NURSES' ADHERENCE TO MULTI-DOSE VIAL POLICY IN LUFWANYAMA DISTRICT, ZAMBIA.

By

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A dissertation submitted to the University of Zambia, Institute of Distance Education in partial fulfillment of the requirement for the award of a degree of Master of Science degree in clinical nursing.

The University of Zambia

Lusaka.

2023.

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DECLARATION

I hereby declare that the research titled Nurses' Adherence to Multi-Dose Vial policy (MDVP) in Lufwanyama District submitted by me to the University of Zambia: School of Nursing in partial fulfilment of the requirement for the award of Master of Science in Clinical Nursing is the record of bonafide research work carried out by me under the guidance of **Dr. Dorothy Chanda** and **Mr. Michael. Kanyanta**. I, further, declare that the work reported in this document has not been submitted and will not be submitted, either in part or in full, for the award of any other degree in this institution or any other institution or university

Name of Candidate; **Bernard Nkandu**

Signature of Candidate; ……..

Date; ……

CERTIFICATE OF APPROVAL

The University of Zambia approves this dissertation on Nurses' Adherence to Multi-Dose Vial Policy in Lufwanyama District, Zambia. In partial fulfillment of the Master of Science Degree in Clinical Nursing.

Examiner I

Signature…… Date……..

Examiner II

Signature…… Date…….

Examiner III

Signature…… Date……

ABSTRACT

Introduction: The policy on multi dose vials allows certain vaccines that contain preservatives to be kept for up to 28 days after opening, as long as storage and proper handling conditions are met (WHO, 2015). This policy has reduced vaccine wastage and contamination in the countries and areas where there is good adherence to it. However, in 2018-2020 statistics in Lufwanyama district of the Copperbelt province in Zambia has shown the rise in vaccine wastage rate. Hence, this study aimed at determining the level of adherence to Multi Dose Vial Policy (MDVP) and its associated factors among nurses in Lufwanyama district.

Material and Method: The research utilised quantitative method and a cross-sectional Analytical study design that was conducted in Lufwanyama district, Zambia. A sample of 109 nurses were selected using fishbowl simple random sampling with the response rate of 86% (94) respondents. Data was collected using a self-administered structured questionnaire, while the association between variables was tested by using the Chi-square which were further analysed using binary Logistic regression to show the degree of association.

Results: The study revealed that there was low adherence (35%) to MDVP in Lufwanyama District, Using binary logistic regression there was a statistically significant association between adherence and Knowledge on MDVP (p = 0.000). The analysis showed that nurses who had high knowledge were 0.065 times more likely to adhere to MDVP compared to those who had low knowledge (AOR: 0.065, CI: .015 - .276). The other independent variables were not statistically significant despite being associated to adherence among cervical cancer patients.

Conclusion and Recommendations: The study established that the level of adherence to MDVP among nurses in Lufwanyama district was low and those with high knowledge had high chances of adhering to MDVP than those with low knowledge. This implies that in order to strengthen adherence to MDVP, there is need for nurse managers to be conducting supportive supervision to ensure nurses adhere to MDVP guidelines.

Keywords: Multi Dose Vial Policy, Vaccine Wastage rate, Adherence, Mentorship, Preservatives.

DEDICATION

I dedicate my dissertation work to my family. Special gratitude to my loving wife **Prudence Chongo** whose words of encouragement and push for tenacity rings in my ears. My parents **Mr and Mrs Nkandu** have never left my side and are very special.

I also dedicate this dissertation to my friends and workmates who have supported me throughout the process. I will always appreciate all they have done especially the librarian **Mr Phiri** for lending me research books even beyond the lending period without any penalty and also helping me develop my technology skills.

I dedicate this work and give special thanks to my brother **Dr Mwansa** who has been encouraging me and rendering financial help whenever I need it. And last but not the least my wonderful daughters **Ashley and Comfort Nkandu** for being there for me throughout the process, both of you have been my best cheerleaders.

ACKNOWLEDGEMENT

First and foremost, praises and thanks to **God the Almighty** for his showers of blessings throughout my research work to complete successfully.

My sincere gratitude goes to my supervisors **Dr Dorothy Chanda** and **Mr Michael Kanyanta** whose invaluable guidance has made this research a success. Without them, I would have found it difficult to reach this far. Their dynamism, vision and motivation have deeply inspired me. They have taught me the methodology to carry out the research and to present the research works as clearly as possible. It is a great privilege and honour to study under their guidance.

I wish also to extend my gratitude to Lufwanyama District Health Team with the leadership of **Dr J. Ng'ambi** for availing me the much-needed information to complete my research. May the good Lord reward them with abundant knowledge so that they may continue with good leadership and hard work.

I also wish to acknowledge the former EPI manager, MoH Child Health Unit **Dr F. Mwansa** for accepting my request to go through the questionnaire to provide expert guidance despite his busy schedule.

In a nutshell, your support, guidance and encouragement will go a long way, I pray that may the good Lord continue blessing you all in everything you do.

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LIST OF ABBREVIATIONS

AOR	Adjusted Odds Ratio
BCG	Bacillus Calmette Guerin
CI	Confidence Interval
DHO	District Health Office
CPG	Clinical Practice Guidelines
EEFO	Earliest Expiry First Out
EPI	Expanded Program for Immunisation
PCV	Pneumococcal conjugate vaccine
MDVP	Multi Dose Vial Policy
OPV	Oral Polio Vaccine
VVM	Vaccine Vial Monitor
WHO	World Health organisation
SD	Standard Deviation
SCT	Social Cognitive theory
SLT	Social Learning Theory
SPSS	Statistical Package for Social Sciences

CHAPTER ONE

1.1 INTRODUCTION

Immunization is the process whereby a person is made immune or resistant to an infectious disease, typically by the administration of a vaccine (WHO, 2015). It is the most effective and affordable way of managing infections in under five year old children as the saying goes 'prevention is better than cure.' This is the reason for heralding vaccination as one of the most cost-effective medical interventions (Krudwig et al., 2018). Therefore, it is very vital to improve on the immunization performance and sustain the gains achieved so far. Vaccines are packaged as one dose per vial (Single Dose Vial) or multiple doses per single vials (Multi Dose Vials). Multi dose vials are preferred among developing Countries because they are cheaper than single dose vials, this is because manufacturing costs in a multi-dose vial are spread over many doses and they have an advantage of lower cold chain costs. However, they are also thought to be associated with higher wastage and contamination (Kartoglu et al., 2020).

The World Health Organization implemented MDVP in 2014 (Parmar et al., 2020). This tool has been reported to reduce wastage and contamination in areas where the policy has been implemented and adhered to (Patel et al., 2015). Currently, the vaccines covered by this policy include the Bacillus Calmette Guerin (BCG), Pneumococcal Conjugate Vaccine (PCV), Oral Polio Vaccine (OPV), measles vaccine, and anti-Tetanus Toxoid vaccine. Zambia implemented the policy and published it in the Expanded Programme on Immunisation (EPI) vaccination manual (Ministry of Health Zambia, 2017). This meant every health worker handling vaccines should abide by this policy.

On the contrary, during the experience as the Nurse in Charge of St. Mary's Mission Hospital in Lufwanyama district, the researcher was deeply concerned with the observed high vaccine wastage during needs assessment and supervisory visits not only within the hospital but also during Outreach Sessions throughout the district as per Chanda (2004) emphasis on the need to conduct supportive supervision in health facilities in-order to identify areas that need improvement. This observation was confirmed by the Health Facilities "Vaccine Return Reports" which revealed a high wastage rate of multi-dose vial vaccines in the years 2018-2020 as

compared to WHO global indicative wastage rates, thus necessitating the need for this study to determine how this wastage can be reduced through evidence-based practice.

This chapter therefore, outlines the background information to the study problem, research justification for conducting this study as well as research objectives, research hypotheses used in the study and the research variables which were measured in the study.

1.2 BACKGROUND INFORMATION

Immunization services have entered a new era, with an expanding selection of vaccines, safer injection syringes, and increased support from international organizations and donor agencies (Drain & Carib, 2019). The increasing focus on immunisation programmes is accompanied by increased scrutiny on the way vaccines are packaged. Vaccines are expensive and are expected to cost USD 5–7 per dose in developing countries (Drain and Carib, 2019). In addition to this, certain vaccines require a child to receive about 3 doses for example Pneumococcal Conjugate Vaccine (PCV) making the cost even higher. For this reason, it has become exceedingly important to determine vaccines optimal vial size, thereby companies considering the production of Multi dose vials as they are cheaper than single dose vials (Kartoglu et al., 2020). According to Parmar et al (2020) "In 2000, approximately 80% of vaccinations administered globally were supplied in multi-dose vials, but new concerns have arisen regarding the safety and cost-effectiveness of multi-dose vaccine vials". Increasing attention on safety, wastage reduction, and programmatic benefits have led to more options in vaccine vial size and packaging. These concerns led to the revision of the policy statement on multi-dose vials by the World Health Organisation in 2014 (Parmar et al., 2020). The previous policy stated that "all opened vaccine vials for an immunisation session should be discarded at the end of that session, regardless of the type of vaccine or the number of doses remaining in the vial." this policy thereby increased the wastage rate of vaccines (World Health Organisation, 2015). The 2014 Multi-Dose Vial Policy has put exceptions by allowing certain vaccines that contain preservatives to be kept for 28days after opening; as some vaccines contain preservatives, while others do not. World Health Organisation (2015) states that "remaining doses in open vials of vaccines with preservatives can be used for up to 28 days after opening, as long as storage and proper handling conditions are met. However, vaccines without preservatives such as Bacillus Calmette Guerin (BCG) and

Measles Vaccine (MV) should be discarded within 6 hours of reconstitution or at the end of a vaccination session, whichever comes first."

Consequently, vaccines that do not contain preservatives stand a higher risk of being wasted and contaminated owing to the prolonged period of usage if strict adherence to the MDVP is not maintained (Wallace et al., 2017). This information is reinforced by Van et al., (2016) study which was aimed at determining microbial contamination and labeling of self-prepared, multi-dose phenylephrine solutions used at Chris Hani Baragwanath Academic Hospital in Johannesburg, South Africa. The study revealed that there was microbial contamination of the solutions. The findings of this study suggest that a lack of strict adherence to the MDVP in the use of vaccines may place children at risk of acquiring infections (Van et al., 2016). Therefore, it is imperative to interrogate the levels of adherence to MDVP to generate a knowledge base that can be used to develop measures for enhancing efficiency on the use of vaccines.

Conversely, widespread use of multi-dose vaccine containers in low- and middle-income countries in immunization programmes is one of the strategies that has improved immunisation performance in terms of its cost-effectiveness, as compared to single-use vials because MDVs sell at a lower price per dose and requires lower cold chain storage and transport capacity (Kure et al., 2020). However, the use of multi-dose vials means more wastage rate as evidenced by Parmar et al. (2020) study which revealed a higher wastage rate for 10-dose vials as compared to 2-dose vials. Because of the wastage rate associated with multi-dose vaccine vials, the World Health Organisation (2015) has sighted multi-dose vial policy (MDVP) as one of the tools available to reduce vaccine wastage. It is estimated that the adoption, implementation and adherence to multi-dose vial policy results in wasted rates decline to approximately 15-20% (World Health Organisation, 2015). This has been supported by Patel et al., (2015) study whose results revealed a decrease in Wastage Rate and saving a significant number of doses of vaccines after introducing MDVP in Surat city, India (Patel et al., 2015). Hence, this study will endeavored to determine nurses' level of adherence to the Multi-Dose Vial policy (MDVP) in Lufwanyama district.

1.2 STATEMENT OF THE PROBLEM

In the past 3 years from 2018 to 2020, Lufwanyama district recorded a high level of vaccine wastage rate evidenced by the statistics from "Vaccine Return Reports" (2018 to 2020) as shown in the table below (Table 1).

Table 1: Wastage rate of Multi-Dose Vaccines from 2018 to 2020 for Lufwanyama district in comparison with WHO Global indicative wastage rate (WHO, 2019).

Type of Vaccine		BCG (Bacillus Calmette Guerin)	PCV (Pneumococcal Conjugate Vaccine)	OPV (Oral Polio Vaccine)	MR (Measles/ Rubella Vaccine)	TT (Tetanus Toxoid)
Acceptable WHO Global indicative wastage rate. (WHO, 2019).		(20 doses) 40%	(4 doses) 10%	(20 doses) 25%	(10 doses) 25%	(10 doses) 25%
Lufwanyama District Wastage Report from 2018-2020.	**2018**	**50%**	**20%**	**25%**	**40%**	**37%**
	2019	**56%**	**20%**	**30%**	**35%**	**37%**
	2020	**60%**	**22%**	**30%**	**38%**	**39%**

Table 1 shows a considerable increase in magnitude on the wastage rates of multi-dose vaccines in Lufwanyama District when compared to the Acceptable WHO Global indicative wastage rate (World Health Organisation, 2019). There was approximately 20% increase in BCG, 12% increase in PCV, 5% increase in OPV, 13% increase in MR, and 14% increase in TT. This increase brings to question the level of nurses' adherence to MDVP.

The probable causes of this increased wastage rate of the multi-dose vaccines could be due to nurses having inadequate knowledge on how to handle vaccines and when to discard them as required by policy guidelines and if vaccines without preservatives are kept for more than six hours after opening, it can lead to vaccine contamination and infections in under-five year old children (Van et al., 2016). As a result, the vaccine may be doing more harm than good to the under-five year old children with a weak immune system.

