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

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ABSTRACT

Introduction - World Health Organisation revised the policy statement on multi-dose vials in 2014. The policy allows certain vaccines that contain preservatives to be reused for up to 28 days after opening, as long as storage and proper handling conditions are met. However, vaccines without preservatives such as BCG and Measles should be discarded within 6 hours of reconstitution or at the end of a vaccination session, whichever comes first. This policy has reduced vaccine wastage and contamination in the countries and areas where there is good adherence to it. However, in the past three years, 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 among nurses in Lufwanyama district and its associated factors.

Methodology - The research utilised quantitative method and a cross-sectional Analytical study design, it was conducted in Lufwanyama district which had a total number of 155 nurses. A sample of 109 nurses was drawn using simple random sampling with the response rate of 86% (94) respondents. A structured questionnaire was used to collect data which was analysed using the Statistical Package for Social Sciences (SPSS) version 20.

Findings - The study findings revealed that the level of adherence to MDVP among nurses in Lufwanyama district was low (35%, 33) and very few (36%, 34) respondents had high level knowledge on MDVP. The study also revealed that half (50%, 47) of the study respondents completely lacked mentorship while a little more than a quarter (27%, 25) had inadequate mentorship on MDVP or immunisation guidelines.

Conclusion: The study concluded that knowledge (P< = 0.00), attitude (P, <= 0.05) and work experience (p<= 0.02) were statistically significant and contributed to poor adherence to MDVP among nurses in Lufwanyama district of Copperbelt province in Zambia.

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

INTRODUCTION

Immunization is the process whereby a person is made immune or resistant to an infectious disease, typically by the administration of a vaccine [1]. 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 [2]. Therefore, it is very vital to improve on the immunization performance and sustain the gains achieved so far. However, Vaccines are expensive and are expected to cost USD 5–7 per dose in developing countries [3]. Certain vaccines require a child to receive about 3 doses for example Pneumococcal Conjugate Vaccine (PCV). For this reason, it has, become exceedingly important to determine its optimal vial size, which refers to the size of the vial in which the vaccine is supplied. Multi-dose vials have more doses of vaccine in them, while a single-dose vial has just one dose of the vaccine. The manufacturing costs in a multi-dose vial are spread over many doses and therefore they tend to cost less per dose as compared to a single-dose vial. Furthermore, multi-dose vials have lower cold chain costs, therefore, many developing countries like Zambia prefer multidose vials because of their cost effectiveness. However, they are also thought to be associated with higher wastage [4]. The reports of high vaccine wastage worldwide and increasing attention on safety led to the revision of the policy statement on multi-dose vials by the World Health Organisation in 2014 [5]. WHO implemented this policy in 2000, and it was revised in 2014.

The previous Expanded Programme for Immunisation (EPI) 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 thereby increasing the wastage rate of vaccines [1].

The 2014 Multi-Dose Vial Policy has put exceptions by allowing certain vaccines that contain preservatives to be reused as some vaccines contain preservatives, while others do not. World Health Organisation (WHO) [1] 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 BCG and Measles Vaccine (MV), should be discarded within 6 hours of reconstitution or at the end of a vaccination session, whichever comes first."

Ogundele [6] 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%. This has been supported by Patel etal [7] study on the Vaccine Wastage Assessment after Introduction of Multi-dose Vial Policy in Surat Municipal Corporation Area of India. The results revealed a decrease in Wastage rate, thus, by the implementation of MDVP saved an estimated 747 727 doses of OPV and 343 725 doses of diphtheria, pertussis and tetanus toxoid vaccine (DPT), HBV and the pentavalent vaccines combined in Surat city of India in a year [7]. So many studies have proven the effectiveness of Multidose Vial policy in the reduction of vaccine contamination and wastage.

During the reign as the Nurse in Charge of St. Mary's Mission Hospital in Lufwanyama district, Zambia. 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 [8] 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 in Lufwanyama district, which revealed a high wastage rate of multi-dose vial vaccines in the three year period (2018-2020). Statistics shows an increase in the wastage rates of multidose vial vaccines of 20% (Bacillus Calmette Guerin), 12% (Pneumococcal Conjugate Vaccine), 5% (Oral Polio Vaccine), 13% (Measles Rubella vaccine), and 14% (Tetanus Toxoid) when compared to the Acceptable WHO Global indicative wastage rate [9]. This increase is so alarming, and entails that there is poor adherence to multi-dose vial policy.

