emergency Obstetric and new-born care in Namibia, the biostatistician and my supervisor reviewed each question in the questionnaire. The expert's involvement determined that the researcher includes all the important components of PPH and ensured the relevancy and clarity of each item in the questionnaire.

3.6.1.3 Construct validity

Construct validity is referred by Grove et al. (2015:291) as a single broad method of measurement evaluation. In this study only the self-administered validated questionnaire designed for the

purpose of this study was used to collect information about PPH among the midwives. No other data collection strategy such as interviews were used.

3.6.2 Reliability

Grove et al. (2015:287) refer to reliability as to the consistency of a measurement method which is important throughout the research process and the testing ensures stability. Cronbach's alpha reliability test which could be suitable in this study was not done, as it was not appropriate for the multiple-choice questions contained in the questionnaire. The test – retest reliability test was not done to avoid participants completing the questionnaire for a second time. The pilot study conducted prior to the main study supported the reliability of the instrument.

3.7 DATA COLLECTION

Data collection is the process of acquiring subjects and collecting the data for a study (Grove et al. 2015:310). Data collection took place from 17 December 2019 to 16 February 2020. The data was collected in the maternity departments (antenatal, labour and postnatal) of Windhoek Central and Katutura state hospitals. The researcher personally collected all the data. Data collection took place during the day between 10H00 in the morning till 18H00 in the evening. During night duty, questionnaires were completed between 19h30 to 23h00. The registered nurses in charge of the two maternity departments gave permission for midwives to complete the questionnaires during duty time. The midwives on night duty completed the questionnaires in the presence of the researcher at the various nursing duty stations. Midwives on day duty completed the questionnaires in the presence of the researcher in the tea rooms of the departments.

At the beginning of data collection, the researcher introduced herself to the potential participant. Thereafter, the researcher then explained the purpose of the study and gave the potential participant information as outlined in the information consent form (Annexure 5). Once the participants agreed to participate, informed consent was signed. The signed informed consent form was then placed into an envelope and sealed. Thereafter, the questionnaire was handed to the participant who agreed to participate in the study for completion. Ninety- three questionnaires were handed out for the actual study and were returned completed. The questionnaires were completed in the presence of the researcher as knowledge was being tested and a true reflection of the knowledge of the participants was required about PPH. The return rate was 100%.

3.8 DATA ANALYSIS

The procedure of analysis involves processes used to examine, reduce, and give meaning to the numerical data gathered in a study (Grove et al. 2015:319). Data analysis assisted the researcher to draw conclusions from the data gathered. The data were prepared and categories of data analysis used are as follows:

3.8.1 Data preparation

The data collected were firstly captured by the researcher on a Microsoft Excel spreadsheet. A qualified biostatistician from the biostatistics unit of Stellenbosch University assisted in analysing the data. The SPSS version 26 was applied by the biostatistician to analyse the data.

3.8.2 Descriptive statistics

According to Gray, Grove and Sutherland (2017:523), descriptive statistics are used to describe study variables and the characteristics of a sample. Data were organized in forms of graphs and frequency tables for easy interpretation.

3.8.3 Inferential statistics

LoBiondo-Wood and Haber (2014:311) refer to inferential statistics as statistical data procedures, which are used to make predictions and generalisations of the findings of a sample. Inferential statistics were applied to examine knowledge differences between categorical variables (registered midwives versus enrolled midwives). The statistical tests applied included Pearson Chi-square and Fisher's Exact.

3.8.4 Association analysis

Statistical associations between the biographical data such as qualifications and the knowledge scores of enrolled midwives and the registered midwives were determined in this study. A 95% confidence interval with a p-value ≤0.05 was used to determine if there were statistical associations between the variables.

3.9 SUMMARY

Chapter 3 provides the detail of the research methodology applied in this study to systematically investigate the knowledge about PPH among midwives working in the maternity departments (antenatal, labour and postnatal) of Windhoek Central and Katutura state hospitals, in Namibia. The chapter also provided information about the measures that were taken to ensure that the results from this study were valid and reliable. The chapter concluded with the data analysis

process which provides information on how the collected data were analysed to draw conclusions and provide meaning.

3.10 CONCLUSION

The questionnaires given to the participants were all returned ensuring a 100% return rate. In the next chapter a detailed data analysis and interpretation of the results of this study are discussed.

CHAPTER 4:
RESULTS

4.1 INTRODUCTION

Chapter 3 provide a detailed research methodology that was applied to scientifically investigate the midwives' knowledge about PPH in the two hospitals. In this chapter the results of the data collected in the study are described. The analysis and interpretation of the study results follows the outline of the questionnaire used for data collection. The statistical tests applied to analyse the data are also described in this chapter. A summary of the knowledge scores obtained from the participants of this study concludes the chapter.

4.2 DESCRIPTION OF DATA ANALYSIS

According to Grove et al. (2013:46) data analysis is a process conducted to reduce, organise and give meaning to the collected data. The researcher captured the data on an Excel worksheet and data were analysed by applying the SPSS version 26.

Descriptive statistics allow the researcher to organise the data in ways that give meaning and facilitate understanding (Grove et al. 2015:502). The data are presented in a form of frequency distribution tables and graphical presentation. The descriptive statistics applied include the mean and standard deviation (SD). According to Grove et al. (2015: 333-335) the mean is a sum of the scores divided by the number of scores being summed. The SD provides the average difference value from the mean in a particular sample.

The chi-squared test, t-test specifically the Levene's test for Equality of Variances, Pearson's chi-squared, Likelihood ratio, Linear–by-Linear Association, Analysis of Variance (ANOVA), Pearson correlation and Bonferroni Post-Hoc statistical tests were applied. The statistical tests were applied to determine association between the independent variable (knowledge scores of the participants and dependent variables (categorical variables such as gender of the participants).

According to Koletsi and Pandis (2016:1066) the chi-square Fisher's Exact test is used to determine association between two categorical variables where the distribution of one varies according to the values of the other. The chi-square Fisher's Exact test was applied to test whether there was a significant difference between the knowledge scores and categorical variables of less than two groups, the example being female and male. The Pearson chi-squared

test was applied to determine statistically significant difference between the knowledge scores and categorical variables of more than two groups, the example of professional qualifications.

The Pearson correlation is used to determine the basic relationship between variables. For the purpose of this study, the Pearson correlation was applied to determine the statistically significant correlation between the participants' age and their knowledge score (Bermudez-Edo, 2018:4).

Grove et al. (2015:506) explain that the likelihood ratio assists in determining the accuracy of diagnostic based on specific and sensitive results. The likelihood ratio determines the significant difference between some categorical variables and knowledge scores for example, the participants' years of maternity experience.

An independent samples test was applied in this study to examine the group differences between the variables such as between registered midwives and enrolled midwives. According to Grove et al. (2015:351) the ANOVA is used to examine differences among three or more groups. In this study ANOVA was applied to test statistically significant difference between groups in terms of their knowledge scores and categorical variables example professional qualifications.

The Bonferroni statistical test was applied as Post-Hoc multiple comparisons test to establish significant differences between the years of maternity experience of the participants and their knowledge scores.

A 95% confidence interval with a p-value of ≤ 0.05 was applied to determine whether there is a statistically significant association between the dependent and independent variables, the example the knowledge scores of the participants and their professional qualifications.

The researcher define competency when a participant obtained a score of ≥80% and incompetent when a score of <80% was obtained by a participant.

4.3 SECTION A: BIOGRAPHICAL DATA

This section comprised of nine biographical questions of the participants n=93. The data presented in this section are gender, age, professional category, qualifications, maternity department experience, emergency obstetrics and new-born care trained and when last trained, participation in PPH event management, as well as the last time a participant managed a PPH event.

4.3.1 Gender

Table 4.1 shows that n=89(96%) of the participants were females and n=4(4%) were males. The table also show the knowledge scores according to the gender. Only 15 (17%) females out of 89 obtained a knowledge score of ≥80%, while 2 out of 4 males obtained a knowledge score of ≥80%. The overall mean score for the female participants was 21.1 with a SD of 2.4. While the overall mean score for the male participants was 23.0 with a SD of 2.0. Further statistical tests showed no significant difference between the gender and the knowledge scores of the participants (p=0.151) when the Fisher's Exact test was applied. The Levene's Test for Equality of Variances also showed no significant difference between groups in terms of participants' gender and their knowledge score (p=0.149). Although, there was no statistical difference in the knowledge score between the female and male participants, further results indicate that the male participants were more competent in diagnosing and preventing PPH as shown in table 4.2.

Table 4.1: Gender (n=93)

Gender	n (%)	≥ 80% Knowledge scores	< 80% Knowledge Scores
Female	n=89 (96%)	n=15 (17%)	n=74 (83%)
Male	n=4 (4%)	n=2 (50%)	n=2 (50%)
Total	**n=93**	**n=17**	**n=76**

Table 4.2: Overall mean score and Std. Deviation per participants' gender and per domain

Domain / Gender	n	Mean (%)	Std. Deviation
Assessing PPH			
Female	n=89	70.5%	21.6
Male	n=4	75.0%	16.6
Diagnosing PPH			
Female	n=89	76.8%	18.5
Male	n=4	80.0%	16.3
Preventing PPH			
Female	n=89	73.4%	10.1
Male	n=4	83.3%	6.4
Managing PPH			
Female	n=89	71.9%	15.9
Male	n=4	77.7%	12.8

4.3.2 Age

The mean age of the participants' was 32, with the SD of 8.4. The youngest participants were 23 years and the oldest midwife was 54 years of age. Three participants did not indicate their age. Figure 4.1 shows the participants' age. A Pearson correlation statistical test applied, showed no statistically significant difference between the participants' age and the knowledge scores in assessing PPH (p=0.106). Further analyses also showed no significant difference when a Pearson correlation test was applied between the participants' age and their knowledge in preventing PPH (p=0.074), diagnosing PPH (p=0.201) and managing PPH (p=0.416).