The nurses' failure to follow policy guidelines has an impact on under-five year old children, their families and communities, the district's financial system, and the Ministry of Health as a whole. The Ministry of Health will spend more money on procuring multi-dose vial vaccines (Radwan et al., 2018). While under five year old children would contract preventable childhood diseases, their families would suffer negative consequences such as poor psychological and emotional functioning, disruption of leisure activities and financial resources, and finally, the communities would face a high disease burden and an increase in disease prevalence among the under five year old children (Wallace et al., 2017). According to WHO, (2015) "a proper application of the MDVP can decrease vaccine wastage while ensuring safety, thereby reducing costs in field use and overcoming storage and transport constraints."

The global partners and stakeholders have continued to make efforts to avert this multi-dose vaccine wastage. WHO as the global partner, has done its part to reduce wastage by developing the policy, while the Ministry of Health Zambia, the District, and the health facilities have also done a lot to reduce vaccine wastage and contamination by implementing tools such as MDVP guidelines, Vaccine Vial Monitor (VVM), and Earliest Expiry First-out (EEFO). These are the principles and guidelines that must be followed by nurses who are the vaccinators on the ground to reduce wastage of the vaccines. Despite all these efforts, multi-dose vial wastage rates continue as Table 1 above illustrates, hence this study endeavored to determine nurses' level of adherence to the Multi-Dose Vial policy (MDVP) and its associated factors in Lufwanyama district.

1.3: THEORETICAL FRAMEWORK

1.3.1 The Social Cognitive Theory.

In this study, the researcher used Social Cognitive Theory (SCT), which was founded by Albert Bandura in 1986. This is a theoretical Model for learning and acquiring knowledge. SCT is grounded on the assumption that learning takes place in the social context, with a dynamic and reciprocal interaction of person, environment, and behaviour. The emphasis on social influence, as well as the emphasis on external and internal reinforcement, distinguishes SCT. One fundamental premise of SCT is that people learn not only from their own experiences but also from observing the actions and outcomes of others. (Soul, 2016). It takes into account the distinct manner in which individuals acquire and maintain behaviour. The theory considers a person's past experiences, which influence whether or not behavioural action will occur. Past experiences shape reinforcement, expectations, and expectancies, all of which shape whether a person will engage in specific behaviour and the reasons for that behaviour (Collins, 2016).

The SCT describes human behaviour as a three-way, dynamic, reciprocal model in which personal factors, environmental influences, and behaviour constantly interact as shown in figure 1.

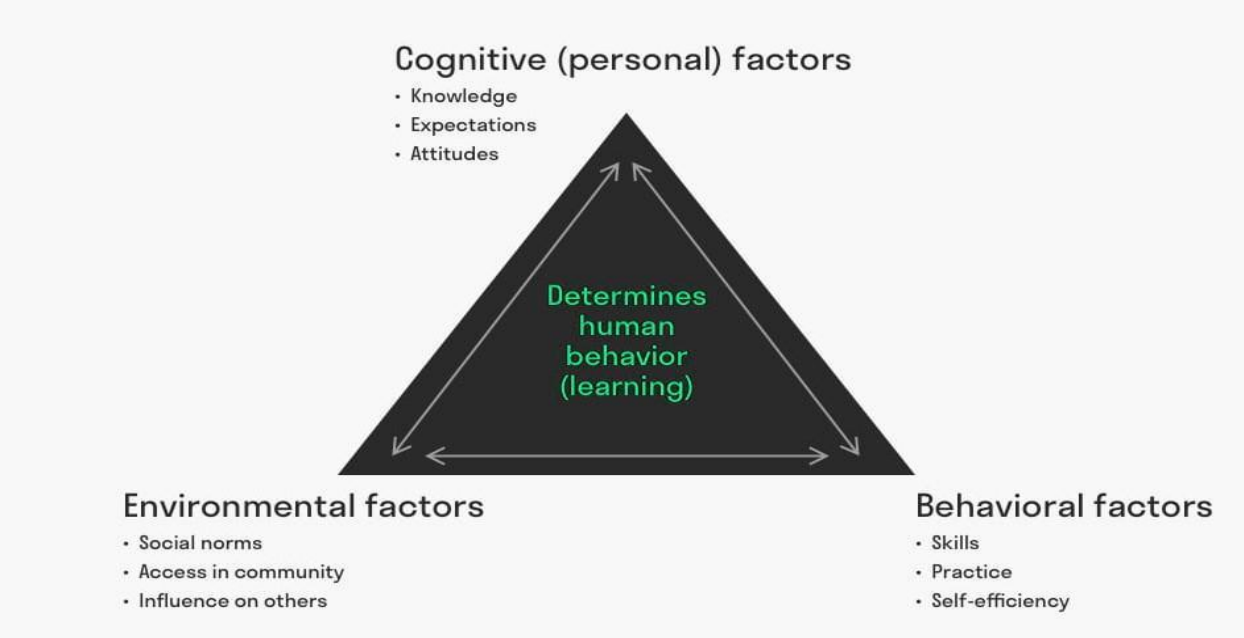

Figure 1. Theoretical Model for Social Cognitive theory (Collins, 2016)**.**

1.3.2 Application of the SCT to this study.

The underlying premise of social cognitive theory in this study was that nurses would learn about MDVP through observational learning, reinforcement, self-control, and self-efficacy. In other words, Social Cognitive theory expects nurses to respond to reinforcement, technical support from the district health office, and influence from more experienced nurses during work, knowledge on MDVP, ability to attach value to MDVP, and ability to effectively implement the policy (Collins, 2016). In this study, the researcher utilised the SCT to understand how its core elements relate to the study variables and how they will influence nurses' adherence to MDVP and its related factors in Lufwanyama District.

Personal Factors: Personal factors in this study were knowledge and attitude towards MDVP, the assumption was that if the nurse has negative attitude and lacking knowledge on MDVP, he/she cannot adhere to it as required (Momennasab et al., 2021). These factors also interacts with behavioural and environmental factors like mentorship and influence from experienced nurses and work experience.

Environmental factors: In this study, mentorship and influence from experienced nurses were considered as environmental factors that would influence nurses' adherence to MDVP. Mentorship can be tremendously beneficial to the nursing workforce by bridging the gap between knowledge and quality clinical practice (Manzi et al., 2017) according to SCT environmental factors interacts with personal and behavioural factors to affect behaviour, which is nurses' adherence to MDVP.

Behavioural factors: - Personal experience was the behavioral factor which was considered in this study, work experience is vital in shaping the behaviour of a nurse towards guidelines and policies (Rizany et al., 2018). Behavioural factors interacts with personal and environmental factors so as to affect nurses' adherence to MDVP, as shown in figure 2 below.

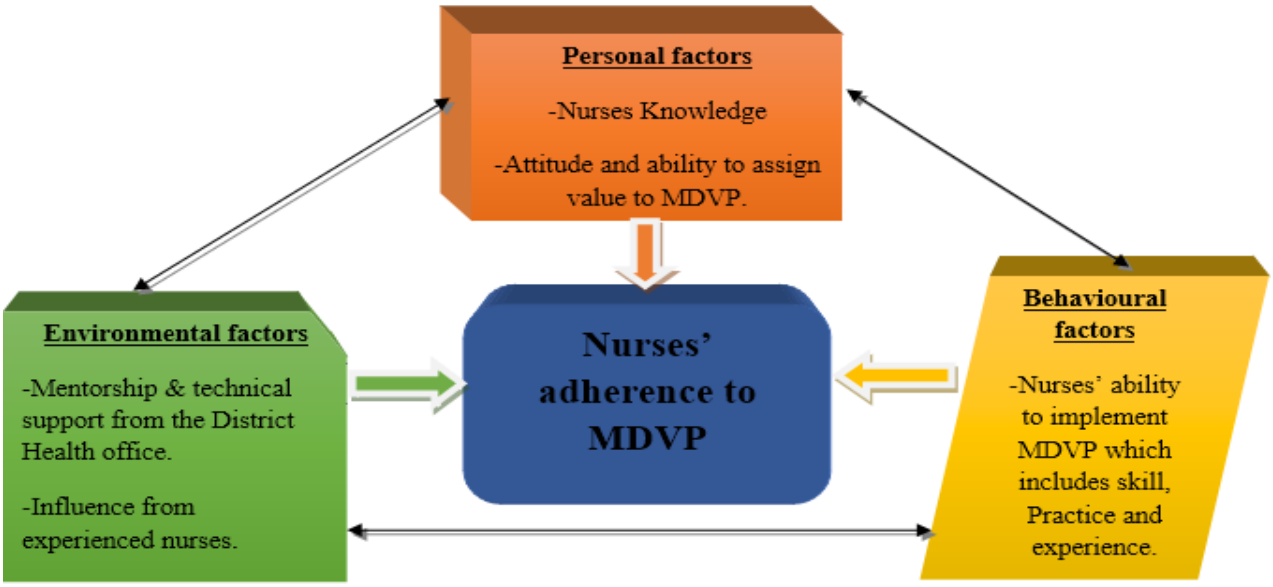

Figure 2. Conceptual framework of Nurses' adherence to Multi-Dose Vial Policy (MDVP) in Lufwanyama district derived from Social Cognitive theory.

1.4 STUDY JUSTIFICATION

Data from "Vaccine Return Reports" in Lufwanyama district revealed high levels of vaccine wastage. This high level of wastage brought to question the levels of adherence to the Multi-Dose Vial Policy among nurses' who were handling the vaccines. Despite this high level of vaccine wastage, no studies were conducted to evaluate adherence to Multi-dose Vial Policy which is the tool to reduce wastage and contamination. The Previous research by John Snow Inc. (2018) only focused on the effects of Dose per Container Change in Zambia.

Regionally, a study by (Wallace et al., 2017) went a step further by focusing on Vaccine wastage in Nigeria: An assessment of wastage rates and related vaccinator knowledge, attitudes and practices, however, did not determine the much-needed information on the level of nurses or vaccinators adherence to policies and guidelines that help to reduce or curb vaccine wastage.

These two studies created gaps that need to be filled in by conducting this study on determining nurses' adherence to the MDVP in Lufwanyama district regarding the huge discrepancy between WHO Global indicative wastage rate and Lufwanyama district vaccine wastage rate on multi-dose vaccine vials.

The recommendations provided in this study may help formulate strategies on how to promote adherence to MDVP and thus assists in reducing the incidence of wastage rate in the health facilities of Lufwanyama district. The study results also may benefit nurses and other health workers because the Provincial and District Health Offices may use the study findings to empower nurses with knowledge and skills on the implementation of MDVP through workshops and seminars. This in turn would influence decisions among nurses in handling vaccines by developing practice guidelines and in performing clinical audit.

1.5 STUDY OBJECTIVES

1.5.1. General Objectives:

To investigate the level of nurses' adherence to MDVP and its associated factors in lufwanyama district.

1.5.2. Specific objectives

1. To ascertain the levels of adherence to MDVP among nurses' in Lufwanyama District.
2. To identify factors that influence nurses' adherence to MDVP in Lufwanyama district.

1.6: STUDY HYPOTHESES

- **Null Hypothesis**

There is no relationship between nurses' adherence to MDVP among nurses' in Lufwanyama district and;

1. Social Demographic factors.
2. Knowledge of nurses on MDVP
3. Nurses' Attitude towards MDVP.
4. Mentorship on MDVP.
5. Influence from experienced nurses.
6. Nurses work experience.

1.7. VARIABLES.

The dependent and independent variables of this study are stated below.

1.7.1. Dependent Variable

The dependent variable in this study was Adherence to MDVP.

1.7.2. Independent

In this research, the independent variables were Knowledge, Attitude, Mentorship, Influence from experienced nurses and work experience.

Table 2; Variables indicators and cut off points

Variable	Conceptual Definitions of Variables	Operational Definitions as used in this Study	Scale of Measurement.	Indicator	Cut off Point.	Question No.
Adherence to MDVP.	-Level of adherence: Degree to which a patient correctly follows medical advice (WHO, 2017).	-Degree to which a nurse correctly follows MDVP while handling vaccines.	Dichotomous	• Good adherence	-Responds correctly to three or more adherence questions.	13-16
				• Poor adherence	-Responds correctly to two or less adherence questions.	

Variable	Conceptual Definitions of Variables	Operational Definitions as used in this Study	Scale of Measurement.	Indicator	Cut off Point.	Question No.
Knowledge on MDVP	-These are facts, information and skills acquired through experience or education; the theoretical or practical understanding of a subject (Rizany et al., 2018).	-Facts, information and skills or theoretical understanding of MDVP.	• Ordinal	• High knowledge	-Respondent answering 6-8 knowledge questions correctly.	5-12
				• Moderate level Knowledge	-Respondent answering 4-5 knowledge questions appropriately.	
				• Low Knowledge	-Respondent answering up to 3 or less knowledge questions correctly.	

Variable	Conceptual Definitions of Variables	Operational Definitions as used in this Study	Scale of Measurement.	Indicator	Cut off Point.	Question No.
Attitude Towards MDVP	-Positive or negative evaluation of people, objects, event, activities, ideas, or just about anything in the environment (Shylaja, 2022).	-Positive or negative evaluation of MDVP.	• Ordinal	• Positive attitude	- The median score of 4-5 on the likert scale.	17-22
				• Neutral	-The median score of 3 on the likert scale.	
				• Negative attitude	-The median score of 1-2 on the likert scale.	
Mentorship on MDVP	-Mentorship is more about supporting a person wherever they are and providing them the necessary tools to grow (Ericksen, 2018).	-Supporting a nurse who handles vaccines and providing guidance to her on MDVP.	• Ordinal	• Adequate Mentorship	-2 or more mentorship visits by LDHT in a year.	22
				• Inadequate mentorship	-1 mentorship visit from LDHT in a year.	
				• No mentorship.	-No mentorship visit from LDHT in a year.	