The probable causes of this increased wastage rate of the multi-dose vaccines was attributed to nurses having inadequate knowledge on how to handle vaccines and when to discard them as required by policy guidelines. This could have led to vaccine contamination, as a result the vaccine may have been 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, under five year old children will contract preventable childhood diseases, their families will suffer negative consequences such as poor psychological and emotional functioning, disruption of leisure activities and financial resources, and finally, the communities will face a high disease burden among the under five year old children. Thus necessitating the need for this study to determine how this wastage could be reduced through evidence-based practice.

The researcher hypothesized that there was no relationship between nurses' adherence to MDVP among nurses' in Lufwanyama district and the following factors which were derived from the Social Cognitive Theory which guided this research. The factors includes; Demographic factors, Environmental factors, Personal factors and Behavioural factors.

METHODOLOGY

Quantitative research method and Analytical cross-sectional design were used in this study: It was conducted in Lufwanyama district in Zambia, a rural district on the Copperbelt province. The total of 99 nurses were calculated as a sample size using Cochrane formula which was later adjusted by adding 10% to carter for a 10% non-response rate, adding up to 109 nurses as the final sample size. This was to ensure that the sample does not fall far below the estimated sample size due to non-response.

Inclusion criteria

All nurses from rural health centers and health posts within Lufwanyama district who participated in immunisation services, were available at the study site during the period of data collection and consented to participate in the study were included.

Exclusion criteria

The study excluded nurse managers because of more involvement, they 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; those who were employed in the year 2022 when the research was being conducted because of little or lack of involvement in immunization activities.

Paper-pencil structured questionnaire was used to collect personal demographic characteristics as well as to capture the variables of interest specifically adherence, knowledge, attitude, mentorship, 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.

Statistics were presented using pie charts and bar charts for single groups nominal and ordinal data respectively, while discrete demographic variables like age and duration of work were presented using histogram and data was expressed as mode and mean. Categorical variables were expressed in terms of proportions (percentages) while the association between categorical variables was tested using the Chi-square during data analysis. Binary Logistic regression was used to test an association between the dichotomous dependent variable and some discrete variables like age.

The circumstances on which the research hypotheses were to be accepted or rejected was achieved by setting the significance level at 5% (p value = 0.05), this meant the researcher was willing to take a risk of rejecting the null hypothesis when in fact it was correct five times out of 100. This further implies that the area of acceptance (Confidence interval) for the null hypothesis was the central 95% of the distribution and the areas of rejection are the 2.5% of each tail, Hence, the test statistic of less than -1.96 or greater than 1.96 led to the null hypothesis being rejected.

RESULTS

94 participants took part in the study representing a response rate of 86%. The structured questionnaire used in this study was adapted from different questionnaires for different variables of the study while other questions were formulated by the researcher. Work experience was adapted from the Work experience measurement scale (WEMS)[10], influence from experienced nurses was adapted from Peer Influence and Performance Tasks of Senior High School Students Likert scale by Moneva and Legaspino [11] both scales have been reported to have a good internal consistency with the Cronbach's alpha coefficient of 0.89 [10]. In this study, Cronbach's alpha coefficients were ranging from 0.56 to 0.74 as shown in the table below.

Table 1: 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

4.2.1 Section A: Socio-Demographic Data.

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

Figure 1 shows age distribution of respondents with the most frequent (39) age group of 25-30 years. The mean age of 30 and standard deviation of 5.597. The distribution was skewed to the left with data ranging between 20 and 50.

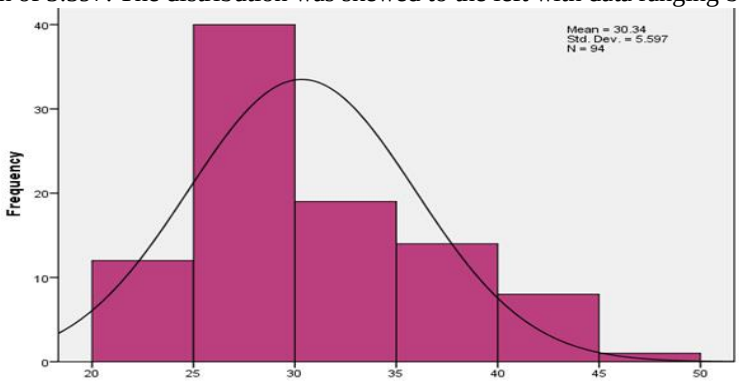

Figure 1: Age distribution of respondents.