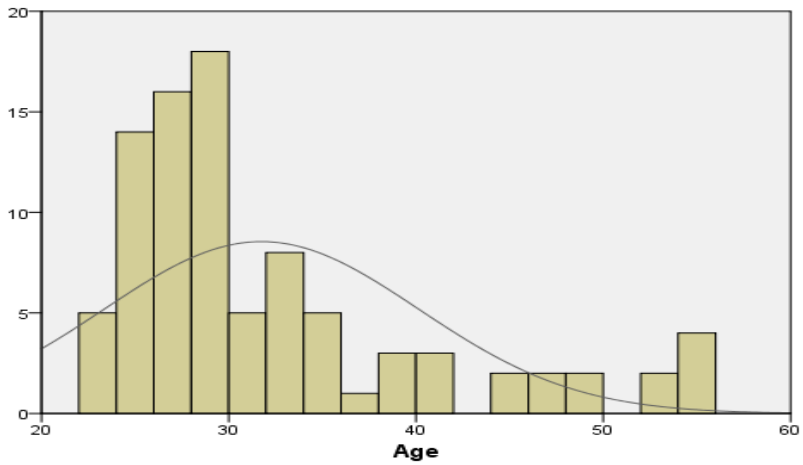

Figure 4.1: Age (n=90)

4.3.3 Professional category

Sixty-six (71%) of the participants were registered midwives, while n=27(29%) were enrolled midwives as shown in table 4.3. Fourteen (21%) of the registered midwives obtained a knowledge score of ≥ 80%, while only n=3(11%) out of 27 enrolled midwives obtained a score of ≥80%. The results show that the majority of participants are incompetent. The mean for the overall score was 21.8 with a SD of 2.2 for the registered midwives, while the overall mean score for the enrolled midwives was 19.8 with a SD of 2.5. Applying T- tests, the Levene's Test for Equality of Variances showed statistically significant difference between participant's professional categories and their knowledge scores in preventing PPH (p=0.009). The registered midwives were more likely to perform better compared to enrolled midwives.

Table 4.3: Professional category (n=93)

Category	n (%)	≥80% Knowledge scores	<80% Knowledge scores
Registered midwives	n=66 (71%)	n=14 (21%)	n=52 (79%)

Enrolled midwives	n=27 (29%)	n=3 (11%)	n=24 (89%)
Total	**n=93 (100%)**	**n=17**	**n=76**

4.3.4 Professional qualifications

Most of the participants n=40(43%), hold a Bachelor's Degree in Nursing and Midwifery but, only n=7(16.5%) obtained a knowledge score of ≥80%. Table 4.5 shows that the participant with an Advanced Midwifery and Neonatal care obtained the highest overall mean score of 23.0. However, further analyses showed that the participant with an Advanced Midwifery and Neonatal care obtained an overall mean score of <80% as shown in table 4.4. A Pearson chi-square statistical test showed no statistically significant difference (p=0.669) between the knowledge scores and the participants' professional qualifications. However, between the professional groups there were statistical differences when ANOVA was applied. A significant difference between groups in terms of participants' professional qualifications and their knowledge scores in assessing PPH was observed (p=0.021).

Table 4.4: Professional qualifications (n=93)

Qualification	n (%)	≥ 80% Knowledge scores	< 80% Knowledge scores
A Four-Year Bachelor degree in Nursing	n=40 (43%)	n=7 (16.5%)	n=33 (82.5%)
A Four-Year Diploma in Comprehensive Nursing and Midwifery Science	n=12 (13%)	n=4 (33%)	n=8 (67%)
A Three-Year Diploma in Nursing and Midwifery	n=4 (4%)	n=1 (25%	n=3 (75%)
A Three-and-a Half Year Diploma in Nursing and Midwifery	n=9 (10%)	n=2 (22%)	n=7 (78%)
A Diploma in Advanced Midwifery and Neonatal Care	n=1 (1%)	n=0 (0%)	n=1 (100%)
A Certificate in Enrolled Nursing and Midwifery	n=27 (29%)	n=3 (11%)	n=24 (89%)
Total	**n=93 (100%)**	**n=17**	**n=76**

Table 4.5: Overall mean score and std. deviation as per participants' qualification

Qualification	n	Mean	Std. Deviation
A Four-Year Bachelor Degree in Nursing	n=40	21.6	2.6
A Four-Year Diploma in Comprehensive Nursing and Midwifery Science	n=12	22.3	3.0
A Three-Year Diploma in Nursing and Midwifery	n=4	21.7	2.6
A Three-and-a Half Year Diploma in Nursing and Midwifery	n=9	21.8	1.9
A Diploma in Advanced Midwifery and Neonatal Care	n=1	23.0	
A Certificate in Enrolled Nursing and Midwifery	n=27	19.3	2.5
Total	**n=93**	**21.2**	**2.4**

4.3.5 Midwives' years of maternity experience

Most of the participants n=18(20%) had three to five years of maternity experience as shown in table 4.6. The overall mean score between the knowledge scores and the experience of the participants was 21.2. The lowest overall mean score of 20.8 was scored by participants with 10 years and more maternity experience, while those with the highest mean score (22) were the participants with one year of experience as shown in table 4.7. A Pearson chi- square statistical test showed no statistically significant difference (p=0.295) between the knowledge scores and years of maternity experience. The Likelihood ratio statistical test also showed no statistically significant difference between the participants' years of maternity experience and their knowledge scores (p=0.286). Applying the multiple comparison Bonferroni Post Hoc test no statistical differences between any participants' knowledge score and their maternity experience were identified.

Table 4.6: Years of maternity experience: (n=93)

Number of years	n (%)	≥80% Knowledge score	<80% Knowledge score
Less than 1 year	n=17 (18%)	n=2 (12%)	n=15 (88%)
One year	n=15 (16%)	n=5 (33%)	n=10 (67%)
>1 year but less than 3 years	n=14 (15%)	n=4 (29%)	n=10 (71%)
3 years but less than 5 years	n=18 (20%)	n=2 (11%)	n=16 (89%)
5 years but less than 10 years	n=16 (17%)	n=1 (6%)	n=15 (94%)
10 years and more	n=13 (14%)	n=3 (23%)	n=10 (77%)
Total	**n=93 (100%)**	**n=17**	**n=76**

Table 4.7: Overall knowledge mean and std. deviation score as per participants' maternity experience

Number of years	N	Mean	Std. Deviation
Less than 1 year	n=17	21.1	2.4
One year	n=15	22.0	3.3
>1 year but less than 3 years	n=14	21.3	2.4
3 years but less than 5 years	n=18	21.1	1.7
5 years but less than 10 years	n=16	21.0	1.8
10 years and more	n=13	20.8	3.2
Total	**n=93**	**21.2**	**2.4**

4.3.6 Training in emergency obstetrics and new-born care

Table 4.8 shows the participants' training in emergency obstetrics and new-born care and their knowledge scores. The majority of participants n=56(61%) were not trained in emergency obstetrics and new-born care. The overall mean score for the participants trained in emergency obstetrics and new-born care was 21.0 with a SD of 2.4. The non-trained participants' overall mean score was 21.3 with a SD of 2.5. The Fisher's Exact statistical test applied showed no statistically significant difference between the participants' knowledge scores and their training in emergency obstetrics and new-born care (p=0.789). Furthermore, the Pearson chi-squared statistical test also showed no statistically significant difference between the knowledge scores and training in emergency obstetrics and new-born care (p=0.720).

Table 4.8: Training in emergency obstetrics and new-born care (n=92)

Training in emergency obstetrics and new-born care	n (%)	≥80% Knowledge score	<80% Knowledge score
No	n=56 (61%)	n=11 (20%)	n=45 (80%)
Yes	n=36 (39%)	n=6 (17%)	n=30 (83%)
Total	**n=92 (100%)**	**n=17**	**n=75**

4.3.7 Last emergency obstetrics and new-born care training

Only n=36(39%) of the participants responded to this question. The majority of the participants n=23(64%) received their last training in emergency obstetrics and new-born care one year to two years before. Twenty participants (87%) out of 23 in this group obtained a score of <80%. A Pearson chi-squared statistical test was applied which showed no statistically significant difference (p=0.601) between the last year of emergency obstetrics training and the participants'

knowledge scores. The Linear-by-Linear association statistical test also showed no statistically significant difference between the knowledge scores and their last year of emergency obstetrics and new-born care training (p=0.587).

Table 4.9: Years ago of obstetrics emergency training and new-born care (n=36)

Years of training	n (%)	≥80% Knowledge ago	<80% Knowledge score
1 year to 2 years	n=23 (64%)	n=3 (13%)	n=20 (87%)
3 years to 4 years	n=12 (33%)	n=3 (25%)	n=9 (75%)
5 years and more	n=1 (3%)	n=0 (0%)	n=1 (100%)
Total	**n=36 (100%)**	**n=6**	**n=30**

4.3.8 Postpartum haemorrhage (PPH) event management

Out of the ninety-one (98%) participants who had managed a PPH event, only n=17(19%) participants, obtained a knowledge score of ≥80%. The overall mean score for the participants who managed a PPH event was 21.2 with a SD of 2.4. The Pearson chi-squared statistical test showed no statistically significant difference between the PPH event management and the knowledge scores of the participants (p=0.499). However, applying the Levene's Test for Equality of Variances showed a significant difference between groups in terms PPH event management and the participant's knowledge scores in preventing PPH (p=0.000). The participants who had managed a PPH event were more likely to perform better compared to participants who never managed a PPH event.