Variable	Conceptual Definitions of Variables	Operational Definitions as used in this Study	Scale of Measurement.	Indicator	Cut off Point.	Question No.
Influence from fellow nurses on MDVP.	-Influence is the power to have an important effect on someone or something. 2018).	- Power to have an effect on a nurse to adhere or not adhere to MDVP.	• Ordinal	• Positive Influence	-The median score of 4-5 on the likert scale.	23-29
				• Negative influence	The median score of 1-2 on the likert scale	
				• No influence	-The median score of 3 on the likert scale	
Work Experience	-The way in which employees internalize and interpret the interactions they have with their organization, as well as the context that underlies those interactions (Fagerberg, 2014).	-In this study it means a nurse internalizing and interpreting the interaction they have at their work place in relation to MDVP.	Dichotomous	• Good Experience	-The median score of 4-5 on the likert scale.	30-34
				• Bad Experience	-The median score of 1-3 on the likert scale.	

CHAPTER TWO

LITERATURE REVIEW

2.0 INTRODUCTION

Many theories have been proposed to explain what motivates adherence of health workers to standard guidelines and policies in health care facilities. Despite literature covering a wide range of such information, this review focused on the variables of the study which includes; adherence to MDVP, socio-demographic characteristics, Knowledge on MDVP, Attitude towards MDVP, Mentorship on MDVP, Influence from experienced nurses on MDVP and nurses work experience. Since there was no specific literature found on nurses' adherence to MDVP, this literature review considered any related literature to the above variables that were considered in this study. Research articles from peer-reviewed journals, textbooks and publications from organisations e.g., WHO were reviewed. In addition, literature was searched from computerized data bases like Science Direct, PubMed, ERIC and Google Scholar.

2.1 OVERVIEW OF MDVP

The concept of using opened multi-dose vials in consequent immunization sessions was first introduced in 1995 as "open-vial policy" (Kartoglu et al., 2020). The policy was revised last time in 2014 and now is known as "multi-dose vial policy" (WHO, 2015). MDVP lists conditions that are applicable for using opened multi-dose vials in subsequent immunization sessions. Not discarding and keeping the opened multi-dose vials for subsequent immunization sessions greatly reduces the vaccine wastage. MDVP lists four conditions which should be met for the opened multi-dose vial to be kept and used for up to 28 days after opening. The criteria are as follows: The vaccine is currently prequalified by WHO, the vaccine is approved for use for up to 28 days after opening the vial, as determined by WHO, the expiry date of the vaccine has not passed and the vaccine vial has been, and will continue to be, stored at WHO or manufacturer recommended temperatures. Furthermore, the vaccine vial monitor, if one is attached, is visible on the vaccine label and is not past its discard point, and the vaccine has not been damaged by freezing (Kartoglu et al., 2020).

2.2 SOCIAL AND DEMOGRAPHIC VARIABLES.

According to Lim et al., (2019) Socio- Demographic variables that affect Nurses' Perception of Patient Safety Management and Standard Precaution Adherence consist of age (years), marital status (married or partnered/single) and educational level (college/university/graduate school). Other work-related characteristics that can be measured are clinical experience (total years of practice, years of practice in current job) and current position (Lim et al., 2019).

In addition Kurtz, (2017) investigated Demographic Factors Associated with Consistent Hand Hygiene Adherence Among ICU Nurses the results revealed that age of the nurse and the number of years of active nursing practice were statistically significant. on the contrary, age did not show an association in Jahanpour et al., (2015) study on medication Adherence in Elderly patients with Cardiovascular Diseases however, there was significant associated between gender and adherence. The above literature suggest that various demographic variables influence adherence in one way or another. The common ones that has come out include gender and age. This has also been shown by Mukhtar et al., (2022) study which revealed Females being significantly associated with a good knowledge, as female respondents were more knowledgeable about childhood vaccination rather than male respondents. The results also showed that higher education level participants had significantly higher knowledge than lower education level participants. Thereby indicating the importance of considering gender and professional qualification as demographic variables that influence adherence (Mukhtar et al., 2022).

2.3 ADHERENCE TO MDVP

The importance of the concept on adherence has been widely studied and reported in healthcare literature. However, there is a lack of clarity in the definition and use of the term in the literature (Gardner, 2015). Compliance, adherence and concordance are often used interchangeably in the literature and practice. The term compliance has been utilized since the 1950s and gained much popularity in the 1970s. During the 1990s, terminology of compliance in the literature began to shift to adherence. Negative connotations were linked to the term compliance because of the

association of lack of autonomy and passiveness of the patient in the treatment process (Kirchhoff et al., 2018).

Despite adherence being a multifaceted concept, it is a key concept in nursing practice and impacts on the care of patients throughout the healthcare system. According to Vaismoradi et al., (2020) quality-of-care improvement and prevention of practice errors is dependent on nurses' adherence to the principles of patient safety. Adherence to and compliance with guidelines and recommendations are influenced by personal willingness, culture, economic and social conditions, and levels of knowledge. On the other hand, lack of adherence and compliance contravenes professional beliefs, norms, and expectations of the healthcare professional's role (Vaismoradi et al., 2020).

Institutional systemic factors influencing nurses' adherence to and compliance with patient-safety principles are: The organisational patient-safety climate, workload, time pressure, encouragement by leaders and colleagues, level of ward performance, provision of education for the improvement of knowledge and skills, institutional procedures or protocols, and also communication between healthcare staff and patients (Vaismoradi et al., 2020). In addition, personal motivation, resistance to change, feelings of autonomy, attitude toward innovation, and empowerment are personal factors that impact on the nurses' adherence to patient-safety principles (Vaismoradi et al., 2020).

Regionally, in an attempt to reduce wastage rate, health workers have been sending children back home without giving them vaccines in multi dose vials like BCG if they are very few, hence affecting children's adherence to vaccines. Shay et al. (2021) study revealed that using linkages, most vaccinators transfer caregivers without providing multi-dose vial (MDV) vaccines, mainly BCG and MCV, 'to minimize wastage' and thus successfully reduce vaccine wastage rates; yet most caregivers wasted their time, energy and money traveling from one health facility to another. On the other hand Kim and Bates, (2013) postulates that there are low rates of adherence to guidelines, many medication administration guidelines are not strictly followed. Key instances where nurses did not follow the guidelines included many from the Five Rights about one in four elements were violated overall. Similarly the same results were obtained in the study done by Karttunen et al., (2020) on nurses' self-assessments of adherence to guidelines on

safe medication preparation and administration in long-term elderly care. One-third of the nurses stated that they do not always follow guidelines when preparing medication, and around a half deviate from them occasionally, when administering medication. The most serious deviation on preparation stage was crushing of sustained release and enteric-coated tablets and mixing of crushed tablets together. On administration stage, the deviation of guidelines of giving medicine in recommended time or in relation to food was common.

From the above literature, adherence remains a big challenge thereby transferring the effects of non-adherence on the end user who is a patient. In relation to Shay et al.,(2021) study, by not opening multi dose vials to vaccinate few children available, health workers appears to largely transfer the cost on the caregivers in terms of transport, and consequently, loosing children to follow-up (Shay et al., 2021). On the other hand, literature seems to suggest that adherence to patient-safety principles was affected by numerous intersecting and complex factors. (Vaismoradi et al., 2020) suggests that variations in the studies' aims, methods, and results hinder the formation of a determinant conclusion on how adherence to patient-safety principles can be improved. However, based on the review results, general indications are that improvement of nurses' knowledge about patient safety, collaboration in performing tasks, reduction of workloads, provision of appropriate equipment and electronic systems for communication and sharing information, regular feedback in the workplace, and standardization of the care processes can help with enhancing nurses' adherence to patient-safety principles. Future qualitative and quantitative studies are needed to better understand how to promote and mitigate adherence to safe-care principles by clinical nurses (Vaismoradi et al., 2020).

2.4 KNOWLEDGE ON MDVP.

The social cognitive theory accounts for personal factors to perform a certain behaviour (Soul, 2016). Knowledge of nurses' influence adherence to guidelines derived from policies like MDVP (Wallace et al., 2017). Effective management of the vaccine cold chain system at all levels is one of the crucial factors for maintaining vaccine potency. Vaccines require more complex handling and storage requirements due to increased temperature sensitivity and complicated immunization schedules. This urges adequate knowledge among nurses handling vaccines.

Globally, researchers like (Khoja, 2018) have examined Registered nurses' knowledge and care practices regarding patients with dysphagia in Saudi Arabia. The results revealed that the participants had partial theoretical and practical knowledge about nursing care for patients with dysphagia.

Ansong et al., (2018) also examined knowledge and Competencies of Vaccinators on Routine Childhood Vaccination in Ghana. A prospective cross-sectional study which revealed gaps in the principles of vaccine handling and administration. Therefore; ibid (2018) recommended a critical need for routine assessment and refresher training for populations where vaccination is conducted by different level of training. The above study used consecutive sampling technique which means that not every person has an equal chance of being part of the sample, which in some way sets a bar for selection and thus reduces the number of people in the sample which can lead to bias. However, the results were similar to Mohammed et al. (2021) who evaluated the Knowledge, attitude and practice of vaccinators and vaccine handlers on vaccine cold chain management in public health facilities in Ethiopia using a Cross-sectional study. The results showed that vaccinators and vaccine handlers had satisfactory knowledge. Receiving training on cold chain management had a statistically significant association with the level of knowledge on cold chain management. In addition, Abdulla et al., (2020) recommended immunization education program because they significantly increase the participants' knowledge about immunization in certain areas of the primary healthcare clinics they work, including vaccine safety, efficiency, and contraindications in the delivery of vaccines to the public (Abdulla et al., 2020).

By using cross sectional research designs the above studies have revealed the gap in the knowledge of health workers and they have recommended refresher courses for the workers to improve their knowledge levels in handling vaccines. It is, therefore, imperative to assess the knowledge of nurse's in Lufwanyama district concerning adherence to MDVP using cross-sectional study designs as suggested by these studies.

2.5 ATTITUDE TOWARDS MDVP.

Nursing professionalism influences the quality of care and is affected by several factors. Nowadays, due to rapid advances in science and the growth of new technologies in different fields, there are considerable changes in all professions including those related to human health (Shohani & Zamanzadeh, 2017). Such changes have led to the presentation of novel viewpoints and the extension of knowledge boundaries regarding better care of people's health. Nursing is not an exception, due to its status in the health care system and its professional contingencies (Shohani & Zamanzadeh, 2017). In fact, professionalization includes a series of attitudes which represent levels of individuals' identification with, recognition by and commitment to a particular occupation. To this effect Shohani and Zamanzadeh, (2017) did a study on nurses' attitude towards professionalisation and Factors Influencing It. The results revealed an average level attitude among nurses towards professionalism. Given the importance of the professionalism in nursing and the influence of various factors, efforts should be directed towards achieving the desired level and reducing the barriers.

Globally, attitude has been studied by many researchers, one of them being Kiyoshi-Teo et al., (2014) whose findings revealed that the most consistent facilitator of adherence to guidelines for prevention of ventilator-associated pneumonia was nurses' positive attitude towards implementing the guidelines (Kiyoshi-Teo et al., 2014). Therefore, this study is suggesting that a good attitude of nurses towards a guideline or policy will result into its effective implementation. Nurses' attitude has been reported to be positive in some studies like Mohammed et al., (2021) study on knowledge, attitude and practice of vaccinators and vaccine handlers on vaccine cold chain management in public health facilities in Ethiopia. The results showed that half of the vaccinators had a positive attitude and good practice. In addition, Cain, (2019) evaluated nurses' attitudes towards sedating patients receiving mechanical ventilation. The study found out that

more than half of nurses showed positive attitude towards implementing this guideline. Therefore, the study further recommended the need to consider nurses' attitudes when seeking to optimize sedation practices during mechanical ventilation. In conclusion the study by Quiros et al., (2017) on Attitudes toward practice guidelines among Intensive Care Unit Personnel, generally showed more positive attitudes towards practice guidelines among staff in pediatric wards compared with adult ICU and Nurses when compared with physicians had more positive attitudes toward guidelines in general but not toward the specific Hand Hygiene Guidelines. Those with more positive attitudes were significantly more likely to report that they had implemented the Guideline recommendations (Quiros et al., 2017).

The literature above seems to agree by putting an emphasis on the importance of attitude of nurses in the implementations of guidelines, therefore, there was need to investigate the effects of attitude towards MDVP and its implementation in Lufwanyama district.

2.6 MENTORSHIP ON MDVP.

Building nurses' resilience to complex and stressful practice environments is necessary to keep skilled nurses in the workplace and ensuring safe patient care through adhering to set guidelines and policies. Mentorship influence retention of nurses' and their level of adherence to policy guidelines (Cusack, et al., 2016). Research has found that the physical work environment may positively or negatively influence nurses', for example stress may negatively impact their job satisfaction and intention to change jobs (Applebaum et al., 2020).

Authors like Ericksen, (2018) postulates that 'mentorship is more about supporting a person wherever they are and providing them the necessary tools to grow'. A mentor can play a powerful role in a nurse's professional growth by providing guidance, clear perspectives and advice. Mentoring is especially useful in nursing because it is a way to help new nurses enter the field while giving experienced nurses a chance to showcase and share their institutional knowledge (Ericksen, 2018).

Regionally, (Anatole et al., 2017) did a study on 'Workforce and Collaboration: International Perspective on Nurse Mentorship' to improve the quality of health care delivery in rural Rwanda. This was done after the gaps in individual nurses' knowledge and skills, as well as systems-level issues, such as supply and human resource management. Nurse focused mentoring and enhanced

supervision at Health Centers program were implemented. Initial results demonstrated significant improvement in a number of quality-of-care indicators.

In addition, there were statistically significant improvements in intrapartum and newborn care practices after introducing nurse and midwife mentors in Bihar, India. It was found that mentors led to significant improvements in nurse-mentees' knowledge, facility-level infection control, intrapartum and newborn management (Creanga et al., 2020). The study further argued that Nurse mentorship intervention had significant results in a health workforce capacity crisis situation, especially when a large number of auxiliary nurse-midwives were expected to provide services for which they lacked the necessary skills (Creanga et al., 2020).