Figure 2 indicates the gender distribution of respondents. Among the respondents, more than half (66%, 62) were females, while (34%, 32) were males.

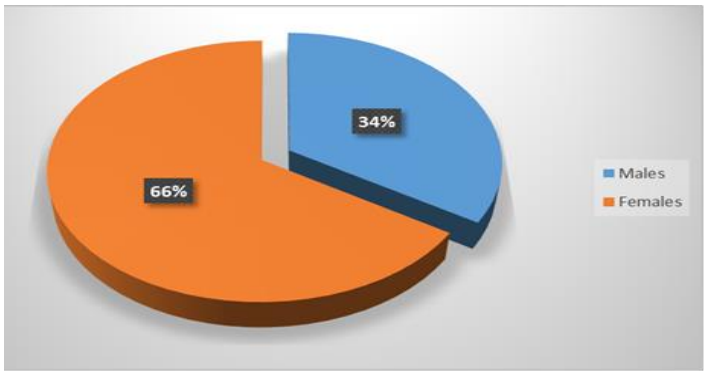

Figure 2 Gender Distribution of Respondents.

Figure 3 indicates that out of 94 nurse respondents, a little more than half (51%, 48) had Diploma qualification in Nursing, more than a quarter, (29%, 27) had advanced Diploma qualification, (16%, 15) had Certificates in Nursing while the minority (4%, 4) held Bachelor's Degree in Nursing

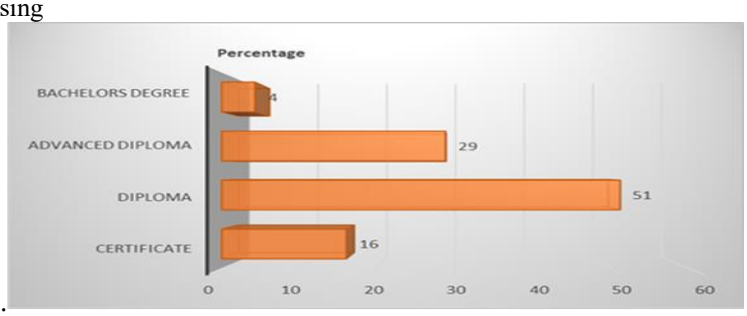

Figure 3 Professional Qualification.

Figure 4 indicates duration of work experience, with the most frequent (24) being 3 years work duration. The mean years of 5.27 and standard deviation of 4.429. The distribution was skewed to the left with data ranging between 1 and 20.

In addition, figure 5 shows duration of work as a categorical variable using the concept from Benner's Novice to Expert theory [12] where those who have worked in under five clinic for a year or less were categorised as Novices (12%,11), Above 1 year -2 years as advanced beginners (14%,13), above 2-3 years as competent nurses (26%, 24), Above 3-5 years as Proficient (11%, 10) and above 5 years as Experts (38%, 36).

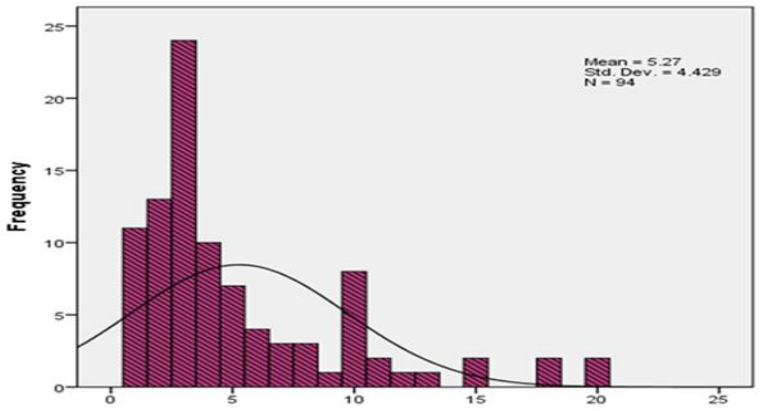

Figure 4: Duration of work (Discrete).