Table 4.10: PPH event management (n=93)

PPH event management	n (%)	≥80% Knowledge score	<80% Knowledge score
Yes	n=91 (98%)	n=17 (19%)	n=74 (81%)
No	n=2 (2%)	n=0 (0%)	n=2 (100%)
Total	**n=93 (100%)**	**n=17**	**n=76**

4.3.9 Last time of PPH event management

Thirty-one (34%) participants managed a PPH event about one week before. The Pearson chi-square test applied showed no statistically significant difference between the last time participants managed a PPH event and the knowledge score (p=0.614). Furthermore, the likelihood ratio also showed no statistically significant difference between the last time participants managed a PPH

event and their knowledge scores (p=0.568). Table 4.11 shows the last time participants managed a PPH event and their knowledge scores.

Table 4.11: Last time of PPH event management (n=91)

Last time of PPH event management	n (%)	≥80% Knowledge score	<80% Knowledge score
About a 1 week ago	n=31 (34%)	n=6 (19%)	n=25 (81%)
About 2 weeks ago to 3 weeks ago	n=12 (13%)	n=4 (33%)	n=8 (67%)
About a 1 month ago	n=18 (20%)	n=2 (11%)	n=16 (89%)
About 3 months ago	n=13 (14%)	n=3 (23%)	n=10 (77%)
About 6 months ago	n=9 (10%)	n=2 (22%)	n=7 (78%)
About a 1 year ago	n=7 (8%)	n=0 (0%)	n=7 (100%)
1 year ago and more	n=1 (1%)	n=0 (0%)	n=1 (100%)
Total	**n=91 (100%)**	**n=17**	**n=74**

4.4 SECTION B: ASSESSING POSTPARTUM HAEMORRHAGE

This section consisted of six true and false questions designed to investigate the midwives' knowledge about assessing PPH. Table 4.12 shows the response of the total number of participants to each question and whether correct or incorrectly answered. The results indicate that n=47(51%) participants obtained a knowledge score of ≥80%, while n=49(49%) participants obtained a knowledge score of <80%. The overall knowledge mean score obtained in this section was 70.7% with a SD of 21.3 which is below 80%. Further analysis indicates that the highest knowledge mean score of 87.5% was obtained by participants who hold a Three-Year Diploma in Nursing and Midwifery. The participants with a Bachelor's Degree in Nursing obtained the second lowest mean score of 70.4%. Participants who hold a Certificate in Enrolled Nursing and Midwifery scored the lowest in this section with an overall mean score of 64.8%.

Participants with 10 years and more maternity experience obtained an overall mean score of 78.2%. The participants not trained in emergency obstetrics and new-born care scored higher with the overall mean score of 71.7%, compared to participants trained in emergency obstetrics and new-born care with an overall mean score of 69.4%. The overall mean score for the registered midwives was 73.2%, while the overall mean for the enrolled midwives was 64.8%.

The ANOVA showed a statistically significant difference between groups in terms of professional qualifications and the participants' knowledge score in assessing PPH (p=0.021). Further

statistical tests applying the Levene's Test for Equality of Variances showed no statistically significant difference between the participants' professional categories and their knowledge in assessing PPH (p=0.085).

Table 4.12: Questions related to assessing PPH

PPH related assessment questions	Correct n (%)	Incorrect n (%)	Total n (%)
Ethnicity contributes to PPH	n=79 (86%)	n=13 (14%)	n=92 (100%)
Smoking contributes to PPH	n=40 (43%)	n=53 (57%)	n=93 (100%)
Woman's age contributes to PPH	n=62 (69%)	n=28 (31%)	n=90 (100%)
A grand-multi parity woman is at risk of PPH	n=86 (92%)	n=7 (8%)	n=93 (100%)
Good nutrition status protects the women from PPH	n=57 (62%)	n=35 (38%)	n=92 (100%)
Good antenatal care provides better PPH assessment	n=71 (76%)	n=22 (24%)	n=93 (100%)

4.5 SECTION C: DIAGNOSING POSTPARTUM HAEMORRHAGE

This section consisted of five true and false questions aimed at investigating the midwives' knowledge about diagnosing PPH. Table 4.13 indicates the participants' response to the individual questions and the total number of participants who answered a particular question. The results indicate that n=67(72%) of the participants obtained a knowledge score of ≥80% and n=26(28%) participants obtained a knowledge score of <80%. The overall knowledge mean score obtained was 76.9% with a SD of 18.4, which is below 80%. Further analysis shows that the participants who hold a Three -and a Half Year Diploma in General Nursing and Midwifery obtained an overall mean score of 84.4%. The participants who hold a Bachelor's Degree in Nursing obtained an overall mean score of 78.5%. Additional analysis indicates that the participants with 5 years to 10 years maternity experience obtained the highest overall mean score of 83.7%. While the participants with more than one year to less than 3 years maternity experience obtained the lowest overall mean score of 70%. The participants with 10 years and more maternity experience obtained an overall mean score of 72.3%.

The participants who were trained in emergency obstetrics and new-born care obtained an overall knowledge score of 75.5%, while the non-trained participants in emergency obstetrics and new-born care obtained an overall mean score of 77.5% in this domain. Participants who were last trained between a year to 2 years before in emergency obstetrics and new-born care, obtained the highest overall mean score of 76.5% compared to other groups when last trained. The overall

mean score for the registered midwives was 79.7%, while the overall mean score for the enrolled midwives was 70.3%.

The Levene's Test for Equality of Variances statistical test showed a statistically significant difference between groups in terms of participants' knowledge in diagnosing PPH and their professional categories (p=0.026). The registered midwives were more likely to obtain better knowledge scores compared to the enrolled midwives. The ANOVA showed no statistically significant difference between groups in terms of years of maternity experience and the participants' knowledge score (p=0.302).

Table 4.13: Questions related to diagnosing PPH

Diagnosing PPH related questions	Correct n (%)	Incorrect n (%)	Total n (%)
The definition of PPH after a vaginal birth	n=87 (93.5%)	n=6 (6%)	n=93 (100%)
The definition of PPH after a caesarean section	n=81 (87%)	n=12 (13%)	n=93 (100%)
Diagnosing PPH starts from accurate blood loss assessment	n=80 (86%)	n=13 (14%)	n=93 (100%)
Measuring a HB level of a woman is a reliable tool to diagnose PPH	n=58 (63%)	n=34 (37%)	n=92 (100%)
A sudden change in the level of consciousness after a birth can indicate PPH	n=76 (83%)	n=16 (17%)	n=92 (100%)

4.6 SECTION D: PREVENTING POSTPARTUM HAEMORRHAGE

This section comprised of nine true and false questions aimed at investigating the participants' knowledge on the prevention of PPH. Table 4.14 shows the total number of participants who answered the individual questions and their responses. The knowledge scores based on the prevention of PPH show an overall knowledge mean score of 73.8% with a SD of 10.1. Further results show that only n=15(16%) of the participants out of 93 obtained a knowledge score of ≥ 80%. The majority of participants n=78(84%) did not know how to prevent PPH, obtaining a knowledge score of <80%. Additional analysis indicates that the participants with a Three-Year Diploma in General Nursing and Midwifery obtained the highest overall mean score of 77.7%. The participant with an Advanced Midwifery and Neonatal care qualification obtained an overall knowledge score of 66.6%. The participants with less than one year of maternity experience scored the highest with the overall mean score of 75.8% compared to participants of other years of maternity experiences. The results also indicate that the overall mean score of the registered midwives in this section was 75.5%, while for the enrolled midwives was 69.5%. Further analysis

also indicates that the participants who were trained in emergency obstetrics and new-born care obtained an overall mean score of 75.3%, while the non-trained participants in emergency obstetrics and new-born care obtained an overall mean score of 72.8%.

The Levene's Test for Equality of Variances applied, showed no statistically significant difference between groups in terms of training in emergency obstetrics and new-born care and participants' knowledge about preventing PPH (p=.0.257). Furthermore, the ANOVA showed no statistically significant difference between groups in terms of professional qualifications of the participants and their knowledge score (p=0.170). Applying further a statistical test, the Levene's Test for Equality of Variances showed statistically difference between groups in terms of participants' professional categories and their knowledge in preventing PPH (p=0.009). The registered midwives were more inclined to obtain better knowledge scores compared to the enrolled midwives.

Table 4.14: Questions related to preventing PPH

Diagnosing PPH related questions	Correct n (%)	Incorrect n (%)	Total n (%)
Artificially rupturing of the membranes should be minimized to prevent PPH	n=27 (29%)	n=65 (71%)	n=92 (100%)
Importance of delivering the placenta by controlled cord traction	n=86 (93%)	n=6 (7%)	n=92 (100%)
Importance of prompt delivering of the placenta and examination for completeness	n=91 (98)%	n=2 (2%)	n=93 (100%)
Importance of administration of uterotonic drugs even if uterine tone is not poor to prevent PPH	n=75 (81%)	n=18 (19%)	n=93 (100%)
Importance of continuous rubbing of the uterus after birth to prevent PPH	n=15 (16%)	n=78 (84%)	n=93 (100%)
Suturing of vaginal tears and lacerations are critical to prevent PPH	n=84 (90%)	n=9 (10%)	n=93 (100)
A full bladder interferes with uterine action and need to be emptied to prevent PPH	n=88 (95%)	n=5 (5%)	n=93 (100%)
Removing retained products of conception after birth is important to prevent PPH	n=81 (87%)	n=12 (13%)	n=93 (100%)
The use of vacuum and forceps during vaginal birth should be minimized to prevent PPH	n=71 (78%)	n=20 (22%)	n=91 (100%)

4.7 SECTION E: MANAGING POSTPARTUM HAEMORRHAGE

This section consisted of nine multiple-choice questions aimed at assessing the participants' knowledge about managing PPH. Table 4.15 indicates the participants' responses to the

individual questions and the total number of participants who answered a particular question. The knowledge score based on the management of PPH shows that the majority of the participants n=70(75%) obtained a knowledge score of <80%. Only n=23(25%) participants out of 93 obtained a knowledge score of ≥80%. The overall knowledge mean score for this domain was 72.1% with a SD of 15.8.