Literature has revealed the importance of mentorship especially to novice nurses who encounter challenges when making the transition to clinical learning because of the complex and unpredictable nature of clinical settings and handling of vaccines at large, hence they depend on mentorship and the influence from experienced nurses in order to adapt and make sound decisions and adhere to set guidelines and policies. Nurses working with vaccines employ a variety of decision-making factors and processes, therefore, Nibbelink and Brewer (2018) informally identify experienced nurses to be important resources for decision-making; (ibid) study also submitted that experienced nurses bring a broad range of previous patient encounters to their practice influencing their intuitive and unconscious processes which facilitates decision-making. Using naturalistic decision making as a conceptual framework to guide research may help with understanding how to better support less experienced nurses' decision-making for enhanced patient outcomes (Nibbelink & Brewer, 2018).

Lastly, Fischer et al., (2015) revealed that implementation of the mentoring intervention demonstrated the ability of mentors to work with facility-level staff to identify gaps and improve the quality of maternal and newborn services in rural PHCs in northern Karnataka in India (Fischer et al., 2015). The program was implemented at scale in a short period of time, staff accepted mentors and the guidance they provided, and mentors demonstrated their ability to increase staff nurses' capacity and confidence. In many health facilities, nurses reported being better able to provide care according to guidelines and to handle maternal and newborn complications. Facilities were also better organized, equipped, and supplied to deliver quality services, and referral procedures improved (Fischer et al., 2015).

Overall, the evidence gathered holds that comprehensive mentoring can be an effective intervention for improving the quality health care and nurse's adherence to guidelines and policies like MDVP. Therefore, the need to provide mentorship to nurses which promotes decision-making skills cannot be over emphasized.

2.7 INFLUENCE FROM EXPERIENCED NURSES ON MDVP.

The Institute of Medicine has identified that up to 98,000 patients die each year as a result of poor decision-making in healthcare (Nibbelink and Brewer, 2018). Decision-making is essential to nursing practice, it is a complex process in acute care nursing practice. Nurses must consider numerous, potentially competing factors when making decisions to meet patient and family needs (Nibbelink and Brewer, 2018).

Nibbelink and Brewer, (2018) suggests that nurses employ a variety of decision-making factors and processes, they further Informally identify experienced nurses to be important resources for decision-making which is similar with the findings of McKenna et al., (2018) on smoking behaviours of nurses. In which peer influence and education levels were cited as influencing prevalence levels of smoking among nurses. In addition, Yuan et al., (2020) examined the influence of nurses' social networks, and specifically, the beliefs of their peers, on nurses' use of a new health information technology system. The results showed no effect of mean peer beliefs on an individual's system use. However, shared peer beliefs were positively associated with an individual's system use. Furthermore, Deshpande and Joseph, (2019**)** adds that the factors impacting ethical behavior of hospital nurses were the level of emotional intelligence and ethical behavior of peers. (Deshpande and Joseph, 2019).

The reviewed literature shows a strong effect of peer/work mate influence on a nurse to take a certain behaviour, which includes guidelines and policies like MDVP.

2.8 NURSES' WORK EXPERIENCE AND ADHERENCE TO MDVP

Fagerberg, (2014) postulates that the work context is important for the development of Nurses' skills and identity as professionals, but the work context and organization can also hinder their professional development. In relation to Social Cognitive Theory, Nurses' ability to implement or follow guidelines and policies is also affected by behavioural factors which include skill, Practice and experience (Collins, 2016). According to Jansson et al. (2020) "Professional competency is a fundamental concept in nursing, which has a direct relationship with quality improvement of patient care and public health." Work experience and education have been shown to significantly influence the development of competency of nurses (Jansson et al., 2020).

Rizany et al. (2018) did a study on Factors that affect the development of nurses' competencies: The results revealed that Competence development is a continuous process of improving knowledge, attitudes and skills, and is influenced by a myriad of factors which included work experience and education. Other studies also have shown the correlation between work experience and high professional competence, this suggests that nurses who have worked for a longer period will show high level of adherence to multi-dose vial policy than nurses who have worked for a short period of time. On the contrary Fernández-Feito et al. (2019) showed that hospital care professionals attached more importance to values and guidelines, regardless of their work experience and that professionals with more than 20 years' experience granted less importance to these values and guidelines. In general, the study concluded that the professional setting influenced the importance assigned to professional nursing values and guidelines.

Lastly, Lin, (2019) synthesized the extant literature about Asian nurses' work experiences in and adaptation to the united states health care system. The review identified bad experience which was characterised by overcoming language barriers, dealing with discrimination, adopting United States (U.S) nursing practices, adjusting to U.S. social customs, becoming accustomed to U.S. culture, and reconciling work ethics. This culminated in poor practice leading to the gap in the quality of health care being rendered (Lin, 2019). In this regard, the results of the studies that were reviewed suggested that Bad work experience can affect the nurse work output negatively which includes inability to adhere to policies and guidelines like MDVP while the opposite is

true as well. Therefore, it is imperative to consider nurse experience as variable that can affect nurses' adherence to MDVP in Lufwanyama district.

2.9 CONCLUSION OF LITERATURE REVIEW

In conclusion, this review considered literature on variables of the study which included adherence to MDVP, attitude towards MDVP, mentorship on MDVP, nurses' influence from experienced nurses on MDVP and nurses work experience. Generally, there is a gap in adherence to different guidelines and protocols including those concerned with immunisation among nurses. Different factors affecting this adherence were itemised, however, knowledge was documented more in relation to adherence, nurses needed to be more knowledgeable, competent and committed to their work through adhering to procedures and polices so as to provide quality immunisation and other nursing services to the communities they serve. Developing professional competency and organizational commitment is vital, but not easy. Therefore, nurse managers should pursue appropriate strategies to enhance the professional competency and organizational commitment of their nursing staff. It is, therefore, necessary to conduct more comprehensive studies on exploring the status and gaps in the management of vaccines and adherence to different policies and guidelines in different cultures and contexts like Lufwanyama district which is a rural part of Copperbelt province.

Most of the studies reviewed used cross-sectional designs and semi structured questionnaire as data collection tool. No study was found that has been done in Zambia and the world at large pertaining to adherence to multi-dose vial policy. Therefore, this study will be conducted to determine Nurses' Adherence to MDVP and its associated factors in Lufwanyama District, Zambia.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 INTRODUCTION

The purpose of this chapter was to explain in detail the research methods and the methodology to be implemented for this study. It has explained the choice of the research approach, then the research design, as well as the advantages and disadvantages of the research tools chosen. This has been followed by a discussion on their ability to produce valid results, meeting the aims and objectives set by this dissertation. The chapter then goes on to discuss the sample size and the sampling strategy that was applied by the author, and the data analysis methods used. It concludes with a brief discussion on the ethical considerations.

3.1 STUDY DESIGN

This study used quantitative research method. The research design was Analytical cross-sectional which allowed for collection of data at a single point in time to provide a snap shot of the phenomenon under study. It was also generally appropriate to this study because its primary purpose was to investigate the level of nurses' adherence to multi dose vial policy and because of the need to understand the association among the variables (Leavy, 2017).

3.2 STUDY SETTING

The research setting is the physical location and conditions in which data collection takes place, (Bryman, 2018). This study was conducted in Lufwanyama district which is a rural district on the Copperbelt province. It had 31 government health facilities situated in different farming areas with no private health facilities, 30 offered immunisation services except for 1 which is the district hospital. The district has a population of 155 nurses. In the recent past the district recorded high wastage rate for vaccines, hence the need to investigate nurses who are vaccine handlers on the level of their adherence to multi dose vial policy which is the tool recommended by WHO to reduce vaccine wastage and contamination.

3.3 STUDY POPULATION

In this study the target population included nurses who participate in immunisation services within Lufwanyama District: While the accessible population were nurses that participated in immunisation services in the district and were available at health facilities during the period of data collection and consented to participate in the study.

3.4 SAMPLE SELECTION

A fishbowl simple random sampling procedure was used for selecting the participants in this study. This technique was employed because the population was relatively homogenous and also to ensure a fairly equal representation of the variables for the study (Leavy, 2017). This was achieved by formulating the sampling framework by obtaining names of participants from the District Human Resource Manager. Numbers were allocated to each name and put in the box were they were shuffled, then the sample was drawn from the total population of 155 nurses from all health facilities within Lufwanyama district.

3.5 ELIGIBILITY CRITERIA

3.5.1 Inclusion criteria

In this study, all nurses from rural health centers and health posts within Lufwanyama district who work from under-five clinic, were available at the study site during the period of data collection and consented to participate in the study were included.

3.5.2 Exclusion criteria

Considering privilege as a cofounding variable. The study excluded nurse managers because of more involvement. Nurse Managers act as the source of knowledge to their subordinates and have high privileges such as attending workshops and seminars more than their subordinates hence, they have more practising experience.

The other group that was excluded were newly employed nurses who were employed in the year 2022 and started work from June of 2022 because they had limited experience in immunization activities.

3.6 SAMPLE SIZE

The sample size was determined using the Cochrane equation as shown below; in this research significance level and confidence interval was set at 5% and 95% respectively.

$$n_0 = \frac{Z^2 pq}{e^2}$$

- Where n_0 is the sample size,
- $\mathbf{Z^2}$ is the abscissa of the normal curve that cuts off an area α at the tails; (1 – α) equals the desired confidence level, e.g., 95%);
- **e** is the desired level of precision, which is 0.05 degrees of precision at 95% level of confidence.
- **p** is the estimated proportion of an attribute that is present in the population.
    - The mean perceived barriers to guideline adherence among general practitioners represents 77% (Lugtenberg et al., 2017).
- **q** is 1-p.
- The value for Z is found in statistical tables which contain the area under the normal curve. For example, Z = 1.96 for 95 % level of confidence.

Therefore;

$$n_0 = \frac{Z^2 pq}{e^2}$$

$$n = \frac{(1.96)^2 \times 0.77 \times 0.23}{(0.05)^2}$$

$$n = \frac{3.816 \times 0.1771}{0.0025}$$

n = 270 respondents.

- **The sample size was adjusted using the formula below because it was bigger than population (P= 155).**

$$n = \frac{n}{1+n/N}$$

$$n = \frac{270}{1+270/155}$$

n = 99 nurses.

- **The Sample was further adjusted for the second time by adding 10% to carter for a 10% non-response rate. This was to ensure that the sample does not fall far below the estimated sample size due to non-response.**

Final n = 10/100 x 99 = 9.9 Rounded off to 10.

Final n = 99 + 10

Final n = **109 Nurses.**

3.7 DATA COLLECTION TOOL

For the purpose of this study, the structured questionnaire was used to collect the data. It was adapted from two questionnaires for the variables; work experience and Influence from experienced nurses. Few questions were obtained from these tools and modified so as to suit the study, while the questions for other variables were formulated by the researcher because there were no tools that suited the study variables and topic. Work experience was adapted from the Work experience measurement scale (WEMS) by Nilsson et al., (2013). Influence from experienced nurses was adapted from Peer Influence and Performance Tasks of Senior High

School Students Likert scale by Moneva and Legaspino, (2020). Both scales have been reported to have a good internal consistency with the Cronbach's alpha coefficient of 0.89 and 0.9 respectively. The questionnaires were administered among carefully selected nurses from several health facilities within Lufwanyama district which offered immunization services. The advantages and disadvantages of the questionnaire are discussed below.

The questionnaire was chosen for this research because it is a reliable and quick method to collect information from multiple respondents in an efficient and timely manner (Bryman, 2018). Questionnaire was a quick and effective way for the researcher to reach multiple respondents within weeks. A general disadvantage of the pencil- paper questionnaire however was physical delivery to respondents which required transport. However, this also worked to the advantage of the researcher because of the ability to physically check the questionnaires for completeness when collecting them to make sure they were free from misinterpretation or giving incomplete and limited responses by the respondent.

3.8 VALIDITY

Validity is the extent to which a question or scale is measuring the concept, attribute or property it intends to measure (Leavy, 2017). If the tool has high validity, it implies that it produces results that correspond to real properties, characteristics and variations in a physical world. Therefore, to ensure validity in this research the following measures were considered.

3.8.1. Internal Validity

In this study, internal validity was achieved by ensuring that the same questions were asked to each respondent in the same sequence. Questions were constructed to avoid ambiguity and the use of simple terms so that respondents understand the questions. The researcher further ensured that the data collection instrument had questions covering all the objectives of the study. Furthermore, the questionnaire was submitted to the supervisors, Lufwanyama District Health Office and Ministry of Health Child Health Unit to the EPI Manager for expert review to ensure that it contained accurate questions as regards the policy.

The pilot study was conducted to pre-test the research instruments after being checked by the research supervisor, Lufwanyama DHO and EPI manager MoH. It ensured that the independent variables were adequately addressed in the questionnaire.

3.8.2. External Validity

External validity was ensured by administering the same questionnaire to all the study respondents without the researcher influencing them in any way. The sample comprised of respondents' selected using probability sampling techniques, a technique that gives everyone in the target population an equal probability of being selected thereby avoiding biases and not having a homogenous population making the results unfit for extrapolation. Since random sampling were used in this study, the results were validly generalised to the whole population of nurses in Lufwanyama district who participate in immunisation activities, however, results were not generalised to other populations of professionals within and outside the district.