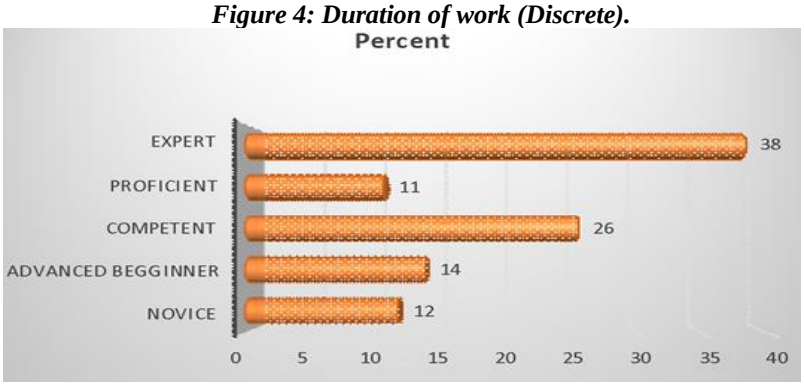

Figure 5: Duration of work (Categorical).

4.2.2 Section B: Adherence.

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 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.

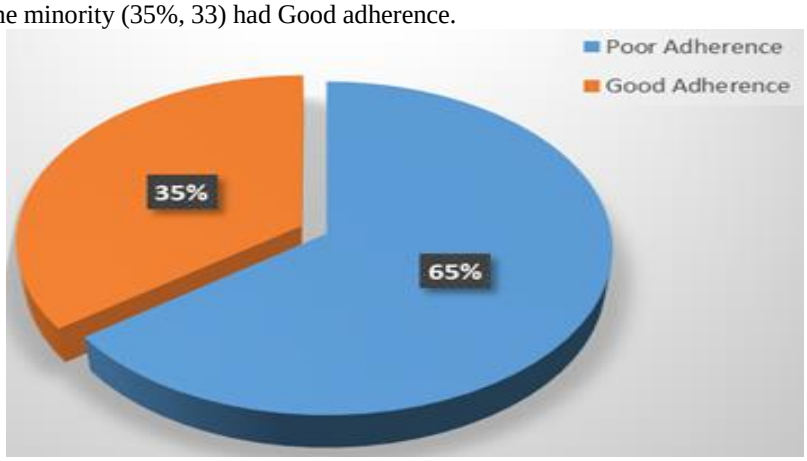

Figure 6: Adherence of respondents to MDVP

4.2.3 Section C: Knowledge.

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 7 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.

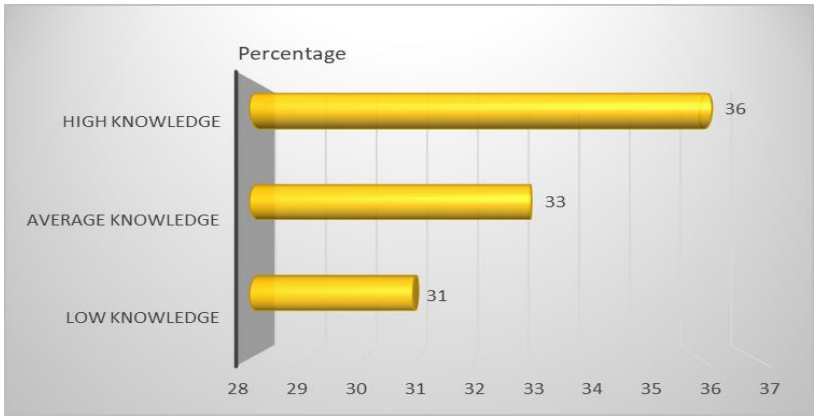

Figure 7: Knowledge of respondents on MDVP

4.2.4 Section D: Attitude.

This section had 5 attitude questions using a 5 point Likert like 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. Furthermore, the researcher transformed all the questions into one variable (attitude) and the respondents who had the median score of 1-2 were categorized as having negative attitude, those with the median score of 3 had a Neutral attitude and those with the median score of 4-5 were classified as having Positive attitude.

Table 2 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, they encourage other nurses to adhere to MDVP and that MDVP reduces vaccine wastage rate and contamination.