The highest mean score of 79.0% was obtained by participants who hold a Three-and-a Half Years Diploma in Nursing and Midwifery although still below 80%. The participant with a qualification in Advanced Midwifery and Neonatal care obtained a knowledge mean score of 77.7%, also below 80%. Additional analysis indicates that participants with a Three-Year Diploma in Nursing and Midwifery obtained the lowest mean score of 61.1%. The results also indicate that the overall mean score for the registered midwives was 73.5%, while the overall mean score for the enrolled midwives was 68.7%.

Further analysis indicates that the participants who are not trained in emergency obstetrics and new-born care obtained the highest overall mean score of 73.8%, while those without training in emergency obstetrics and new-born care obtained a mean score of 69.7%. The participants who managed a PPH event about a week and about 6 months before are among the participants who obtained the highest overall knowledge mean score of 77.7%. Additional analysis showed that participants with the 1 year to less than 3 years maternity experience obtained highest overall mean score of 77.7%.

The Levene's Test for Equality of Variances showed no significant difference between groups in terms of the participants professional categories and their knowledge score in managing PPH (p=0.182). Furthermore, the ANOVA statistical test applied showed no statistical difference between groups in terms of participants' professional qualifications and their knowledge in managing PPH (p=0.364).

Table 4.15: Questions related to managing PPH

Managing PPH related questions	Correct n (%)	Incorrect n (%)	Total n (%)
The most critical interventions to manage PPH	n=54 (58%)	n=39 (42%)	n=93 (100%)
Single start dose of oxytocin to be added in the intravenous Ringer Lactate	n=78 (86%)	n=13 (14%)	n=91 (100%)
The first step in managing PPH	n=87 (94%)	n=6 (6%)	n=93 (100%)
The second drug to be used after oxytocin in a woman with a large soft atonic uterus and continues to bleed	n=25 (27%)	n=68 (73%)	n=93 (100%)
When the recommendation of blood transfusion is recommended in a woman who experienced PPH	n=68 (75%)	n=23 (25%)	n=91 (100%)
Appropriate intravenous cannula for obstetrics haemorrhage resuscitation	n=55 (61%)	n=35 (39%)	n=90 (100%)
The recommended single start dose of misoprostol to manage PPH	n=88 (95%)	n=5 (5%)	n=93 (100%)
When bimanual compression is recommended	n=84 (92%)	n=7 (8%)	n=91 (100%)
The final surgical intervention for refractory bleeding from the uterus to manage PPH	n=65 (71%)	n=27 (29%)	n=92 (100%)

4.8 SUMMARY

This chapter presented the analysis and interpretation of the data obtained from the questionnaire to investigate the midwives' knowledge about assessing, diagnosing, preventing and managing PPH. Different statistical tests applied to determine any statistically significant differences between categorical variables and the knowledge scores were described. The results indicate that n=91(98%) participants obtained an overall knowledge mean score of <80% in all four PPH core domains (assessment, diagnosing, preventing and managing PPH). Only two (2%) out of 93 participants obtained a knowledge score of ≥80% in all four PPH core domains. Further analysis also showed that only n=17(18%) participants out of 93 obtained an overall knowledge score of ≥ 80%, while n=76(82%) participants obtained an overall knowledge score of < 80%.

4.9 CONCLUSION

The results indicate that the researcher successfully explored the research question which was: What is the knowledge about postpartum haemorrhage among midwives working in the maternity departments (antenatal, labour and postnatal) of Windhoek Central and Katutura state hospitals in Namibia? The result indicate that 82% of the midwives were found to be incompetent about assessing, diagnosing, preventing and managing PPH. Furthermore only few matters were the

results indicate statistical significant difference. A discussion, conclusions and recommendations of the results obtained are discussed in chapter 5.

CHAPTER 5:
DISCUSSION, RECOMMENDATIONS AND CONCLUSION

5.1 INTRODUCTION

Chapter 4 presented the results obtained in the study. This chapter provides an in-depth discussion based on the data results presented in chapter 4. The recommendations, as well as the limitations experienced during the study, are described.

5.2 DISCUSSION

The aim of the study was to investigate the knowledge about PPH among midwives working in the maternity departments (antenatal, labour and postnatal) of Windhoek Central and Katutura state hospitals in Namibia.

The objectives of the study were to investigate if midwives working in the maternity departments of Windhoek Central and Katutura state hospitals in Namibia have knowledge about:

- Assessing postpartum haemorrhage
- Diagnosing postpartum haemorrhage
- Preventing postpartum haemorrhage
- Managing postpartum haemorrhage and

To determine associations between the biographical data and the knowledge scores of enrolled midwives and the registered midwives.

For the purpose of this discussion, the objective of determining associations between the knowledge scores and the biographical data of the participants, will first be discussed aligned with the objectives of determining midwives' knowledge about assessing, diagnosing, preventing and managing PPH.

5.2.1 Objective 1: To determine associations between the biographical data and the knowledge scores of enrolled midwives and registered midwives

5.2.1.1 Qualifications of the participants

The results of this study reveal that 43% of the participants had a Bachelor's Degree in Nursing. The patients' safety and improved health care are mainly achieved by a midwife with a Bachelor's Degree or higher qualification such as an advanced qualification in midwifery (Altmann,

2011:262). The education and training of a higher qualification such as the Bachelor's Degree is more extensive and provide more depth in education. Thus, the presence of a midwife with a degree in nursing and midwifery is linked to more positive health outcomes. Altmann (2011:262) confirms that a decrease in patients' morbidity and mortality in healthcare institutions are associated with a large number of Bachelor Degree qualified health-care providers. The rationale being that more knowledge and skills are acquired during the undergraduate training of the Bachelor's Degree. Thus, an expectation exists that individuals with a higher qualification should obtain better scores. Kovner, Brewer, Katigbak, Djukic and Fatehi (2012:333) state that the education and training of a Bachelor's Degree prepared nurse, equip her/him to meet all the challenges of the 21st century health care.

However, paragraph 4.3.4 described no statistical difference between the qualifications of the participants and their knowledge scores (p=0.669). Further results (paragraph 4.3.4) indicate a statistical difference between groups in terms of participants' professional qualifications and their knowledge in assessing PPH (p=0.021). The participants with a Three - Year Diploma in Nursing and Midwifery obtained the highest mean scores in this domain of 87.5% (paragraph 4.4). In addition, participants with a Bachelor's Degree obtained a much lower mean score than the participants with a Diploma in General Nursing and Midwifery (Table 4.5). Furthermore, only 16.5% of the participants with a Bachelor's Degree obtained a knowledge score of ≥80% which indicate that most of these participants (82.5%) were incompetent (Table 4.4).

The participant with an Advanced Diploma in Midwifery and Neonatal Care who is a specialist in Midwifery obtained an overall knowledge score of <80%. As described in the conceptual theoretical framework, paragraph 1.7, acquiring knowledge and developing skills pass through five stages. The third stage is the competent stage. Applying Benner (2013:3), a competent midwife has the ability to recognize a PPH event and execute emergency treatment, while also calling for assistance from other members of her team. For the purpose of this study, competency is recognized when a midwife obtains ≥80% in a PPH knowledge evaluation questionnaire as described in paragraph 1.7.

The course in Advanced Midwifery provides specialist knowledge in Midwifery to enable midwives to execute midwifery care with the highest degree of competency, enhance critical thinking skills and solve problems especially those involved in difficult situations. According to the South African Nursing Council (SANC) Act of (2005:2) the Advanced Midwifery qualification will enable the graduate to function as a clinically focused, service- orientated and competent independent

midwife. With reference to the stages as described by Benner (2013:4), a midwife who has obtained a qualification in Advanced Midwifery and Neonatal Care will be proficient in her practice, being on the fourth stage.

Unfortunately, the study only had one participant with the qualification in Advanced Midwifery and Neonatal Care which is insufficient for any comparisons and make conclusion.

5.2.1.2 Professional category of the participants

The result indicates (paragraph 4.3.3) that only 3 enrolled midwives obtained knowledge scores of ≥80%. Further results indicate (paragraphs 4.4, 4.5, 4.6 and 4.7) that the overall mean scores for the enrolled midwives in all four domains were below 80%. Similarly, the registered midwives also obtained an overall mean score of <80%. As described in paragraph 4.3.3, a statistical difference between groups in terms of the professional categories of the participants and their knowledge score in preventing PPH (p=0.009) was identified. Furthermore, paragraph 4.5 indicates a statistically significant difference between groups in terms of the participants' professional categories and their knowledge score in diagnosing PPH (p=0.026). The results indicate that registered midwives obtained better knowledge mean scores compared to enrolled midwives in all four PPH domains as shown in paragraph 4.4, 4.5, 4.6 and 4.7. The study emphasises the gap in the level of education and training of enrolled midwives compared to that of the registered midwives in Namibia. The curriculum for the enrolled midwives in Namibia is very limited. The programme for enrolled midwives is only two years in duration with midwifery education offered in the second year, which is also the last year of training. Furthermore, they are only taught normal midwifery (normal pregnancy, labour and puerperium) (Namibian Nursing Act 8, 2004:5). However, many time despites the limited education and training the enrolled midwives are expected to perform midwifery care beyond their scope of practice, due to the shortage of registered midwives.