3.9 RELIABILITY

Reliability is the consistency of a set of measurements or measuring instrument often used to describe a test (Leavy, 2017). To ensure reliability in this study, the researcher made sure that goals and objectives were clearly defined and operationalised, matched the assessment measures to the goals and objectives and a pilot study was conducted from a selected site with similar characteristics to the study site. This was done to ensure stability, consistency and accuracy of the research instrument. In addition, the researcher ensured standardisation of the conditions by carrying the same steps in the same way for each measurement. Lastly, the researcher had broaden the sample by using simple random sampling instead of convenience which selects people out of convenience thereby narrowing the sample characteristic representation. This improved equivalence aspect. Data on variables was collected using items of the questionnaire with some questions adapted from different questionnaires with Cronbach's alpha coefficients of more than 0.75.

3.10 DATA COLLECTION TECHNIQUE

For the purposes of this research, a paper-pencil structured questionnaire was used to collect personal demographic characteristics as well as capture the variables of interest specifically adherence to MDVP, knowledge on MDVP, attitude towards MDVP, mentorship on MDVP, work experience and influence from fellow nurses. The tool had simple, short and direct questions to avoid misunderstanding and was administered to 109 participants. The questionnaires were delivered physically by the researcher because the study site had areas that did not have mobile network and internet. After obtaining the participants informed consent, the questionnaire was left to be filled by the respondent. At least 10 questionnaires were distributed per day to avoid exhaustion.

The main reason the researcher preferred this technique was its advantage of respondent being honest while responding to the questionnaires regarding controversial issues in particular due to the fact that their responses are anonymous. However, there were drawbacks encountered for example some participants did not returning them, which was addressed by including the 10% non-response rate to the sample size during sample size calculation.

3.11 PILOT STUDY

A pilot study is any small-scale test of a research instrument (such as a questionnaire, experiment or interview-schedule), run in advance of the main field work and used to test the utility of the research design (Bryman, 2018). The pilot study was done at South Kalengwa clinic in Kalulushi district using a sample of 11 respondents. A pre-test on the data collection tool was conducted with the aim of determining its practicability. The appropriateness and clarity of the language used in constructing the questionnaire was also determined.

During this study the respondents noticed a mistake, in which strongly disagree was typed as strongly agree and the typo was rectified.

3.12 ETHICAL CONSIDERATIONS

There were several types of ethical issues that were taken into consideration for this project. The most important was in relation to the ethical approval which was sought from University of Zambia Biomedical Research Ethics Committee (UNZABREC) and the National Health Research Authority (NHRA).

All the participants were informed in advance about the purposes of this study by providing the information sheet that contained details of the study prior to obtaining consent. Participants were allowed to withdraw from the study at any time without facing any penalty. Their identity as well as the names of the health facility they belonged to were kept in strict confidentiality, thus meeting the requirements of the code of ethics.

In addition, the privacy and confidentiality policy of all of the health facilities were taken into consideration as well, as certain facilities had a very strict policy for access to their employees for research purposes. Therefore, the researcher signed consent forms for confidentiality and privacy with the District Health Director (DHD). Some participants had fear of suffering victimization should they report non-adherence to the MDVP this was overawed by assuring them that no name or any form of identity for the respondent or facility was indicated on the questionnaire. Finally, all the information that was collected in the course of this dissertation was used only for the purposes of the study, and was kept confidential.

CHAPTER FOUR

PRESENTATION OF RESULTS

4.1 INTRODUCTION

This chapter presents the results of this study. The study aimed to assess the level of nurses' adherence to the multi-dose vial policy in Lufwanyama district. 94 participants took part in the study representing a response rate of 86%, the response rate was initially higher however, five (5) questionnaires were eliminated because they had a lot of information missing.

In this study, Cronbach's alpha coefficients were ranging from 0.56 to 0.74 as shown in the table below;

Table 3: Values of Cronbach's Alpha Coefficients.

VARIABLE	NUMBER OF ITEMS	CRONBACH'S ALPHA
1. **Adherence**	3	.559
2. **Knowledge**	7	.601
3. **Attitude**	4	.649
4. **Influence from experienced nurses.**	6	.638
5. **Work experience.**	4	.744

Source; Authors calculation based on SPSS.

4.2 DATA ANALYSIS

Data was analyzed using the IBM® Statistical Package for Social Sciences (SPSS®) for Windows version 20.0. The Chi-square test was used to determine an association between predictor variables (demographic factors, Knowledge on MDVP, Attitude towards MDVP, Mentorship on MDVP, Influence from experienced nurses and adherence.) and outcome variable (adherence to MDVP). For those cells having a frequency of less than 5 a fisher's exact test was

used. The Confidence Interval (CI) and level of significance were set at 95% and 5% respectively. The binary logistic regression analysis was used to determine true predictor of adherence to MDVP.

4.3 PRESENTATION OF RESULTS

Research findings have been presented according to the sections of the questionnaire. Some data were grouped together to give an overall picture. Data were presented using Percentages, frequency tables and Bar charts.

4.3.1 DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS

Social-demographic data that was collected comprised of age, Professional qualification, Duration of work and gender. Findings have been presented below.

Table 4: Socio-Demographic Data.

Characteristics	**Frequency**	**Percent**
Age		
22-26 years	28	29.8%
27-29 years	24	25.5%
30-34 years	19	20.2%
35-45 years	23	24.5%
Total	**94**	**100%**
Gender distribution of respondents.		
Females	62	66%
Males	32	34%
Total	**94**	**100%**

Characteristics	Frequency	Percent
Professional Qualification.		
Certificate	15	16%
Diploma	48	51.1%
Advanced Diploma	27	28.7%
Bachelor's Degree	4	4.3%
Total	**94**	**100%**
Duration of work		
Novice (less than 1 year)	11	11.7%
Advanced Beginner (1-2 years)	13	13.8%
Competent (Above 2-3 years)	24	25.5%
Proficient (Above 3-5 years)	10	10.6%
Experts (above 5 years)	36	38.3%
Total	**94**	**100%**

Table 4: shows that more than a quarter 29.8% (28) of respondents were between the ages of 22-26 years. The majority respondents 66% (62) were females, while more than half 51.1% (48) of the respondents had a diploma. While more than a quarter 38% (36) had worked for more than 5 years in under-five clinic.

4.3.2: INDEPENDENT VARIABLES

4.3.2.1 Knowledge on MDVP.

This section had 8 knowledge questions: if respondents get 6-8 questions correctly they were categorized as having High knowledge, while those who got 4-5 questions correctly were categorized as having Average Knowledge and those with the score of 3 and less were classified as having low Knowledge.

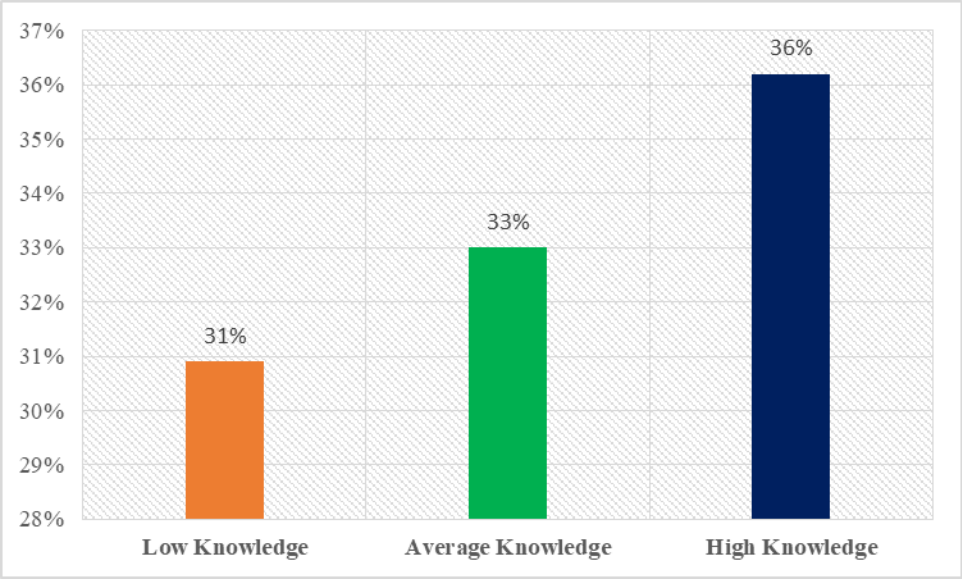

Figure 3: Knowledge of respondents on MDVP

Figure 3 indicates that out of 94 nurse respondents; 31% (29) had Low level Knowledge, While 33% (31) had medium level Knowledge and the highest 36% (33) had High level Knowledge.

4.3.2.2 Attitude towards MDVP.

This section had 5 attitude questions using a 5 point Likert scale, in which respondents specified their level of agreement to a statement typically under five points: (1)strongly disagreed; (2) Disagree (3) neutral (4) Agree (5) strongly agree.

Table 5; Respondents Attitude towards MDVP

	Median	**Std. Deviation**	**Verdict**
Never read through the EPI manual or MDVP	2	1.25	Disagree
MDVP allows opened vaccine to be kept with assurance of safety and efficacy for up to 28 days.	4	.99	Agree
Always adheres to MDVP.	4	1.16	Agree
Encourage other nurses to adhere to MDVP.	4	1.28	Agree
MDVP reduces vaccine wasted and contamination.	4	1.13	Agree

Table 5 shows the overall response to each attitude questions from 94 respondents, using the median as the measure of central tendency; half (50%, 47) of respondents disagreed to the statement that they have never read through the EPI manual or about MDVP, while another half (50%, 47) agreed to the statements that; MDVP allows opened vaccines to be kept with assurance of vaccine safety and efficacy for 28 days after opening, they always adhere to MDVP, encourage other nurses to adhere to MDVP and that MDVP reduces vaccine wastage rate and contamination.

4.3.2.3 Mentorship on MDVP

Mentorship was measured by one question; which was about the number of times the District health team visited the respondent's work station/facility for mentorship on immunisation or MDVP in the past one year. The responses were categorized as follows; those who were not visited at all (no mentorship), those who were visited once (inadequate Mentorship) and those who were visited twice or more were considered as adequate mentorship.

Table 6; Mentorship on MDVP.

	No. of visits in a year.	**Frequency**	**Percent**
No Mentorship	None	46	48.9%
Inadequate Mentorship	Once.	25	26.6%
Adequate Mentorship	Twice and More	23	24.5%
Total		94	100.0%

Table 6 indicates that out of 94 respondents, less than half (48.9%, 46) of the study respondents had no mentorship. The data also illustrated that a little more than a quarter (26.6%, 25) of the study respondents had inadequate mentorship while (24.5%, 23) of the study respondents had adequate mentorship.

4.3.2.4 Influence from experienced nurses.

This section had 7 questions on a 5 point Likert like scale measuring influence from experienced nurses. The respondents specified their level of agreement to a statement typically under a five points: (1) strongly disagreed; (2) Disagree (3) neutral (4) Agree (5) strongly agree. Questions were transformed into one variable (Influence) and the respondents who had the median score of 1-2 were categorized as having negative Influence, those with the median score of 3 had No influence and those with the median score of 4-5 were classified as having Positive Influence.

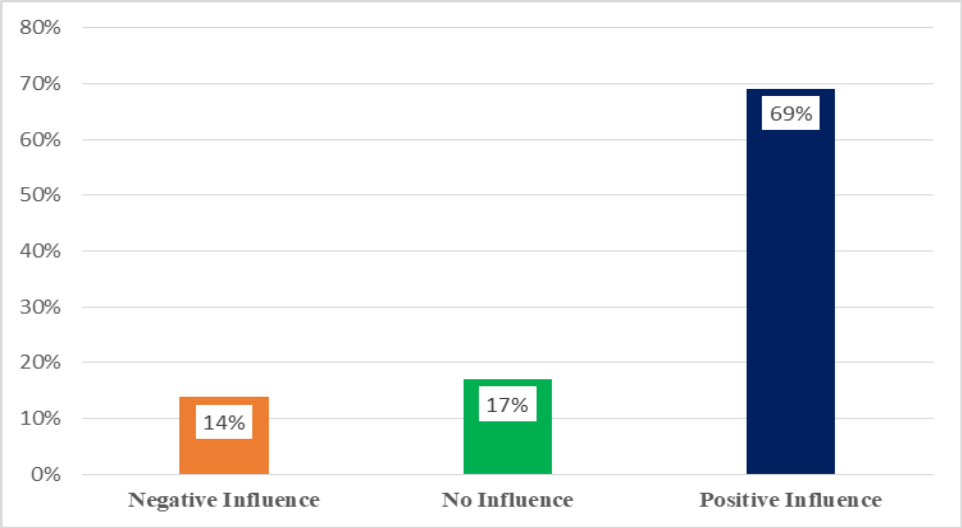

Figure 4; Influence from experienced nurses.

Figure 4 illustrates Influence in terms of percentage, out of 94 nurse respondents. More than half (69%, 65) were influenced positively, 17% (16) had no influence and the minority (14%, 13) were influenced negatively.

4.3.2.5 Work Experience

This section had 5 questions on a 5 point likert like scale assessing work experience. Respondents specified their level of agreement to a statement typically under five points: (1) strongly disagreed; (2) Disagree (3) neutral (4) Agree (5) strongly agree. The researcher transformed all the questions into one variable (Work Experience), respondents who had the median score of 1-3 were categorized as having bad experience, those with the median score of 4-5 were classified as having Good experience.