Table 2; Respondents Attitude towards MDVP

	Mean	**Median**	**Mode**	**Verdict**	**Std. Deviation**
I have never read through the EPI manual or Multi Dose Vial Policy	2.24	2.00	2	Disagree	1.250
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".	3.68	4.00	4	Agree	.997
I always adhere to Multi Dose Vial Policy.	3.68	4.00	4	Agree	1.157
I do encourage other nurses to adhere to Multi Dose Vial Policy.	3.72	4.00	4[a]	Agree	1.282
Multi Dose Vial Policy reduces vaccine wasted rate and contamination.	3.76	4.00	4	Agree	1.133

In addition figure 10 illustrates attitude as one variable in terms of percentage, out of 94 nurse respondents. More than half (60%, 56) had positive attitude towards MDVP, 30% (28) had a neutral attitude and the minority (11%, 10) had negative attitude towards MDVP.

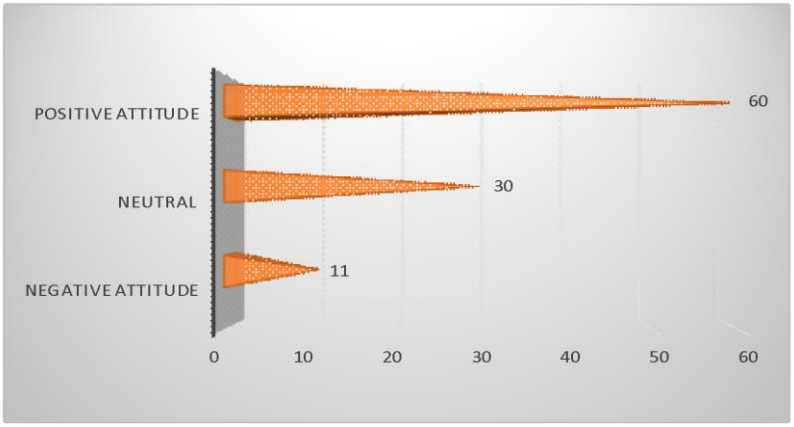

Figure 8: Respondents Attitude towards MDVP (categorical).

4.2.5 Section E: Mentorship

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 3 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.

Table 3; Mentorship Visits

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

4.2.6 Section F: Influence.

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. Furthermore, the researcher transformed all the questions 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.

Table 4 shows the overall response to each questions on influence from 94 nurse respondents, using the median as the measure of central tendency; half (50%, 47) of respondents agreed to spending much time with workmates at under five clinic and being encouraged to strictly adhere to MDVP by other nurses, while the other half (50%, 47) did neither agree or disagree to being discouraged by other nurses to abide to MDVP. Another half (50%,47) agreed to competing with work mates for best performance, discussing immunisation procedures and guidelines during some spare time at work, having been assisted to improve the skill in immunisation and adhering to MDVP and their work mates always able to solve challenging situations in under five clinic.

Table 4; Influence from experienced nurses

	Mean	Median	Mode	Final verdict	Std. Deviation
I spend much time with my workmates at under-five clinic.	3.54	4.00	4	Agree	1.284
My fellow nurses encourage me to strictly abide to MDVP.	3.51	4.00	4	Agree	1.162
My fellow nurses discourage me to abide to MDVP	3.18	3.00	2	Neutral	1.311
I and my workmates compete for the best performance.	3.30	4.00	4	Agree	1.234
We discuss immunisation procedures and guidelines during some spare time at work.	3.53	4.00	4	Agree	1.189
My workmates have assisted me to improve my skill on immunisation and adhere to Multi Dose Vial Policy.	3.57	4.00	4	Agree	1.324
My workmates always solve challenging situations in under-five clinics.	3.40	4.00	4	Agree	1.370

In addition figure 9 illustrates Influence as one variable 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.

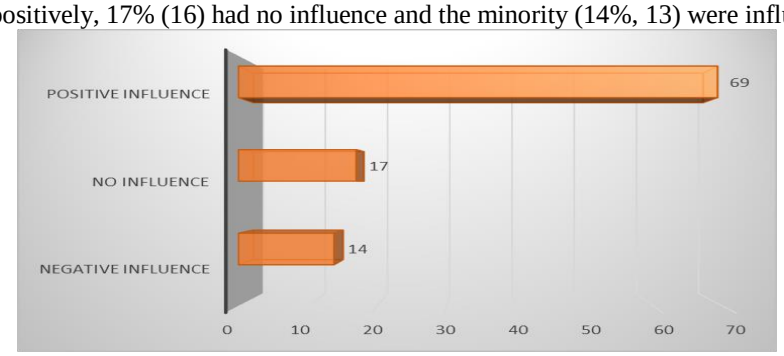

Figure 9: Influence from experienced nurses (categorical)

4.2.7 Section G: 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.

Furthermore, the researcher transformed all the questions into one variable (Work Experience) and the 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.