Jacob, Sellick and Mckenna (2015:306) also support the notion that the education and training for the enrolled midwives is limited. Jacob et al. stated that not only is the education curriculum of enrolled midwives limited but also narrowed in the analytic and cognitive skills. Jacob et al. stated that these skills are important for critical thinking, which is required for clinical decision making, analysis of health care, as well as for monitoring and evaluation. Jacob, Barnett, Sellick and McKenna (2013:159) supported this by indicating that the training of enrolled nurses is limited, and the focus is to do fewer complex procedures. Postpartum haemorrhage is a complex condition hence complex skills and knowledge is needed. The training and education of enrolled

midwives is limited to basic patient care such as assisting with activities of daily living and monitoring the health status of the patient. Therefore, enrolled midwives are rendering substandard care in midwifery, due to their level of training.

5.2.1.3 Training of participants

The training in emergency obstetrics and new-born care was also identified as a challenge in clinical practice. Only 39% of the participants were trained in emergency obstetrics and new-born care, while the majority of the participants, 61% were not trained in emergency obstetrics and new-born care (Table 4.8). The participants who were not trained in emergency obstetrics and new-born care obtained a higher mean score (21.3), compared to those participants who had training (paragraph 4.3.6). Compulsory training in emergency obstetrics and new-born care for all midwives is critical because it contributes to the reduction of high PPH-related maternal morbidity and mortality. Furthermore, the training in emergency obstetrics and new-born care does not only improve the knowledge and skills among midwives but, also creates an opportunity to identify systems failures and the effectiveness of providing a multidisciplinary interactive maternity care approach.

Grady, Ameh, Adegoye, Kongnyuy, Dornan, Falconer, Islam and Van Den Broek (2011:21) also supported the training of quality emergency obstetrics and new-born care among SBAs to reduce maternal and neonatal mortality in low resource countries. Grady et al. noted that not only does training enhance the knowledge and skills among the participants, but also raises awareness in ensuring that the practice is delivered in accordance with current best practice. Additionally, the training provides the best opportunity to introduce new maternity care protocols and guidelines. El Ayadi et al. (2013:531) added that the training assists in testing the effectiveness of existing PPH procedures and policies (paragraph 2.5.5.1). Otolorin, Gomez, Currie, Thapa and Dao (2015:s46) also state that training SBAs in emergency obstetrics and new-born care is essential to reduce maternal morbidity and mortality. Otolorin et al. added that the training in emergency obstetrics and new-born care is mainly provided within the context of community-focused and facility-based health systems. This ensures timely prevention and intervention of complications, hence saving maternal lives.

The researcher questions the quality of training in emergency obstetrics and new-born care provided to the participants, as well as the effectiveness of the training. One of the major aims of providing emergency obstetrics and new-born care training to midwives is to enhance their knowledge and skills in emergency obstetrics and new-born care. Thus, it was expected that the

participants who were trained in emergency obstetrics and new-born care would have obtained higher knowledge scores, compared to non-trained participants. Pavord and Mayburg (2015:2759) also supported that the training in emergency obstetrics and new-born care is aimed at boosting the midwives' knowledge and skills, to be confident and competent in rendering emergency obstetrics and new-born care.

Ameh and Van Den Broek (2015:1083) recommend that policy makers evaluate the effectiveness of training in emergency obstetrics and new-born care after every training session. This will enable policy makers to make continuous improvements to the training programme and to provide evidence to sustain the intervention. The recommendation from Ameh and Van Den Broek (2015:1083) is for policy makers to assess participants before and after the training. Substantiated further by Van Lonkhuijzen, Dijman, Roosmalen, Zeeman and Scherpbier (2010:784) added that evaluating the effectiveness of emergency obstetrics and new-born care is critical in assessing changes in knowledge and skills, as well as improvement in the behaviour of the participants.

5.2.1.4 Experience of the participants

The results indicate that the years of maternity experience did not have an influence on the knowledge scores of the participants as shown in paragraph 4.3.5. Applying the multiple comparison Bonferroni Post Hoc test, no statistical differences were identified between the number of years of maternity experience of participants and their overall knowledge scores. The results obtained in this study regarding the maternity experience and the knowledge score are unexpected, as participants with more years of maternity experience obtained lower knowledge scores compared to participants with fewer years of maternity experience (Table 4.6). Maternity settings require to have midwives who are competent and have expertise which could be obtained in the time spent in the maternity setting. Jacob et al. (2013:163) substantiate that there is a relationship between the levels of experience of a nurse and in providing quality nursing care.

The more the experience the better the quality of care is supposed to be. Benner (2013:2-7), (paragraph 1.7) in the conceptual framework of this study requires experts to have an intuitive grasp of every situation. Benner states that the healthcare settings need health care providers who are competent in quality healthcare delivery. The participants with 10 years and more maternity experience were regarded as experts in this study but, their knowledge scores were lower compared to participants of fewer years of maternity experience.

In conclusion, the results obtained in the study show that the participants are incompetent about PPH and their biographical data specifically their qualifications, experience and training did not influence their overall knowledge about PPH.

5.2.2 Objective 2: To determine if midwives have knowledge about assessing postpartum haemorrhage

The importance of assessing a patient for PPH is to identify women who are at potential risk of developing PPH during labour and the postnatal period. The assessment process allows for proper planning to ensure that the necessary equipment, supplies and adequate personnel are available during childbirth and in the postpartum period of women at risk of developing PPH. This is supported by Lockart (2015:133) who also states that identification of women at risk of developing PPH is important for planning and to ensure the necessary personnel and resources are available at childbirth. Mclintock and James (2011:1441) added that assessing women at risk of developing PPH, allows for early referral for these women to deliver at centres with access to onsite blood transfusion.

The results of the study indicate that the overall knowledge mean score about the assessment of patients for PPH was 70.7%, below 80% as described in paragraph 4.4. Thus, it is important to have well trained highly skilled midwives in the clinical environment to ensure proper assessment for possible PPH. This will allow the midwife to introduce the appropriate PPH response to reduce PPH-related maternal deaths. Further results (paragraph 4.4) indicate that despite the fact that 43% of the participants hold a Bachelor's Degree in Nursing, their knowledge mean score was lower (70.4%), compared to the participants with a Three - Year Diploma in Nursing (87.5%). The results obtained in this domain show that the participants are incompetent in assessing PPH.

5.2.3 Objective 2: To determine if midwives have knowledge about diagnosing postpartum haemorrhage

Diagnosing PPH is important for early recognition of a PPH event. Diagnosing PPH starts from an accurate postpartum blood loss assessment or estimation. It is therefore critical that midwives are capable in diagnosing PPH as the entry point toward the management of PPH. Delays in diagnosing PPH lead to poor management of PPH and is associated with increased morbidity and mortality. This is also supported by Hancock et al. (2015:2) who indicate that delay in diagnosing PPH have a direct effect on the severity of bleeding, and the development of complications such as coagulopathy resulting in high rates of morbidity and mortality. Thus, reliability of blood loss estimation by a midwife is the crucial step in early detection of PPH. Prata

(2010:274) added that the ability to diagnose PPH improves the timing for referral, hence reducing PPH morbidity and mortality.

The results indicate that the participants are incompetent in diagnosing PPH, as the overall knowledge mean score of 76.9% was obtained with reference to diagnosing PPH, as indicated in paragraph 4.5. Further results indicate that the participants who were not trained in emergency obstetrics and new-born care, obtained the highest mean score of 77.5%, while the participants trained in emergency obstetrics and new-born care obtained an overall mean score of 75.5%. However, the results for both groups (trained and non-trained participants) were below 80%, indicating incompetence. Late diagnosis of PPH could lead to a delay in rendering proper PPH care. The participants in this study did not how to diagnose PPH and were therefore found to be incompetent.

5.2.4 Objective 3: To determine if midwives have knowledge about preventing postpartum haemorrhage

The importance of preventing PPH in the maternity settings is to reduce maternal morbidity and mortality caused by PPH. It is therefore important that midwives possess with the necessary knowledge to prevent PPH. The scope of practice for the registered midwives and enrolled midwives (paragraphs 2.10.1 and 2.10.2) also requires registered midwives and enrolled midwives to prevent pregnancy, labour and puerperium complications, PPH included. This is also supported by Rani and Begum (2017:4) who indicate that PPH related maternal deaths are high in developing countries where midwives do not have knowledge and skills in preventing PPH.

The results indicate that only 16% obtained a knowledge score of ≥80%, as shown in paragraph 4.6. Further results also indicate that the participants were incompetent in preventing PPH by obtaining an overall knowledge mean score of 73.8%, below 80%. The overall mean score for the registered midwives was 79.5%, while the overall mean score for the enrolled midwives was 69.5%, as indicated in paragraph 4.6. The scope of practice (paragraph 1.10.2) indicates that the role of registered midwives is to supervise enrolled midwives and that enrolled midwives execute their duties under their direct supervision. The result is therefore raising a question of how registered midwives are preventing PPH and supervising the enrolled midwives when they are also incompetent. This is also supported further by Jacob et al. (2015:304) who stated that the role of the registered midwives does not only include the responsibility and accountability for their own actions, but they are also responsible and accountable for the nursing care provided by other

health staff who they supervise. In conclusion, the participants were incompetent in preventing PPH as indicated by the results.