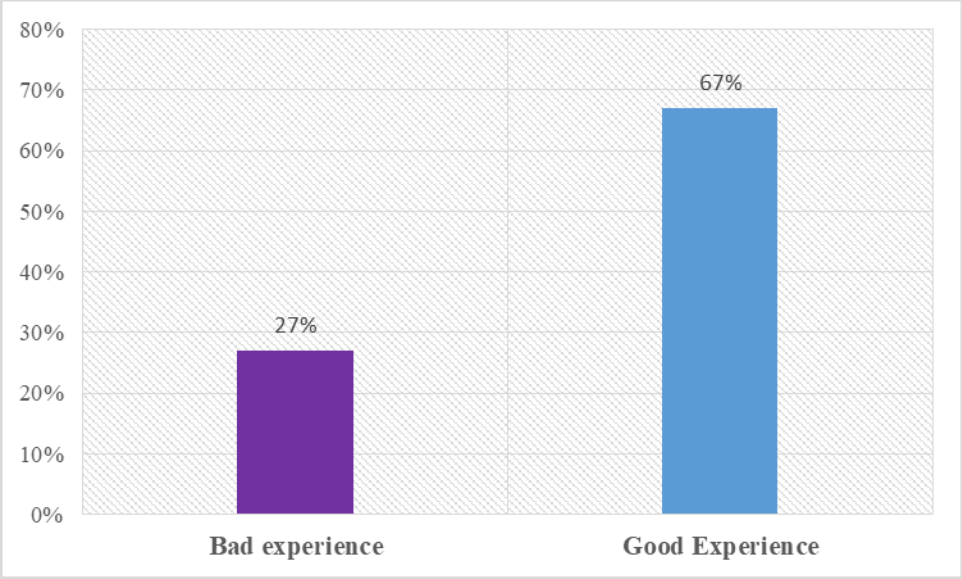

Figure 5: Respondents Work Experience.

Figure 5 illustrates Work experience as one variable in terms of percentage, out of 94 nurse respondents. More than half (71%, 67) had good work experience, while the minority (29%, 27) had bad experience.

4.3.3 DEPENDENT VARIABLE

4.3.3.1 Adherence to MDVP.

The section had 4 adherence questions: if respondents gets 3 and above correctly, they were categorized as Good adherence, while those who scored 2 and below were categorized as Poor adherence.

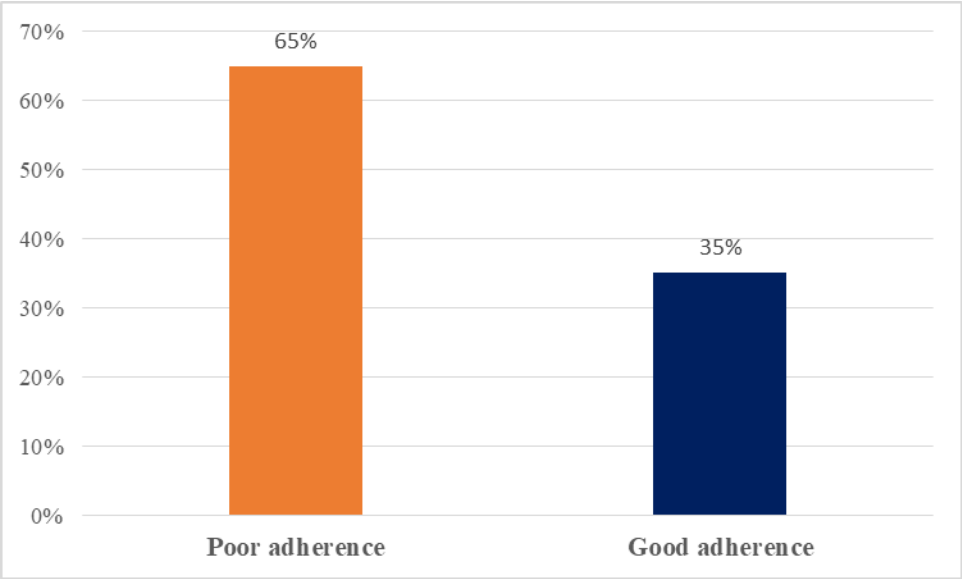

Figure 6: Adherence of respondents to MDVP

Figure 6 shows that out of 94 nurse respondents more than half 65% (61) of the study respondents' demonstrated poor adherence to MDVP, while the minority (35%, 33) had Good adherence.

4.3.4 THE RELATIONSHIP BETWEEN ADHERENCE TO MDVP AND DEMOGRAPHIC FACTORS.

This section presents results of the Chi square test of independence between the categorical dependent variable (adherence) verses demographic factors which are: Age, Gender, Professional qualification and work experience.

Table 7: Association between Adherence verses age and duration of work.

Demographic Characteristics		Adherence to MDVP		P- Value
		Adherence	Non- Adherence	
Age	22-26 years	19 (67.8%)	9 (32.1%)	0.231
	27-29 years	19 (79.2%)	5 (20.8%)	
	30-34 years	11 (57.9%)	8 (42.1%)	
	35-45 years	12 (52.2%)	11 (47.8%)	
Gender	Females	26 (81.2%)	6 (18.8%)	0.017
	Males	35 (56.5%)	27 (43.5%)	
Professional Qualification	Certificate	7 (46.7%)	8 (53.3%)	0.338
	Diploma	31 (64.6%)	17 (35.4%)	
	Advanced Diploma	20 (74.1%)	7 (25.9%)	
	Bachelor's Degree	3 (75.0%)	1 (25.0%)	
Duration of work	Novice (less than 1 year)	8 (72.7%)	3 (27.3%)	0.873
	Advanced Beginner (1-2 years)	9 (69.2%)	4 (30.8%)	
	Competent (Above 2-3 years)	16 (66.7%)	8 (33.3%)	
	Proficient (Above 3-5 years)	7 (70.0%)	3 (30.0%)	
	Experts (above 5 years)	21 (58.3%)	15 (41.7%)	

Table 7 shows the association between adhere and demographic variables, a Chi-Square Test for Independence indicated a significant association between adherence to MDVP and Gender (p-0.017).

4.3.5 THE RELATIONSHIP BETWEEN ADHERENCE TO MDVP AND INDEPENDENT VARIABLES.

Table 8: Association between Adherence verses age and duration of work.

Independent Variables		**Adherence to MDVP**		**P- Value**
		Adherence	**Non- Adherence**	
Knowledge on MDVP	Low Knowledge	23 (79.3%)	6 (20.7%)	0.000
	Average Knowledge	28 (90.3%)	3 (9.7%)	
	High Knowledge	10 (29.4%)	24 (70.6%)	
Attitude towards MDVP	Positive Attitude	9 (90.0%)	1 (10.0%)	0.005
	Neutral	23 (82.1%)	5 (17.9%)	
	Negative Attitude	29 (51.8%)	27 (48.2%)	
Mentorship on MDVP	Adequate Mentorship	33 (71.7%)	13 (28.3%)	0.274
	Inadequate Mentorship	16 (64.0%)	9 (36.0%)	
	No Mentorship	12 (52.2%)	11 (47.8%)	
Influence from fellow nurses	Positive Influence	11 (84.6 %)	2 (15.4%)	0.128
	Negative Influence	12 (75.0%)	4 (25.0%)	
	No Influence	38 (58.5%)	27 (41.5%)	
Work Experience	Good experience	24 (88.9%)	3 (11.1%)	0.020
	Bad experience	37 (55.2%)	30 (44.8%)	

Table 8 shows the association between adhere and independent variables, a Chi-Square Test for Independence indicated a significant association between adherence to MDVP and Knowledge on MDVP (p-0.000), attitude on MDVP (p- 0.005), work experience (p- 0.02).

4.3.6 BINARY LOGISTIC REGRESSION ANALYSIS.

This analysis considered only variables that were significant from Chi-Square Test for Independence.

Table 9: unadjusted and adjusted logistic regression analysis

Variables	Indicator	Unadjusted analysis				Adjusted Analysis			
		OR	CI (95%)		P-value	OR	CI (95%)		P-value
Gender	Male	Ref				Ref			
	Female	.299	.108	.829	.020	.634	.185	2.180	.470
Knowledge	Low Knowledge	Ref				Ref			
	Moderate knowledge	.109	.034	.348	.000	.208	.055	.785	.020
	High Knowledge	.045	.011	.181	.000	.065	.015	.276	.000
Attitude	Negative Attitude	Ref				Ref			
	Neutral attitude	.119	.014	1.006	.051	.356	.033	3.841	.395
	Negative attitude	.233	.078	.701	.010	.619	.619	.145	.518

Binary logistic regression analysis showed that holding other variables constant, respondents who had high knowledge were 0.065 times more likely to adhere to MDVP compared to those who had low knowledge, and this effect was highly significant (AOR: 0.065, CI: .015 - .276, P-

.000). Further analysis showed that, respondents with moderate knowledge had increased odds of adherence to MDVP too as compared to those with low Knowledge (AOR: .208, CI: .055 - .785, P - .020).

CHAPTER 5

DISCUSSION OF FINDINGS

5.1 INTRODUCTION

This chapter discussed the results of the study whose main objective was to investigate the level of adherence to MDVP among nurses in Lufwanyama district and its associated factors which included; Gender, age, Professional qualification, adherence, knowledge, attitude, influence from experienced nurses, mentorship and work experience. These variables were derived from the social Cognitive Theory which is the framework for this research.

The study was a quantitative, cross-sectional analytical research and was undertaken because of the rise in wastage rate and undocumented infections (abscesses) following vaccine injections in Lufwanyama district. This was happening during the period when tools like MDVP have already been formulated, MDVP was formulated by World Health Organisation, (2015) to curb the vices of wastage and contamination of vaccines. There is overwhelming evidence of its effectiveness in other regions where it has been implemented as portrayed by Radwan et al., (2021) study which revealed that the adoption of MDVP in Alexandria in Egypt led to a significant reduction in the wastage rates and led to savings in vaccine requirements and costs. MoH Zambia realised the effectiveness of this policy and joined its international counterparts by adopting it and published it in the EPI manual, 2017(MoH Zambia, 2017). Therefore, this chapter presents the summary of the findings as per research variables of this study, conclusions and recommendations based on the data analysed in the previous chapter.

5.2 DEMOGRAPHIC CHARACTERISTICS

From the findings more than half of the participants were females (62, 66%) in the age range of 22-26 years and gender was significantly associated to adherence to MDVP, this was expected because nursing is a female predominate profession, this is reflected in the demographic of nursing around the world (Punshon et al., 2019). This was in agreement to Saleh et al., (2020), who postulated that human beings have an inbuilt desire to care and nurture others. In some professions such as nursing, women are perceived as privileged in relation to these traits, and

women are in the majority in the nursing profession (Saleh et al., 2020). In this study age and duration of work were not significantly related to adherence to MDVP among nurses in lufwanyama district as majority (65%, 61) showed poor adherence to MDVP regardless of their age group. Contrary to a study conducted by Kurtz, (2017) on demographic Factors Associated with Consistent Hand Hygiene Adherence among ICU Nurses, the results revealed that age of the nurse and the number of years of active nursing practice were statistically significant. Professional qualification in this study was also not significantly related to adherence to MDVP among nurses in Lufwanyama district as majority of them across the professional qualification categories showed poor adhered to MDVP, on the contrary Mukhtar et al., (2022) observed that higher education level (degree and above) participants had significantly higher knowledge than lower education level participants (diploma and below). The difference in the results can be attributed to the fact that in this study and in Zambia currently a lot of nurses have a diploma and there is no even distribution of professional qualification (Mungeyi, 2022).

5.3 ADHERENCE TO MDVP

Adherence was the dependent variable in this study, out of 94 nurse respondents the level of adherence was determined to be at 35% (Good adherence). The study revealed that more than half of the nurses (60%, 56) have not been labeling the date and time of opening the vaccines with preservatives. This further exposes uncertainty in the duration of keeping vaccines for more than 28 days during which period, the vaccines are bound to lose their potency and thus promoting contamination and bacteria growth (Van et al., 2016). Lack of adherence can be attributed to workload, time pressure, encouragement by leaders and colleagues, level of ward performance, provision of education for the improvement of knowledge and skills as postulated by Vaismoradi et al., (2020). MDVP requires that a nurse/vaccinator labels the vaccine with preservatives so that if the vaccine stays for more than the stipulated time it is discarded. Worse more, the results revealed that more than a quarter (36%, 34) were keeping vaccines with preservatives for less than 6 hours after opening hence increasing the wastage rate, these findings are similar to Karttunen et al., (2020) findings which revealed that one-third of the nurses stated that they were not always following guidelines when preparing medication, and around a half deviate from them occasionally, when administering medication (Karttunen et al., 2020).

Basing on these results it is evident that poor adherence to MDVP could be the reason in the increase in magnitude of wastage rates of vaccines in Lufwanyama district. Continued poor adherence to the policy may cost the Ministry of Health increased financial costs to procuring vaccines and antibiotics to treat hospital-acquired infections in immunized children following vaccinations (Radwan et al., 2018). This would demonstrate continued delivery of poor quality of services to the community evidenced by increased post-vaccination morbidity rates, this assertion is supported by Vaismoradi et al., (2020) who postulated that Quality-of-care improvement and prevention of practice errors is dependent on nurses' adherence to the principles of patient safety.

5.4 KNOWLEDGE ON MDVP.

Basing on the Social Cognitive Theoretical Model that guided this study, Knowledge was one of the personal factors that was considered in this study. The results revealed a statistical relationships between adherence and knowledge (P< = 0.00). Knowledge levels of nurses on MDVP were not impressive as only 36% (34) out of 94 nurse respondents had high level knowledge on MDVP, these results confirmed that there was insufficient knowledge on MDVP among nurses in Lufwanyama district and this has contributed to poor adherence to MDVP and consequently, vaccine wastage rate and contamination. The results above are similar to results found by Ansong et al., (2018) having examined knowledge and Competencies of Vaccinators on Routine Childhood Vaccination in Ghana. The results revealed gaps in the principles of vaccine handling and administration because most of the participants did not have knowledge. The similarities in the findings of this study and that of Ansong et al., (2018) can be attributed to similarities in the study sites, both studies were conducted in the rural parts of Africa where shortage of staff is common hence putting pressure on the available ones who are overwhelmed with different activities (Drennan & Ross, 2019). However, Khoja, (2018) also found the similar results despite conducting his study in the urban areas of Saudi Arabia were he examined Registered nurses' knowledge and care practices regarding patients with dysphagia. The results revealed that the participants had partial theoretical and practical knowledge about nursing care for patients with dysphagia (Khoja, 2018).