Table 5 shows the overall response to each questions on work experience from 94 nurse respondents, using the median; half (50%, 47) of 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. The other half (50%, 47) did neither agree nor disagree to their work environment being distractive and non-motivating while half (50%, 47) agreed to presence of strong feeling of team work and participation in line with immunisation at their work places.

Table 5: Respondents Work experience.

	Mean	Median	Mode	Final Verdict	Std. Deviation
My role in under five clinic is very clear.	4.03	4.00	4	Agree	1.140
I'm inspired by the immunisation goals of the under-five clinic at my facility.	3.54	4.00	4	Agree	1.152
I always receive constructive feedback from my manager.	3.43	4.00	4	Agree	1.214
My work environment is distractive and not motivating?	3.19	3.00	2[a]	Neutral	1.289
There is a strong feeling of team work and participation in line with immunisation at my work place?	3.63	4.00	4	Agree	1.278

In addition figure 10 below 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.

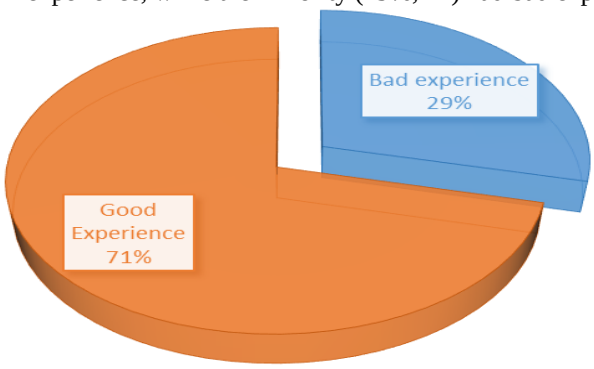

Figure 10: Respondents Work Experience (categorical)

4.3 INFERENTIAL ANALYSIS

Relationship between adherence to multi dose vial policy and associated factors.

This section presents results of the Chi square test of independence between the categorical dependent variable (adherence) verses categorical independent variables like; Gender, Professional qualification, knowledge, attitude, mentorship, influence and work experience, however, for professional qualification and influence from experienced nurses, chi square assumptions were violated, therefore, Fisher exact has been reported.

For the relationship between categorical dependent variable (adherence) and discrete independent variables like age and Duration of work, binary Logistic regression results have been reported.

This section helped the researcher to either reject or accept the null hypotheses for this study which states that;

1. There is no relationship between Demographic variables and nurses' adherence to MDVP in Lufwanyama district.
2. There is no relationship between environmental factors and nurses' adherence to MDVP in Lufwanyama district.
3. There is no association between personal factors and nurses' adherence to MDVP in Lufwanyama district.
4. There is no relationship between behavioural factors and nurses' adherence to MDVP in Lufwanyama district.

4.3.1 Association between Demographic variables and adherence to MDVP.

Binary logistic regression was performed to assess the impact of a set of predictor variables on the odds that respondents would report good adherence to MDVP. The model contained two independent variables (age of respondents and duration of work). The full model containing all predictors was statistically insignificant, χ^2 (2, N= 94) = 1.795, p ≥ .005. The model as a whole correctly classified 62.8% of cases. Table 9 shows that none of the two demographic variables made a unique statistically significant contribution to the model.

Table 9: Association between Adherence verses age and duration of work.

	B	S.E.	Wald	f	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Age	.0	.0	1.		.	1.0	.943	1.228

	73	68	174		279	76		
Duration of work	-.037	.084	.196		.658	.963	.816	1.137
Constant	-2.650	1.732	2.342		.126	.071		

Table 10 shows the results of the chi square which was done to test for the association between the dichotomous dependent variable (adherence) and the categorical demographic variables (profession qualification and Gender). The results indicated no significant association between Adherence and professional qualification, X2 (1, N =94) p = 0.338. On the other hand the results indicated a significant association between gender and adherence to MDVP: X2(1, n =94) p = 0.017, phi = 0.246.