5.2.5 Objective 4: To determine if midwives have knowledge about managing postpartum haemorrhage

The role of managing PPH effectively is important to prevent further complications such as a hysterectomy and critical to save maternal lives. Thus, it is important to explore the knowledge about managing PPH to improve maternal outcome. This is also supported by Olowekere, Adekeye, Ogunfowokan, Olagunju and Irinoye (2013:29) who stated that midwives are the closest healthcare providers to women. Thus, midwives need to have access to appropriate information to ensure identification of risk, early diagnosis and provision of appropriate management. The results indicate that the majority of the participants, 75% did not know how to manage PPH and obtained a knowledge score of <80%. Only 25% of the participants knew how to manage PPH by obtaining a knowledge score of ≥80% (paragraph 4.7). The result indicates a high level of incompetence among the participants in managing PPH. Chaturvedi, Upidhyaya and De Costa (2014:1) indicate that a high number of avoidable maternal deaths are attributed to poor knowledge among midwives and stressed the importance of midwives at all levels to demonstrate a high level of competence to reduce maternal deaths. Supported further by Nyango et al. (2010:131) stated that midwives need to possess with adequate knowledge and skills to perform all core functions of PPH (paragraph 2.5.5). In conclusion, the participants were found to be incompetent in the management of PPH.

To conclude the discussion, the results show that the participants were incompetent in assessing, diagnosing, preventing and managing PPH. Further results also indicate that only 2 participants obtained a knowledge score of ≥ 80% in all four domains, which demonstrate poor competence about PPH.

5.3 RECOMMENDATIONS

The conclusions obtained in 5.2 indicate that the participants were found to be incompetent in assessing, diagnosing, preventing and managing PPH. The recommendations are based on the outcome of the objectives. The recommendations are as follows:

5.3.1 Training

The study recommends the urgent implementation of quality emergency obstetrics and new-born care training to address the poor knowledge among the participants working in the maternity

departments of the two hospitals. The study further recommends that the quality of training be evaluated specifically evaluating the teaching methods, content and the presenter prior to the training. The study suggests a weekly training programme for in-service training to be established in these maternity departments to ensure that the midwives remain competent. The training should offer pre-testing to assess the participants' knowledge before the training and post-testing to evaluate the effectiveness of the training by assessing the changes in the participants' knowledge. The study also recommends training programmes to include follow-up sessions with the participants to continue monitoring their level of knowledge and skills in providing emergency obstetrics and new-born care.

Furthermore, the study is recommending obstetric drills as another intervention of training for midwives working in the maternity departments of Windhoek Central and Katutura state hospitals. The study further recommends training to be provided by qualified trainees highly competent in emergency obstetrics and new-born care. Ameh, Adegoke, Hofman, Ismail, Ahmed and Van Den Broek (2012:283) also stated that it is critical that all midwives are trained in emergency obstetrics and new-born care. Ameh et al. indicate that training midwives in emergency obstetrics and new-born care is one of the key strategies to improve maternal and new-born health, significantly reducing maternal and neonatal mortality.

5.3.2 Orientation programme for the new staff members

The study recommends a three-month formal orientation programme to be implemented in the two maternity departments for the new midwives. The orientation programme is to assist new midwives to go through assessment and evaluation of major clinical maternity procedures. This is to ensure that they are competent before permanently placed to work in the maternity departments. The study is also recommending on-going evaluation of the knowledge and skills of midwives after orientation programmes to ensure that they are competent in providing for patients' needs and safety. The NMHSS (2018:22) also requires hospitals to define basic competencies and educational level and skills for each healthcare member. Similarly, the Health Professional Council of Namibia (HPCNA) also requires consistent and ongoing commitment of lifelong learning to update and develop the knowledge, skills and ethical attitudes that underpin competent practice. Thus, a Continuing Professional Development (CPD) system must be introduced to aspire to excellence in healthcare provision and delivery (HPCNA, 2010).

5.3.3 Increasing the number of Advanced midwives in the maternity departments of Windhoek Central and Katutura State Hospitals

The study is recommending that the NMHSS provide more opportunities for midwives to pursue a Diploma in Advanced Midwifery and Neonatal Care. According to the SANC Act (2005: 2), the purpose of the qualification in Advanced Midwifery and Neonatal Care is to produce competent, independent and critical thinking midwives within a wide range of midwifery healthcare settings. Furthermore, the qualification aims to provide midwives with a wide range of skills, knowledge and attitudes that will enable them to make a meaningful and sustained contribution to midwifery services. South African Nursing Council also recommend that nursing managers in charge of maternity departments to have a qualification in Advanced Midwifery and Neonatal Care to ensure quality maternity care delivery.

5.3.4 Introducing the qualification in advanced midwifery and neonatal care in Namibia

At the time of this study, the qualification in Advanced Midwifery and Neonatal Care was not offered in Namibia. Currently the midwives who wants to pursue this qualification goes to South Africa for training which is not feasible and accessible to all midwives. The study is therefore recommending the programme to be introduced at the local universities in the country to provide midwives with more knowledge and skills. Introducing this programme in the country will contribute to the decrease in the morbidity and mortality of maternal and neonatal care, because the programme provides in-depth education and training in midwifery and new-born care.

5.3.5 Allocating enrolled midwives to other areas in the maternity departments of Windhoek Central and Katutura State Hospitals

The results obtained in the study show that the enrolled midwives obtained an overall knowledge mean score of <80% in all PPH core domains. Windhoek Central and Katutura state hospitals are Namibia's major referral hospitals and receive complicated maternity cases from the thirteen regions of the country as referred to in 1.2. Thus, the two maternity departments of the two hospitals need midwives with a high level of education and training to render quality maternity care. The level of training and education of enrolled midwives is limited. The training does not provide the enrolled midwives upon completion of their study with adequate knowledge and skills to perform with the highest degree of competency as discussed in paragraph 5.2.3. The scope of practice of the enrolled midwives is also limited to the handling of normal pregnancy, labour and puerperium only. Therefore, the study is recommends that enrolled midwives be allocated only in antenatal and postnatal departments of the two hospitals and be removed from the labour suites.

Furthermore, enrolled midwives should be upskilled and send to nursing colleges for registered midwives training to gain more knowledge and skills in midwifery.

5.3.6 Investigation into the Bachelor's Degree of the nursing programme

The results show that the participants with a Bachelor's Degree in Nursing obtained the lowest overall mean score compared to the participants with a Diploma in Nursing and Midwifery (paragraph 5.2.1.1). The study is recommending the NMHSS through the Nursing Council of Namibia to launch a formal investigation into the training and education of the Bachelor's Degree in Nursing across all universities offering the programme in the country. This is to ensure that the education and training of the Bachelor's Degree in Nursing is complying with the rules and regulations stipulated under the Namibian Nursing Act 8 of 2004. One of the duties of the Nursing Council of Namibia is to control the education, tuition and training of nurses and midwives in the country.

5.3.7 Introducing skills laboratories or clinical coordinators in the maternity departments

It is recommended that the use of a skills laboratory or clinical coordinators be introduced for assisting with the clinical practice teaching in hospitals. Skills laboratories or clinical coordinators will support the acquisition, maintenance and enhancement of the clinical skills of midwives. This is done by providing hands-on learning experience for the practice of clinical skills, which are deemed essential for effective and safe management of maternity patients. In addition, the skills laboratories or clinical coordinators will ensure that all midwives have access to the mandated learning opportunities and appropriate assessment before approaching real maternity patients and for patients' safety.

5.4 LIMITATION TO THE STUDY

The study was conducted in the maternity departments (antenatal, labour and postnatal) of Windhoek Central and Katutura state hospitals, Namibia's major referral hospitals, excluding the district hospitals. Yet, many women are delivering in district hospitals where midwives are also required to have adequate PPH knowledge to manage patients. The results from this study are limited to Windhoek Central and Katutura state hospitals in Namibia only. Furthermore, some variable groups (male/female) sample size were smaller and unequal, thus the risk of Type 2 error exist. Therefore, the statistically significant association for some results must be interpreted carefully to exclude Type 2 error.

5.5 FUTURE RESEARCH

This study results indicates that the midwives working in the maternity departments of Windhoek Central and Katutura state hospitals in Namibia were incompetent in assessing, diagnosing, preventing and managing PPH. Furthermore, some of the biographical data such as training and years of maternity experience did not influence their knowledge about PPH. The study therefore recommends similar research studies to be conducted in the district hospitals to determine the midwives' knowledge about PPH. This study also recommends further research to assess midwives' skills as another form of competence as for this study it was based on knowledge only.

5.6 SIGNIFICANCE OF THE STUDY

The significance of this study identified that the midwives working in the maternity departments of Windhoek Central and Katutura state hospitals in Namibia were incompetent in assessing, diagnosing, preventing and managing PPH. The study therefore concludes that the high PPH-related maternal morbidity and mortality in the two hospitals is also attributed to the lack of knowledge about PPH among midwives. Policy makers and education institutions may benefit by the outcome of this study by introducing measures to improve the competency levels of midwives.

5.7 CONCLUSION

The study has investigated scientifically the knowledge about PPH among the midwives working in the maternity departments (antenatal, labour and postnatal) of Windhoek Central and Katutura state hospitals in Namibia. Namibia is challenged with high maternal deaths caused by PPH nearly every year (NMHSS, 2016:36). Though there could be other reasons contributing to high PPH-related maternal mortality, the study focused on the midwives' knowledge about PPH. Maternal morbidity and mortality can be alleviated by the presence of a midwife with sufficient knowledge about PPH. Thus, it is critical that midwives are competent about PPH.