Knowledge of nurses' influence adherence to guidelines and policies like MDVP. Effective management of the vaccine cold chain system at all levels is one of the crucial factors for maintaining vaccine potency. Vaccines require more complex handling and storage requirements due to increased temperature sensitivity and complicated immunization schedules. This urges adequate knowledge among nurses handling vaccines (Ansong et al., 2018).

5.5 ATTITUDE TORWARDS MDVP.

Attitude is another personal factors that was considered in this study, the study revealed a statistical relationships between adherence and attitude ($P <= 0.05$), therefore, this study has established that knowledge and Attitude are personal factors that influenced adherence of nurses to MDVP. Unlike knowledge, this study revealed good attitude towards MDVP among nurses in Lufwanyama district. Out of 94 nurse respondents, more than half (60%, 56) of the study respondents had positive attitude. Most of the respondents disagreed to the statement that they have never read through the EPI manual or about MDVP, while most of them agreed to MDVP allowing opened vaccines to be kept with assurance of vaccine safety and efficacy for 28 days after opening, always adhering to MDVP, encouraging other nurses to adhere to MDVP and that MDVP reduces vaccine wastage rate and contamination. The results are consistent with Mohammed et al. (2021) who evaluated the Knowledge, attitude and practice of vaccinators and vaccine handlers on vaccine cold chain management in public health facilities in Ethiopia using a Cross-sectional study. Results showed that vaccinators and vaccine handlers had positive attitude. Similar results were also obtained by Kiyoshi-Teo et al., (2014) whose results revealed that the most consistent facilitator of adherence to guidelines was nurses' positive attitude toward the guidelines. Kiyoshi-Teo et al., (2014) also suggested that a good attitude of nurses towards a guideline or policy will result into its effective implementation.

The question then could be, if attitude of nurses was good towards MDVP how then does adherence remained low? According to Yanti et al., (2020) Human attitude is a predictor of normal behavior, although other factors may affect it. He further argued that attitude can determine actions, but sometimes attitude is not reflected in to action (Yanti et al., 2020).

5.6 MENTORSHIP ON MDVP.

Mentorship was one of the environmental factors that were considered in this study, however results revealed that there was no statistical relationship between nurses adherence to multi doses vial policy and Mentorship (P = 0.274), contrary to Creanga et al., (2020) whose study showed statistical significant improvements in intrapartum and newborn care practices after introducing nurse and midwife mentors in Bihar, India. This difference can be attributed to the difference in sample size as Creanga et al., (2020) had a bigger sample than this study.

In this study the results revealed that out of 94 respondents, a little less than half (48.9%, 46) of the study respondents had no mentorship, they revealed that they were never visited in the past year by Lufwanyama district health team for mentorship on MDVP or immunisation guidelines for the past one year. These study findings demonstrates that inadequate mentorship can be a barrier to nurses adhering to MDVP because mentorship is very important especially to novice nurses who encounter challenges when making the transition to clinical learning because of the complex and unpredictable nature of clinical settings and handling of vaccines at large (Anatole et al., 2017). Hence they depend on mentorship and the supervision from experienced nurses in order to adopt efficient and effective clinical practice that guarantees patient safety, by making sound decisions and adhering to set guidelines and policies (Anatole et al., 2017). A mentor can play a powerful role in a nurse's professional life, providing guidance, perspective and advice. Mentors also keep the mentees in check thereby adhering to guidelines that are derived from policies (Chanda, 2004) like MDVP and the end result is quality delivery of health services to the health care recipients.

5.7 INFLUENCE FROM EXPERIENCED NURSES

Influence from experienced nurses is another environmental factor that was considered in this study. The results revealed that there was good percentage of respondents being positively influenced to adhere to MDVP. Out of 94 nurse respondents, more than half (69%, 65) were influenced positively, these findings were consistent to McKenna et al., (2018) Argument that nurses Informally identify experienced nurses to be important resources for decision-making. This study further revealed that most of the respondents agreed to spend much time with workmates at under five clinics where they are always being encouraged to strictly adhere to

MDVP by other nurses. They also agreed on discussing immunisation procedures and guidelines during some spare time at work and being assisted to improve the skill in immunisation and adhere to MDVP.

This influence is vital in making nurses adhere to MDVP especially that it has been a positive influence, because experienced nurses bring a broad range of previous patient encounters to their practice, influencing their intuitive and unconscious processes which facilitates decision-making. In due course they help less experienced nurses' in effective decision-making for enhanced patient outcomes (Nibbelink & Brewer, 2018).

5.8 WORK EXPERIENCE.

The behavioural factor that was considered in this study was work experience and its component (work duration) that was considered as a demographic variable. The study findings revealed the relationship between Adherence to MDVP and Work experience ($p = 0.02$) while there was no correlation between adherence to MDVP and work duration ($p = 0.658$). Therefore, this study has established work experience as the behavioural factors that influence adherence of nurses to MDVP on the contrary Fernández-Feito et al. (2019) descriptive cross sectional study showed that hospital care professionals attached more importance to all the values and guidelines, regardless of their work experience and that professionals with more than 20 years' experience granted less importance to the values. The differences in the study findings can be attributed to the study design that was employed, Fernández-Feito et al., (2019) employed descriptive cross sectional design which implies that his study did not employ statistical tests however, this study used analytical cross sectional and identified an association.

In this study out of 94 nurse respondents 71% (67) had good work experience, half (50%, 47) of the respondents agreed to their role in under five clinic being very clear, being inspired by their facility's immunisation goals and always receiving constructive feedback from their managers. While half (50%, 47) were neutral to their work environment being distractive and non-motivating. The other half (50%, 47) also agreed to presence of strong feeling of team work and participation in line with immunisation at their work places. The results from this study are similar to Rizany et al. (2018) Systematic review study on Factors that affect the development of

nurses' competencies. The study revealed that Competence development is influenced by a myriad of factors one of them being work experience. On the contrary Lin, (2019) study identified bad experience which was characterised by overcoming language barriers, dealing with discrimination etc. which culminated in poor practice leading to the gap in the quality of health care being rendered (Lin, 2019).

Work experience is very vital in ensuring that nurses adhere to guidelines and policies like MDVP, according to Jansson et al. (2020) Work experience and education have been shown to significantly influence the development of competency of nurses.

5.9: CONCLUSION

The main objective of the study was to investigate the level of nurses' adherence to MDVP and its associated factors in lufwanyama district. The specific objectives were to ascertain the levels of adherence to MDVP and to identify factors that influence nurses' adherence to MDVP in Lufwanyama district. Using binary logistic regression one factor (Knowledge) was being significant in influencing adherence to MDVP. Furthermore, the study established that the level of adherence to MDVP among nurses in Lufwanyama district was low. This implies that in order to strengthen adherence to MDVP, there was need to make sure nurses are trained on MDVP and associated guidelines. Furthermore, the study has further identified other factors that influenced nurses' adherence to MDVP in Lufwanyama district as being; Gender, attitude and work experience.

5.10: KEY FINDINGS

The key findings of this study are that the procedures pertaining to adherence to MDVP are not being followed fully, some of which includes labeling the vaccine after opening and duration of keeping vaccines after opening rendering vaccines vulnerable to contamination and ineffectiveness as the vaccines lose their potency (Van et al., 2016). In addition, most of the nurses are lacking knowledge on MDVP and are not updated on the current information on the policy guidelines. More than half (65%, 61) of the study respondents did not know when the policy was revised, as well as the effects of not adhering to the policy despite the district having a good number of competent nurses (26%, 24), Proficient (11%, 10) and Experts (38%, 36). This

shows that most of the nurses (75%, 71) have worked from under-five clinic for more than 2 years. The findings of this study further indicated that other challenges that hinge on effective implementation of MDVP include inadequate mentorship, as it was revealed that most of the nurses have never received mentorship pertaining to MDVP and immunisation guidelines in the past one year. It is also evident that Gender, Knowledge, attitude and work experience has an influence on the nurses' adherence to MDVP and its implementation. Given the foregoing, the onus is on the Ministry of Health Child Health Unit and Lufwanyama District Health Office to recognize that the low level of nurses' adherence to MDVP in Lufwanyama District needs special attention in order to reduce contamination and vaccine wastage thereby providing quality health care to the community.

5.11: LIMITATIONS OF THE STUDY.

The following was the limitation of this study: This was a quantitative study; therefore in depth information on factors that could affect adherence to MDVP from the nurses' perspective could not be explored.

5.12. IMPLICATIONS OF THIS STUDY TO NURSING

5.12.1 Nursing Practice.

Nurses are the backbone of health care systems in Zambia and play a leading role in the delivery of quality health care services. Therefore, this study contribution to nursing practice specifically clinical nursing cannot be over emphasized in that basing on the results of the study, whenever a clinical nurse practitioner is collecting health history in children who present with abscess or fever of unknown origin he/she should consider inquiring about vaccination history and whenever incidences of abscesses in children increases in the out Patient department and community at large, the clinical nurse practitioner should consider broadening the inquiry on level of nurses' adherence to MDVP among others. In addition, if nurses strictly adhere to MDVP there will be reduction in reported and unreported consequences of contamination e.g. abscess in the outpatient departments of health facilities in Lufwanyama District. Nurses adherence to MDVP will also save a lot resources for the ministry in the procurement of vaccines (Radwan et al., 2018).

5.12.2: Nursing Administration

The LDHO nursing management/ administration have a role in carrying out their management functions such as planning, organizing, controlling and delegating. The findings of this study indicated that a significant number of nurses (48.9%, 46) did not receive mentorship on MDVP Therefore, it is important that they should make sure they implement mentorship activities. If held up with other activities it is imperative that they delegate.

5.12.3 Nursing Education

The study showed that most of the nurses had low knowledge on MDVP Hence pointing out an urgent need to incorporate MDVP under immunisation topic in Paediatrics and paediatric nursing. The current curriculum for RN diploma does not cover the above mentioned aspects therefore, there is need to include it and orient nurse educators as well.

5.12.4 Nursing Research

This study has contributed to the Nursing research body of knowledge especially it has been published. Because during literature review the researcher did not find any research done to assess nurses adherence to MDVP, therefore, the information that this research has generated by identifying the level of adherence to MDVP and its associated factors (Gender, knowledge, attitude and work experience) is considered new by the researcher to that effect. And if these findings are utilised they will help in reducing the incidence of wastage rate and abscesses in the health facilities in Lufwanyama district. It also triggered nurses to probe and read more on MDVP evidenced by the comments in the comment section of the questionnaire where out of the 42 nurse respondents who wrote the comments, more than half (64%, 27) confessed to needing knowledge on MDVP and called the questionnaire the “mind opener” while others (20%, 8) requested for workshops and mentorship on the same. Therefore, these results has potential to positively influence decision among nurses in handling of vaccines.

5.12 RECOMMENDATIONS

Immunisation is the most effective and affordable way of managing infections and it has made much gains as the best way to prevent diseases, however, if the adverse effects following Immunisation like abscess prevalence continues to rise, then mothers will be demotivated to take their children for vaccination and the gains that have been made so far will be lost thus leading to the district (Lufwanyama) and the country at large to go back to the era of high childhood disease burden; therefore there is need for;

Lufwanyama District Health Team;

1. To hold refresher courses on MDVP and vaccine management so as to raise the knowledge of nurses in the district.

2. To improve on Mentorship to all facilities in the district.

3. To equip Nurse Managers with knowledge and skills to orient new staff that might join the district in future on MDVP and other immunisation guidelines.

4. Need for nurse managers to do nursing audits so as to keep subordinates in check and help assess the quality of care provided to the community.

Ministry of Health Child health Unit (MoH-CHU).

1. To conduct a Cross sectional study on the large scale, possibly sample provinces so as to ascertain the nurses' level of adherence to MDVP in the country.

2. To publish and distribute more materials that has Multi Dose Vial Policy and immunisation guidelines to nurses, this will raise awareness and knowledge among nurses on vaccine management.

5.14: UTILISATION OF STUDY RESULTS

Research utilization is applying knowledge obtained from research in clinical practice (Leavy, 2017) therefore, findings from this study may help in reducing the incidence of wastage rate in the health facilities in Lufwanyama district. The study results may also benefit nurses and other health workers because the Provincial and District Health Offices may use the study findings to empower nurses with knowledge and skills on the implementation of multi-dose vial policy through workshops and seminars. In addition, the findings may influence decisions among nurses in handling vaccines by developing practice guidelines and in performing clinical audit.

5.15 DISSEMINATION OF FINDINGS

The findings of the study will be disseminated as dissertations submitted to the University Of Zambia and School of Nursing Sciences Libraries, MoH Child Health Unit and the Lufwanyama District Health Offices.

The researcher has published the research article from this study in the International Journal of Scientific Development and Research (IJSDR) and also the researcher has made presentations at post graduate forum and professional conferences.

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APPENDIX 1 (PARTICIPANT INFORMATION SHEET)

Nurses' level of adherence to multi dose vial policy (MDVP) in lufwanyama district.

Good morning/afternoon.

My name is **Bernard Nkandu**, I am a Master of Science in clinical nursing student at University of Zambia (UNZA), carrying out a research to determine nurses' level of adherence to Multi Dose Vial policy (MDVP) in Lufwanyama district. I reside in Kalengwa east house No. 14766, Kalulushi and my contact numbers are 0978048919 and 0953505641.

World health organisation introduced a Multi dose vial policy in 2014 so as to curb wastage of multi-dose vaccines. However, Lufwanyama District has recorded high vaccine wastage in the past 3 years, evidenced by the Health Facilities' Vaccine Return Reports for the district, thus necessitating the need for this study to determine how this wastage can be reduced through evidence-based practice.