In reference to the above results, one (Gender) of the four demographic variables showed an association with the dependent variable (adherence). Therefore, the researcher has made a decision to reject the null hypothesis which states that; there is no relationship between Demographic variables and nurses' adherence to MDVP in Lufwanyama district. Despite the results of most of the demographic variables not being statistically significant, one has shown a relationship with the dependent variable, thereby, rendering the null hypothesis not to be true.

Table 10: Adherence verses Gender and Professional Qualification

		Level of Adherence		**X^2(df)**	**P-Value**	**Phi**
		Poor Adherence	Good Adherence			
Professional Qualification	Certificate	7	8	b	0.338	
	Diploma	31	17			
	Advanced Diploma	20	7			
	Bachelor's Degree	3	1			
Gender of Respondent	Male	26	6	1	0.017	0.246
	Female	35	27			

b. Fisher exact computed because of low expected counts.

4.3.2 Association between personal factors and nurses' adherence to MDVP.

Table 11 shows the results of the chi square which was done to test the association between the dichotomous dependent variable (adherence) and the categorical independent variables (Knowledge and Attitude). The results indicated a significant association between Adherence with both Knowledge and attitude: Knowledge X2 (2, N =94) p = 0.00, phi = 0.567; Attitude X2(2, N =94) p = 0.05, phi = 0.337.

The above results have revealed a relationship between the dependent variable (adherence) and Personal factors (attitude and Knowledge). Therefore, the researcher has made a decision to reject the null hypothesis which states that: There is no association between personal factors and nurses' adherence to MDVP in Lufwanyama district.

Table 11: Adherence verses attitude and Knowledge.

		Level of Adherence		**X^2(df)**	**P-Value**	**Phi**
		Poor Adherence	Good Adherence			
Knowledge	Low Knowledge	23	6	2	0.00	0.567
	Average Knowledge	28	13			
	High Knowledge	10	24			
Attitude	Negative	9	1	2	0.05	0.337
	Neutral	23	5			
	Positive	29	27			

4.3.3 Association between Environmental factors and nurses' adherence to MDVP.

Table 12 shows the results of the chi square which was done to test the association between the dichotomous dependent variable (adherence) and the categorical independent variables (Mentorship and Influence). The results indicated a non-significant association between adherence with both Mentorship and Influence: Mentorship X2 (2, N =94) p = 0.274, phi = 0.166; Influence X2(2, N =94) p = 0.140.

The above results have revealed that there is no relationship between the dependent variable (adherence) and Environmental factors (Mentorship and Influence). Therefore, the researcher has made a decision to accept the null hypothesis which states that: There is no relationship between environmental factors and nurses' adherence to MDVP in Lufwanyama district.

Table 12: Adherence verses mentorship and Influence.

Level of Adherence		**X^2(df)**	**P-Value**	**Phi**
Poor Adherence	Good Adherence			

Mentorship	No mentorship	33	13	2	0.274	0.166
	Inadequate mentorship	16	9			
	Adequate mentorship	12	11			
Influence	Negative Influence	11	2	b	0.140	
	No Influence	12	4			
	Positive Influence	38	27			

b. Fisher exact computed because of low expected counts.

4.3.4 Association between Behavioural factors and nurses' adherence to MDVP.

Table 13 shows the results of the chi square which was done to test the association between the dichotomous dependent variable (adherence) and the categorical independent variable (work experience). The results indicated a significant association between adherence and work experience, X2 (1, N =94) p = 0.02, phi = 0.319.

Table 13: Adherence verses work experience.

		Level of Adherence		X^2(df)	P-Value	Phi
		Poor Adherence	Good Adherence			
Work Experience	Bad Experience	24	3	1	0.02	0.319
	Good Experience	37	30			

The results above reveal that there is a relationship between the dependent variable (adherence) and Behavioural factors (Work experience). Therefore, the researcher has made a decision **to reject** the null hypothesis which states that: There is no relationship between behavioural factors and nurses' adherence to MDVP in Lufwanyama district.

DISCUSSION

Level of adherence to MDVP among nurses in lufwanyama district.