The study found that 82% midwives were incompetent in assessing, diagnosing, preventing and managing PPH. Thus, this study concludes that high PPH-related maternal morbidity and mortality in Windhoek Central and Katutura state hospitals in Namibia is also attributed by lack of knowledge about PPH among midwives. Benner (2013:2-7) as described in the conceptual framework of this study, indicates that expertise and competency in the nursing field are achieved through good nursing education and experience. Therefore, the NMHSS must put in place the recommended measures to ensure that midwives are equipped with the necessary knowledge about PPH.

The objectives of this study were: To determine if midwives working in the maternity departments (antenatal, labour and postnatal) of Windhoek Central and Katutura state hospitals in Namibia have knowledge about:

- Assessing postpartum haemorrhage
- Diagnosing postpartum haemorrhage
- Preventing postpartum haemorrhage
- Managing postpartum haemorrhage

To determine associations between the biographical data and the knowledge scores of the registered midwives and enrolled midwives.

To conclude, the goal and objectives of this study were successfully explored and achieved. The research question was therefore answered.

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ANNEXURES

Annexure 1: Stellenbosch University Research Ethical Approval

UNIVERSITEIT STELLENBOSCH UNIVERSITY

Approval Notice

New Application

30/09/2019

Project ID :10867

HREC Reference No: S19/08/167

Project Title: The knowledge about Postpartum Haemorrhage among Midwives working in the maternity departments of Windhoek Central and Katutura State hospitals in Namibia

Dear Mrs Helena Nuumbosho,

The **Response to Stipulations** received on 29/09/2019 19:17 was reviewed by members of **Health Research Ethics Committee 2 (HREC2)** via **expedited** review procedures on 30/09/2019 and was approved.

Please note the following information about your approved research protocol:

Protocol Approval Period: This project has approval for 12 months from the date of this letter.

Please remember to use your Project ID **[10867]** and Ethics Reference Number **[S19/08/167]** on any documents or correspondence with the HREC concerning your research protocol.

Please note that the HREC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

After Ethical Review

Please note you can submit your progress report through the online ethics application process, available at: Links Application Form Direct Link and the application should be submitted to the HREC before the year has expired. Please see *Forms and Instructions* on our HREC website (www.sun.ac.za/healthresearchethics) for guidance on how to submit a progress report.

The HREC will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.

Provincial and City of Cape Town Approval

Please note that for research at a primary or secondary healthcare facility, permission must still be obtained from the relevant authorities (Western Cape Departement of Health and/or City Health) to conduct the research as stated in the protocol. Please consult the Western Cape Government website for access to the online Health Research Approval Process, see: https://www.westerncape.gov.za/general-publication/health-research-approval-process. Research that will be conducted at any tertiary academic institution requires approval from the relevant hospital manager. Ethics approval is required BEFORE approval can be obtained from these health authorities.

We wish you the best as you conduct your research.

For standard HREC forms and instructions, please visit: Forms and Instructions on our HREC website https://applyethics.sun.ac.za/ProjectView/Index/10867

If you have any questions or need further assistance, please contact the HREC office at 021 938 9677.

Yours sincerely,

Mr. Francis Masiye,

HREC Coordinator,

Health Research Ethics Committee 2 (HREC2).

National Health Research Ethics Council (NHREC) Registration Number:

Annexure 2: Namibia Research Ethical Committee Approval

REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198
Windhoek
Namibia

Ministerial Building
Harvey Street
Windhoek

Tel: 061 – 203 2507
Fax: 061 – 222558
E-mail: itashipu87@gmail.com

OFFICE OF THE EXECUTIVE DIRECTOR

Ref: 17/3/3 HTN
Enquiries: Mr. A. Shipanga

Date: 13 November 2019

Ms. Helena T. Nuumbosho
PO Box 617
Oranjemund
Namibia

Dear Ms. Nuumbosho

***Re:* The knowledge about postpartum haemorrhage among midwives working in the maternity departments of Windhoek Central and Katutura State Hospitals in Nambia.**

1. Reference is made to your application to conduct the above-mentioned study.

2. The proposal has been evaluated and found to have merit.

3. **Kindly be informed that permission to conduct the study has been granted under the following conditions:**

3.1 The data to be collected must only be used for academic purpose;

3.2 No other data should be collected other than the data stated in the proposal;

3.3 Stipulated ethical considerations in the protocol related to the protection of Human Subjects should be observed and adhered to, any violation thereof will lead to termination of the study at any stage;

Annexure 3: Katutura State Hospital Medical Superintendent approval to access statistical data on PPH

Republic of Namibia

Ministry of Health and Social Services

Private Bag 13215
WINDHOEK
Namibia

Intermediate Hospital Katutura
Independence Avenue
WINDHOEK

Telephone (061) 203 2537
Telefax (061) 222558

Enquiries: Mr.B.Tjivambi

Date: 05 Dec 2018

OFFICE OF THE MEDICAL SUPERINTENTED

Mrs.Helena T. Nuumbosho
0811495858
WINDHOEK

RE: APPLICATION TO ACCESS STATISTICAL DATA ON POSTPARTUM HAEMORRHAGE (PPH) IN KATUTURA STATE HOSPITAL.

This office hereby grants you permission to access statistical data on postpartum haemorrhage (PPH) in Intermediate Hospital Katutura

Thank you

Yours in health

.....
DR. F. M. SHIWEDA
ACT. MEDICAL SUPERINTENDENT

MINISTRY OF HEALTH
& SOCIAL SERVICES
PRIVATE BAG 13215
WINDHOEK NAMIBIA
12 -12- 2018
INTERMEDIATE HOSPITAL KATUTURA

Annexure 4: Windhoek Central Hospital Medical Superintendent approval to access statistical data on PPH

MINISTRY OF HEALTH AND SOCIAL SERVICES

Private Bag 13215 Windhoek Namibia	Harvey Street Windhoek Central Hospital	Tel. No: (061) 203 3024 Fax No: (061) 222886
Enquiries: Ms. S.Iipinge		Date: 07 December 2018

OFFICE OF THE CHIEF MEDICAL SUPERINTENDENT

Ms. Helena T. Nuumbosho
University of Stellenbosch
0811495858

Dear Ms. Nuumbosho

SUBJET:

PREMISSION TO CONDUCT A RESEARCH STUDY TO HAVE ACCESS TO STATISTICAL DATA ON POSTPARTUM HAEMORRHAGE (PPH) AT MATERNITY WARD, WINDHOEK CENTRAL HOSPITAL.

1. *Reference is made to the above mentioned subject:*

2. This letter serves to inform you that permission has been granted for you to do a research on the above mentioned subject as you have requested and does not include any remuneration.
3. The Clients/Patients information should be kept confidential at all times.
4. Preliminary findings to be submitted to Customer Care office, Windhoek Central Hospital upon completion of the study.

Yours Sincerely,
..... 11/12/2018
Dr.K.H. NAKANGOMBE
ACTING CHIEF MEDICAL SUPERINTENDENT

Annexure 5: Participants Information Leaflet and Consent Form

Title of Research Project:	
The knowledge about postpartum haemorrhage among midwives working in the maternity departments of Windhoek Central and Katutura state hospitals in Namibia.	
DETAILS OF PRINCIPAL INVESTIGATOR (PI):	
Title, first name, surname: Mrs Helena T . Nuumbosho	Ethics reference number: S/19/08/167
Full postal address: P.O Box 617, Oranjemund, Namibia	PI Contact number: +264 811495858
SUPERVISOR: Professor Ethelwynn L. Stellenberg	Supervisor contact number: +27219389297

Dear colleague

You are being invited to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the principal researcher and my supervisors any questions about any part of this research project that you do not fully understand. It is very important that you are satisfied and that you clearly understand what this research is about and how you could be involved. Your participation is **entirely voluntary** and you are free to decline to participate. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the **Health Research Ethics Committee at Stellenbosch University** and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

What is this research all about? This research study is about the knowledge of postpartum haemorrhage (PPH) among midwives working in the maternity departments of Windhoek Central and Katutura state hospitals. This study aims at investigating systematically the knowledge of PPH among midwives working in the maternity departments of the two hospitals. This study does not aim to appraise or criticize the participant's knowledge. It aims at identifying gaps in the assessment, diagnosing, prevention and management of PPH in the maternity departments. That is the reason why the researcher is conducting this research. The researcher will ensure that the identity of these two hospitals is kept confidential.

Why have you been invited to participate? You are invited to participate in this research study because you are a valuable participant who is needed to provide this study with the information to meet its objectives.

What will your responsibilities be? You will participate in this study by completing a questionnaire that will take you approximately 30 minutes to complete. The questionnaire is available in English only. The researcher is 100% confident that all participants a fluent in English. Their day to day activities take place in English as a medium language of communication. The questionnaire will be handed over to you by the researcher or the field worker. Data collection will take place during morning hours between 07h00 - 11h00, in the afternoon between 14h00 - 18h00 and in the evening between 19h00 - 23h00. You are required to complete a consent form before completing the questionnaire. This is an important document which indicate that you have chosen freely to participate in the study.

Will you benefit from taking part in this research? You will not benefit immediately from taking part in this research study. However, findings from this study will be disseminated to the relevant authorities which in future will determine if training on postpartum haemorrhage is required or not.

Are there risks involved in you taking part in this research study? There are no risks involved in you taking part in this study. This study is strictly anonymous. Your name is not required which protect your identity. This study is also of low risk and the researcher does not foresee any emotional problems if taking part in this study.

If you do not agree to take part, what alternatives do you have? Your participation is entirely voluntary and you are freely to decline to participate from which you will not be penalized.