The purpose of this study therefore, is to determine the nurses' level of adherence to multi-dose vial policy in lufwanyama district. I am requesting you to participate in this study because you meet the criteria and you have been selected randomly.

The study intends to recruit 110 participants, there are no procedures that you will be required to do or that will be done on you apart from giving answers to questions in this questionnaire. Taking part in this study is voluntary and if you agree to participate, I will require you to provide answers to questions about yourself and about multi dose vial policy. The questionnaire will take about 20 minutes to complete and it's once off. There are no anticipated problems but in case some questions make you feel uncomfortable; you are free to express your discomfort or decide not to respond or with draw from the study at any point without being required to provide an explanation for your decision and without suffering any victimization on the basis of your withdrawal from the study.

There are no direct benefits to you for choosing to participate in this study. However, you will be helping me and others in future to develop recommendations to relevant authorities on how to reduce wastage rates and contamination of vaccines.

I will do my best to ensure that your personal information is kept private. Your record will not have your name. It will be kept in a secure place and only used for purposes of the study.

At this time, do you want to ask me anything about the study? If you have any questions at any time even after the interview, feel free to ask.

Confidentiality

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

The interviewer has discussed this information with me and offered to answer my questions. For any further questions, I may contact the Chairperson, University of Zambia Biomedical Research Ethics Committee (UNZABREC) on the following details; Postal address 50110, Ridgeway campus, Lusaka. Phone number +260977925304 and via email at: unzarec@unza.zm who will institute necessary measures to resolve my issue ethically and professionally.

APPENDIX 2 (INFORMED CONSENT)

_____has described to me what is going to be done, the risks, the benefits involved and my rights regarding this study. I understand that my decision to participate in this study will not alter my usual medical care. In the use of this information, my identity will be concealed. I am aware that I may withdraw at any time. I understand that by signing this form, I do not waive any of my legal rights but merely indicate that I have been informed about the research study in which I am voluntarily agreeing to participate. A copy of this form will be provided to me.

Name: _____Signature of participant _____Age_____

Date (DD/MM/YY) _____

Name of Witness_____ Signature of Witness_____

Date (DD/MM/YY) _____

APPENDIX 3 (SELF-ADMINISTERED QUESTIONNAIRE)

Instructions:

1. Do not write your name on the questionnaire
2. Tick the correct answer (s)
3. For other questions write in spaces provided.
4. Answer all the questions

For official use only

SECTION A: DEMOGRAPHIC DATA

1. What was your age on your last birthday? _____ ☐

2. What is your gender?
   1. Male ☐
   2. Female ☐

3. What is your qualification?
   1. Certificate ☐
   2. Diploma ☐
   3. Advanced Diploma ☐
   4. Bachelor's Degree ☐
   5. Master's Degree ☐

4. For how long have you been working from under-five clinic? _____ ☐

SECTION B: KNOWLEDGE ON Multi Dose Vial Policy (MDVP).

5. What is Multi Dose Vial Policy?

   1. A Policy that defines the conditions to safely handle opened multidose vaccine vials. ☐
   2. A Policy that defines the conditions to safely handle non-opened multidose vaccine vials. ☐
   3. A Policy that defines the conditions to safely handle both opened and non-opened multidose vaccine vials. ☐
   4. I don't know. ☐

6. MOH EPI manual 2017 document provides guidance on the Multi Dose Vial Policy:

1. True ☐
2. False ☐
3. I don't know ☐

7. State whether the following sentence is true or not: "some vaccines have preservatives in them"

a) True ☐
b) False ☐
c) I am not sure ☐

8. Who developed Multi dose Vial Policy

1. Ministry of Health ☐
2. World Health Organisation ☐
3. Copperbelt Provincial Health Team ☐
4. I don't Know ☐

9. When was the current policy revised?

1. 2014 ☐
2. 2020 ☐
3. 2012 ☐
4. I don't Know ☐

10. What can/do you do if the vaccine vial septum has been submerged in water after opening the vial?

1. Keep in the fridge ☐
2. Discard ☐
3. Use it quickly ☐
4. I don't know ☐

11. What can/do you do to BCG and Measles containing vaccine after reconstitution?

1. Use it for a single session, then discard. ☐
2. Should be carried from one session to another, even if the sessions are very Far apart. ☐
3. Keep it for next day until if finishes. ☐
4. I don't know ☐

12. Which one is the negative effect associated with not adhering to Multi Dose Vial Policy?

1. Causes the facility to run short of vaccines. ☐
2. Increases the wastage rate of vaccines. ☐
3. Increases number of missed children ☐
4. I don't know ☐

SECTION C: ADHERENCE TO Multi Dose Vial Policy (MDVP).

13. What do you do after opening an injectable vaccine with preservatives e.g., PCV,

1. Start injecting/giving children ☐
2. Check VVM ☐
3. Label the date and time of opening ☐
4. I don't know ☐

14. How long do you keep injectable vaccines **without** preservatives after opening the vial e.g., BCG?

1. Less than 6 hours ☐
2. 6-24 hours ☐
3. For some days ☐
4. I don't know ☐

15. How long do you keep injectable vaccines **with** preservatives after opening the vial e.g., Tetanus Toxoid?

1. Less than 6 hours ☐
2. 2 weeks ☐
3. 4 weeks ☐
4. I don't know ☐

16. The Multi-Dose Vial Policy allows vaccine vials to be kept with assurance of vaccine safety and efficacy for up to 28 days after opening".

1. True ☐
2. False ☐
3. I don't know ☐

SECTION D: ATTITUDE

		Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
17.	I have never read through the EPI manual or about Multi Dose Vial Policy.					
18.	Multi-Dose Vial Policy allows opened vaccine vials to be kept with assurance of vaccine safety and efficacy for up to 28 days after opening".					
19.	I always adhere to Multi Dose Vial Policy.					
20.	I do encourage other nurses to adhere to Multi Dose Vial Policy.					
21.	Multi Dose Vial Policy reduces vaccine wasted rate and contamination.					

SECTION E: MENTORSHIP

22. How often has District Health Team (DHT) visited your facility for mentorship on Immunisation or MDVP in the past one year?

1. None ☐
2. Once ☐
3. twice and more ☐

SECTION F: INFLUENCE FROM EXPERIENCED NURSES.

		Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
23.	I spend much time with my workmates at under-five clinic.					
24.	My fellow nurses encourage me to strictly abide to MDVP.					
25.	My fellow nurses discourage me to abide to MDVP					
26.	I and my workmates compete for the best performance.					
27.	We discuss immunisation procedures and guidelines during some spare time at work.					
28.	My workmates have assisted me to improve my skill in immunisation and adhere to Multi Dose Vial Policy.					
29.	My workmates always solve challenging situations in under-five clinics.					

SECTION G: WORK EXPERIENCE.

		Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
30.	My role in under five clinic is very clear.					
31.	I'm inspired by the immunisation goals of the under-five clinic at my facility.					
32.	I always receive constructive feedback from my manager.					
33.	My work environment is distractive and not motivating?					
34.	There is a strong feeling of team work and participation in line with immunisation at my work place?					

35. Kindly share any thoughts or comments you may have had before or during this interview on the MDVP. _____

_____

_____

Thank you for your participation!

APPENDIX 4 (PERMISSION LETTER)

P.O Box 22540 Kalengwa Road
Kitwe, Zambia
lufwanayamaldho@gmail.com
Mobile :0977868993

All correspondences to be addressed to the DISTRICT DIRECTOR OF HEALTH

REPUBLIC OF ZAMBIA
MINISTRY OF HEALTH
LUFWANYAMA DISTRICT HEALTH OFFICE

17th June, 2021.

MR Bernard Nkandu
The University of Zambia
School of Nursing Sciences
P. o. Box 50110
Lusaka, Zambia.

Dear Mr Bernard Nkandu,

RE: **REQUEST TO COLLECT DATA ON THE VACCINE WASTAGE RATE FROM VACCINATING FACILITIES IN LUFWANYAMA DISTRCT FROM 18.06.2021 TO 22.06.2021**

Reference is made to the letter dated 14.06.2021 regarding the above captioned subject.

Iam pleased to inform you that permission has been granted to your request to collect data on the wastage rate of the vaccines that are used in the vaccination facilities in Lufwanyama District.

Kindly note that the data you will collect should not be used for any other purpose other than academic and that all the outcomes of the final study report should be shared with this office.

Yours Faithfully

LUFWANYAMA -DISTRICT HEALTH OFFICE

Dr Jacob Ngambi
DISTRICT HEALTH DIRECTOR

CC-PHD
CC-PNO
CC-MCH LUFWANYAMA DHO

MINISTRY OF HEALTH
LUFWANYAMA DISTRICT HEALTH MANAGEMENT TEAM
DISTRICT MEDICAL OFFICER
P.O. BOX 21[illegible]

APPENDIX 5 (ETHICAL CLEARANCE LETTER)

UNIVERSITY OF ZAMBIA
BIOMEDICAL RESEARCH ETHICS COMMITTEE

Telephone: +260 977925304
Telegrams: UNZA, LUSAKA
Telex: UNZALU ZA 44370
Fax: + 260-1-250753

Ridgeway Campus
P.O. Box 50110
Lusaka, Zambia
E-mail: unzarec@unza.zm

Federal Assurance No. FWA00000338 IRB00001131 of IORG0000774 NHRAR-REC No 2021-05-0002

15th July, 2022

Your REF. No 2878-2022

Mr. Bernard Nkandu,
University of Zambia,
Institute of Distance Education,
Clinical Nursing,
P.O Box 32379,
Lusaka.

Dear Mr. Nkandu,

RE: NURSES' LEVEL OF ADHERENCE TO MULTI-DOSE VIAL POLICY (MDVP) IN LUFWANYAMA DISTRICT (REF. NO. 2878-2022)

The above-mentioned research proposal was presented to the Biomedical Research Ethics Committee on 14th July, 2022. The proposal is **approved**. The approval is based on the following documents that were submitted for review:

a) Study proposal
b) Questionnaires
c) Participant Consent Form

APPROVAL NUMBER : REF. 2878-2022

This number should be used on all correspondence, consent forms and documents as appropriate.

i. **APPROVAL DATE : 15th July 2022**
ii. **TYPE OF APPROVAL : Standard**
iii. **EXPIRATION DATE OF APPROVAL : 14th July 2023**
iv. After this date, this project may only continue upon renewal. For purposes of renewal, a progress report on a standard form obtainable from the UNZABREC Offices should be submitted one month before the expiration date for continuing review.
v. **SERIOUS ADVERSE EVENT REPORTING**: All SAEs and any other serious challenges/problems having to do with participant welfare, participant safety and study integrity must be reported to UNZABREC within 3 working days using standard forms obtainable from UNZABREC.
vi. **MODIFICATIONS**: Prior UNZABREC approval using standard forms obtainable from the UNZABREC Offices is required before implementing any changes in the Protocol (including changes in the consent documents).

vii. **TERMINATION OF STUDY**: On termination of a study, a report has to be submitted to the UNZABREC using standard forms obtainable from the UNZABREC Offices.

viii. **NHRA:** You are advised to obtain final study clearance and approval to conduct research in Zambia from the National Health Research Authority (NHRA) before commencing the research project.

ix. **QUESTIONS**: Please contact the UNZABREC on Telephone No. +260977925304 or by e-mail on unzarec@unza.zm.

x. **OTHER**: Please be reminded to send in copies of your research findings/results for our records. You are also required to submit electronic copies of your publications in peer-reviewed journals that may emanate from this study. Use the online portal: unza.rhinno.net for further submissions.

Yours sincerely,

Sody Mweetwa Munsaka, BSc., MSc., PhD
CHAIRPERSON
Tel: +260977925304
E-mail: s.munsaka@unza.zm

APPENDIX 6 (PERMISSION LETTER FROM LDHO)

All Correspondence should be addressed to the
District Health Director
Mobile: +0967853069 +260-2-731869
Email:lufwanyamaldho@gmail.com

In reply please quote.....

REPUBLIC OF ZAMBIA
MINISTRY OF HEALTH
LUFWANYAMA DISTRICT HEALTH OFFICE

Boma Area, Kalengwa Road
P. o Box 22540
LUFWANYAMA

5th September, 2022

Bernard Nkandu
House No 14766
Kelengwa East
Kalulushi

RE:RECEIPT OF YOUR REQUEST TO CONDUCT THE RESEARCH

I wish to acknowledge the receipt of your letter dated 2th September,2022 over the above subject matter.

The District Health Office has no objection to your request to conduct an academic research on Nurses level of adherence to multi- Dose vial policy in our district. As this is part of your academic requirement in your masters degree in Clinical Nursing.

The office has granted you the permission to administer the questionaires in our health facilities.

Wishing you well as you conduct your research.

Yours ~~In~~ Service

Dr. Jacob N'gambi
District Health Director
LUFWANYAMA.

APPENDIX 7 (NRHA REGISTRATION CERTIFICATE)

APPENDIX 8 (CERTIFICATE OF PUBLICATION)

INTERNATIONAL JOURNAL OF SCIENCE & ENGINEERING DEVELOPMENT RESEARCH

An International Open Access Journal ISSN: 2455-2631

Certificate of Publication

The Board of

International Journal of Science & Engineering Development Research

Is hereby awarding this certificate to

BERNARD NKANDU

In recognition of the publication of the paper entitled

Nurses` Adherence to Multi-Dose Vial policy (MDVP) in Lufwanyama District, Zambia.

Published in Volume 8 Issue 3, March-2023

ISSN 2455-2631

Co-Authors - DR DOROTHY CHANDA,MR MICHAEL KANYANTA

Paper ID - IJSDR2303059

Editor-In Chief

www.ijsdr.org | editor@ijsdr.org