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 the vaccines are bound to lose their potency and thus promoting contamination and bacteria growth. 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. While, (27%, 25) of the respondents revealed that they were keeping vaccines without preservatives for more than 6 hours after opening sometimes for up to 2 weeks thus making them good media for growth and multiplication of microorganisms. Thereby rendering the vaccines to be ineffective and thus posing a great risk of infections to the under five year old children.

Basing on these results it is evident that poor adherence to MDVP resulted in the increase in magnitude in the wastage rates of vaccines in Lufwanyama district of Zambia. 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. 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 [13] who postulated that Quality-of-care improvement and prevention of practice errors is dependent on nurses' adherence to the principles of patient safety.

Environmental factors that influence nurses' adherence to MDVP in lufwanyama district.

The environmental factors that were considered in this study were mentorship and influence from experienced nurses. The results revealed that there was no statistical relationship between nurses adherence to multi doses vial policy and Mentorship (P = 0.274) and Influence (P = 0.140) therefore, the researcher has considered what has been revealed under this objective in this study as occurring by chance.

A little less than half (48.9%, 46) of the study respondents had no mentorship, a little more than a quarter (26.6%, 25) of the study respondents had inadequate mentorship while almost a (24.5%, 23) of the study respondents had adequate mentorship. These study findings demonstrates that inadequate mentorship could be a barrier to nurses adhering to MDVP in Lufwanyama district in Zambia, 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. 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. This is supported by Ericksen [14] who postulated 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 life, providing guidance, perspective and advice. Mentors also keep the mentees in check thereby adhering to guidelines that are derived from policies [8] like MDVP and the end result is quality delivery of health services to the health care recipients.

On the other hand 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, most of the respondents agreed to spending 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.

Personal factors that influence nurses' adherence to MDVP in lufwanyama district.

Basing on the Social Cognitive Theoretical Model that guided this study, the personal factors that were considered were knowledge and attitude. The study revealed a statistical relationships between adherence and knowledge (P< = 0.00) and attitude (P< = 0.05), therefore, this study has established that knowledge and Attitude are personal factors that influence adherence of nurses to MDVP. However, the knowledge levels of nurses on MDVP were not impressive as only 36% (34) out of 94 nurse respondents had high level knowledge on MDVP, while 33% (31) had medium level knowledge and 31% (29) had low level knowledge. 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 Suman at al [15] who examined knowledge using a cross-sectional study to assess knowledge of mothers/ caregivers and health care workers regarding Pentavalent vaccine and side effects of the vaccine. The study revealed lack of knowledge about the serious Adverse Effects Following Immunisation (AEFI), inability to communicate with the clients and not adhering to open vial policy increased the chances of adverse events that can impact on vaccination coverage.

On the contrary, this study has revealed good attitude towards MDVP among nurses in Lufwanyama district, Zambia. Out of 94 nurse respondents, more than half (60%, 56) of the study respondents had positive attitude towards MDVP while 30% (28) had a neutral attitude and 11% (10) had negative attitude towards MDVP; this finding can be attributed to the fact that lacking knowledge on the policy and its effects can cause someone to have neutral or negative attitude towards the policy. 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 and Kahissay[16] 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 satisfactory knowledge and positive attitude.

Behavioural factors that influence nurses' adherence to MDVP in health facilities of lufwanyama district.

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 factor that influenced adherence of nurses to MDVP in Lufwanyama district. Out of 94 nurse respondents 71% (67) had good work experience, while 29% (27) had bad 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. Work experience is very vital in ensuring that nurses adhere to guidelines and policies like MDVP, according to Jansson et al [17] Work experience and education have been shown to significantly influence the development of competency of nurses.

The results from this study are similar to Rizany and Handayani [18] Systematic review study on Factors that affect the development of nurses' competencies. The study revealed that Competence development is a continuous process of improving knowledge, attitudes and skills, and is influenced by a myriad of factors one of them being work experience.

CONCLUSION

The study has established that the level of adherence to MDVP among nurses in Lufwanyama district is low (35%, 33), Very few (36%, 34) respondents had high level knowledge on MDVP, and the research has revealed that half (50%, 47) of the study respondents had inadequate mentorship. The study has further identified factors that influenced nurses' adherence to MDVP in Lufwanyama district, as being; Gender, knowledge, attitude and work experience.

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