Who will have access to data obtained from this research study? The data from this study will be kept strictly confidential. Only the researcher, biostatistician and my supervisors will have access to this data.

What will happen in the unlikely event of some form injury occurring as a direct result of you taking part in this research study? This study is of low risk and the researcher does not foresee any injury that could occur from this research project.

Will you be paid from taking part in this study and are there any costs involved? No you will not be paid from taking part in this research study and there are no costs involved in taking park in this research project.

Is there anything else that you should know or do? Ask questions relating to the study.

You can contact the principal investigator Mrs Helena T. Nuumbosho at +264811495858, the supervisor Professor Ethelwynn L. Stellenberg at +27219389297 and the Health Ethics Committee of Stellenbosch University at +271-9389207 for any matter of concern.

Declaration by the participant

By signing below, I…… have agree to take part in a research project entitled the knowledge about postpartum haemorrhage

among midwives working in the maternity departments of Windhoek Central and Katutura state hospitals in Namibia.

I declare that:

- I have read this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurized to take part.
- I may choose to leave the study at any time and will not be penalized or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the researcher feels it is in my best interests, or if I do not follow the study plan as agreed to.

Signed at……on this date……2019

……. …….

Signature of participant **Signature of witness**

Declaration by the investigator

I …..... declare that:

- I explained the information in this document to…….....
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that she/he adequately understands all aspects of the research, as discussed above.
- I did not use an interpreter.

Signed at……. on this date……..2019

…… ……

Signature of investigator **Signature of witness**

Annexure 6: Instrument/questionnaire

Postpartum Haemorrhage (PPH) Questionnaire

Title of the study: The knowledge about postpartum haemorrhage (PPH) among midwives working in the maternity departments of Windhoek Central and Katutura state hospitals in Namibia.

Instructions

It will take approximately thirty (30) minutes to complete this questionnaire. Please do answer all the questions.

Section A: Basic biographical information

Please complete the questionnaire by marking your answer with X where applicable.

1. What is your Gender?

Female	
Male	

2. Indicate your age

3. Indicate your category

Registered midwife	
Enrolled midwife	

4. Indicate your qualification

A Four-Year Bachelor's Degree in Nursing	
A Four-Year Diploma In Comprehensive Nursing and Midwifery Science	
A Three-Year Diploma in General Nursing and Midwifery	
A Three-and a-Half Year Diploma in General Nursing and Midwifery	
A one Diploma in Midwifery Science	
A postgraduate Diploma in Advanced Midwifery and Neonatal Care	
2 years Certificate in Enrolled Nursing and Midwifery	

5. Indicate your years of experience in the maternity department.

Less than one year	
One year	
<1 year but less than 3 years	
3 years - but less than 5 years	
5 years - but less than 10 years	
10 years and more	

6. Indicate whether you were trained in emergency obstetrics and new-born care.

Yes	
No	

7. If yes, when last were your trained.

1 year – to 2 years	
3 years – to 4 years	
5 years and more	

8. Did you ever manage a postpartum haemorrhage event?

Yes	
No	

9. If yes, when last did you manage a postpartum haemorrhage situation?

About a 1 week ago	
About 2 weeks ago to 3 weeks ago	
About a 1 month ago	
About 3 months ago	
About 6 months ago	
About a 1 year ago	
1 year ago and more	

Section B: Assessment of PPH

Please circle the most appropriate answer true to agree and false to disagree

1. Women from certain ethnic groups are more associated with the risks of PPH.

a) True

b) False

2. Social lifestyle such as smoking can increase the risks of PPH in a labouring woman.

a) True

b) False

3. A woman's age can be one a contributing factor to the development of PPH.

a) True

b) False

4. A grand-multi parity woman with more than 4 children is more at risks of developing PPH than a primigravida woman.

a) True

b) False

5. A woman with good nutritional status is less prone to develop PPH, than a woman with poor nutritional status.

a) True

b) False

6. Good antenatal care attendance, at least four visit provide a better assessment of women at risks of developing PPH.

a) True

b) False

Section C: Diagnosing PPH

Please circle the most appropriate answer true to agree and false to disagree.

1. Diagnosing PPH is defined when blood loss of 500mls or more occur following a vaginal birth.

a) False

b) True

2. PPH is diagnosed when blood loss of 1000mls or more occur after caesarean section.

a) True

b) False

3. To diagnose PPH starts from accurate assessment/estimation of postpartum blood loss.

a) True

b) False

4. Measuring haemoglobin (HB) of a postpartum woman is a reliable tool to diagnose PPH.

a) True

b) False

5. A sudden change in the level of consciousness, hypotension and tachycardia after birth in a woman can indicate PPH.

a) True

b) False

Section D: Prevention of PPH

Circle the appropriate response true to agree and false to disagree.

1. Certain interventions carried out during labour, such as artificially rupturing of membranes (AROM) should be minimized to reduce the risks of PPH.

(a) True

(b) False

2. It is important to deliver the placenta by controlled cord traction (CCT) to prevent PPH.

(a) True

(b) False

3. To prevent PPH, prompt delivery of the placenta and examination for completeness is necessary.

(a) True

(b) False

4. Administration of uterotonic drugs such as oxytocin after births (vaginal or caesarean) are not required to prevent PPH unless uterine tone is poor.

(a) True

(b) False

5. Continuously rubbing the uterus until its hard after births is not necessary to prevent PPH.

(a) True

(b) False

6. Suturing vaginal lacerations and tears following a vaginal birth is critical to prevent PPH.

(a) True

(b) False

7. A full urinary bladder interferes with uterine actions and must be emptied following births to prevent PPH.

(a) True

(b) False

8. It is not important to remove retained products of conception after vaginal births to prevent PPH.

(a) True

(b) False

9) The use of vacuum and forceps instruments during vaginal births should be minimized to prevent PPH.

a) True

b) False

Section E: Management of PPH

Please circle the correct answer.

1. Which of the following interventions is critical in the management of PPH?

a) Monitor the vital signs

b) Establish the cause of bleeding

c) Give appropriate IV/IMI antibiotics

d) Administer Oxytocin 20 units IMI

2. Oxytocin is the first drug of choice in the management of PPH. Which of the following doses is the recommended World Health Organization (WHO) intravenous start dose of oxytocin to be added to a Ringer Lactate in the event of PPH?

a) 10 units at the rate of 125 to 240mL/h

b) 20 units at the rate of 125 to 240mL/h

c) 30 units at the rate of 125 to 240Ml/h

d) all of the above

3. Which of the following statements is the first step in the management of PPH?

a) Offer the woman oral fluids

b) Offer the woman analgesics

c) Calling for assistance

d) Obtain consent for blood transfusion

4. Which drug is recommended to be used after oxytocin in a woman with a large soft uterus that is atonic and continues to bleed?

a) Ergometrine / Syntometrine

b) Prostglandin F2 alpha

c) Misoprostol/Cytotec

d) Cyklokapron

5. When is the administration of blood transfusion recommended in a women who is experiencing PPH?

a) A woman with a Hemoglobin (HB) level of > 10gd/l

b) A woman with a HB level of <8gd/l

c) A woman with a HB level of 12gd/l

d) A woman with a HB level of >8gd/l

6. Which intravenous (IVI) cannula size is appropriate in obstetric haemorrhage resuscitation?

a) 22G IVI cannula

b) 24G IVI cannula

c) 20G IVI cannula

d) 16G IVI cannula

7. Misoprostol/Cytotec is one of the critical drugs in the management of PPH. Which of the following doses is the recommended single start dose of Misoprostol to be given rectally?

a) 200mcg

b) 600mcg

c) 12000 mcg

d) All of the above

8. When is bimanual compression of the uterus recommended to manage PPH?

a) When the woman's uterus is well contacted.

b) When a woman continues to bleed after all the necessary steps has been carried out to establish and manage cause of bleeding.

c) When a woman becomes unconscious

d) All of the above

9. Which of the following interventions is the final surgical intervention for refractory postpartum bleeding from the uterus to manage PPH?

a) Dilation and Curettage (D&C)

b) Hystorotomy

c) Hysterectomy

d) None of the above

The end. Thank you for completing this questionnaire, much appreciated!

Annexure 7: Declaration by language editor

Lona's Language Services

English/Afrikaans
Afrikaans/English

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* Translations * Editing * Proofreading
* Transcription of Historical Docs
* Transcription of Qualitative Research
* Preparation of Website Articles

TO WHOM IT MAY CONCERN

This letter serves to confirm that the undersigned

ILLONA ALTHAEA MEYER

has edited and proofread the **thesis of Helena Taamba Nuumbosho** for language correctness and translated the ABSTRACT into Afrikaans.

TITLE: THE KNOWLEDGE OF POSTPARTUM HAEMORRHAGE AMONG MIDWIVES WORKING IN THE MATERNITY DEPARTMENTS OF WINDHOEK CENTRAL AND KATUTURA STATE HOSPITALS IN NAMIBIA

Signed

Ms IA Meyer

06 September 2020

Annexure 8: Declaration by technical editor

Lize.net
COMMUNICATION (Pty) Ltd
Company registration: 2019/050723/07

To whom it may concern

This letter serves as confirmation that I, Lize Vorster, performed the language editing and technical formatting of Helena Taamba Nuumbosho's thesis entitled:

The knowledge of postpartum haemorrhage among midwives working in the maternity departments of Windhoek Central and Katutura State hospitals in Namibia

Technical formatting entails complying with the Stellenbosch University's technical requirements for theses and dissertations, as presented in the Calendar Part 1 – General or where relevant, the requirements of the department.

Yours sincerely

Lize Vorster
Language Practitioner

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