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Original Article

Technological Factors Influencing the Quality of Data for the Voluntary Medical Male Circumcision Program in Selected Health Facilities in Siaya County, Kenya

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Data Quality Audits, Performance, health services, Voluntary Medical Male Circumcision, Kenya Health Information System.

ABSTRACT

The voluntary medical male circumcision (VMMC) program has been going on since 2008 with limited studies on the quality of data which is defined as data's fitness to serve its intended purpose. The study sought to assess technological factors influencing the quality of VMMC program data in Siaya County in terms of data timeliness, accuracy, and completeness. Completeness is measured by describing whether a value for a given data element from a facility was available in the information system. Timeliness is measured by the date when data was submitted to the information system compared to the expected submission date. Accuracy is measured by recorded data in Kenya Health Information System (KHIS) with data collected from facility registers. Out of 224 health facilities sampled, 202 responded (90.1% response rate). Questionnaires and Records checklists were administered online to respondents, and Key informant interviews were done with the County team. Statistical Package for Social Sciences (SPSS) analysed quantitative data using measures of central tendencies and measures of dispersion. Pearson chi-square determined associations at a 95% confidence interval and P-value >=0.05. Data Quality Index (DQI) was calculated by aggregating all scores for timelines, accuracy, and completeness. Good data scored 1=Yes across the three variables, and poor data scored a 0- No for either of the three. Using DQI, 29.7% had good data quality. The proportion of the respondents who agreed that staff are trained in Electronic Medical Records (EMR) System (64.2%) was significantly associated with good data quality than those who did not ($\chi 2$ =9.10, df=1, p-value=0.01). Key informants reported that staff are trained on VMMC indicators through on-job training (OJT). In conclusion, EMR ensures that all the data in the KHIS is used for planning and decision-making at County and National levels and recommends that health records officers are trained effectively to improve reporting.

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INTRODUCTION

Globally, World Health Organization (WHO) recommended Voluntary Medical Male Circumcision (VMMC) as an HIV prevention option for men based on evidence showing a reduction in HIV acquisition of 50% to 60%. (WHO, 2021). VMMC has been implemented in Kenya since 2008 (Odoyo-June et al., 2021). Siaya County is a non-circumcising county, and thus non-governmental organisations work closely with the Ministry of Health to support the implementation of the VMMC program across the health facilities in Siaya County. HIV Estimates 2018 report showed a high HIV prevalence of 21.1% in Siaya (Ministry of Health Kenya National AIDS and STI Control Programs, 2018). Kenya Demographic Health Survey (KDHS, 2015) also reported Siaya County had low MC rates, at 56%. According to Kenya Health Information System (KHIS, the number of circumcisions done from 2008 to June 2019 was 299,261. The reporting rates in KHIS in terms of completeness, timeliness, and accuracy were below the average of 80%, and limited investigation has been done on the quality of data.

The Sustainable Development Goal (SDG) 3 on good health and well-being, data quality is essential in ensuring health and well-being for all and the commitment to end the epidemics of AIDS, tuberculosis, malaria, and other communicable diseases by 2030. For the improvement of health, Universal health care (UHC) data is important in achieving data quality (Dowou et al., 2023). The results from the study would inform the Ministry of Health and National AIDs and STI Control Program (NASCOP) in the allocation of resources for the VMMC program and national support. To the donors, the results would affect decision-making, especially for funding support. At the county, the facilities that routinely provide the VMMC services would have improved reporting mechanisms to the national level to help in planning and county allocation of funds and resources. The results would be used in national surveys and research that affect the VMMC program, thus improving the male circumcision service provision at the health facilities.

The choice of Siaya County was justified by the fact that there is limited study or information on the quality of data among the health facilities that provide VMMC in the county despite having donor support and success stories on minimum adverse events. Three dimensions for data quality, i.e., completeness, timeliness and accuracy, were selected in the study as the national VMMC program lays emphasis on them as key priority areas of data quality. In addition, during the regular data quality audits, these attributes are directly measured and linked to the data available on the national health information system, KHIS, which is used to track the VMMC program performance at county and national levels.

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TECHNOLOGICAL FACTORS INFLUENCING DATA QUALITY

These are the technology and expertise used in the creation, administration, and improvement of health information processes. Efficient and effective HIS is essential to both the healthcare system and to the people's health by providing a system for policy planning. According to a study done in Kenya, technological factors like system design, knowledge, reporting tools, the complexity of the HMIS and knowledge affect data quality (Oreni et al., 2021)

METHODS & MATERIALS

Data Collection

The study adopted a facility-based descriptive cross-sectional survey research design. The study population were all the health facilities in Siaya County. The respondents in each facility were the health records and information officer(s) or the person responsible for VMMC reporting. A structured questionnaire with a 5 Likert scale containing questions structured to accommodate closed-ended questions was developed. The Likert scales ranged from "Strongly Disagree" to "Strongly Agree" to enable the researcher to obtain information on fixed issues. The lowest was 1 strongly disagree and the highest 5- strongly agree. The questionnaires were collected electronically using the Open Data Tool Kit (ODK), then verified, automatically coded, and tallied according to the research objectives.

The key informant interview guide was a set of open-ended questions, with the first section on the socio-demographic information of the respondents. These questions were developed by the researcher and from previous studies on VMMC.

The records review checklist was administered to the facility health records and information officer or the person responsible for reporting at the facility. The checklist was developed to address the data quality in terms of accuracy, completeness and timeliness of the total number of circumcisions reported in the national KHIS. The checklist was looking at one indicator; the number of clients circumcised. The number in the source documents (client records forms and minor theatre register) was compared with what was reported in the MOH 731 and the KHIS for the past 1 year (2019). For timeliness, the reporting dates in each month were confirmed using the reporting rates per month in KHIS, i.e. the number of reports done before the reporting deadline in the system against the expected number of reports for that month. This checklist was adopted from the national RDQA tool by MEASURE evaluation. Following the pre-test, a Cronbach's alpha reliability coefficient of 0.85 was established, indicating that the questionnaire was reliable.

Data Analysis

Data analysis is defined as the process of ordering and restructuring data from the field in order to grasp the overall connotation and interpret it to derive insights as presented by research questions to illustrate the issues and data into smaller fragments that make sense (Bhat, 2023). The responses in the questionnaires were interpreted for analysis based on the fundamental assumptions of the Likert scale of 1 – 5, where 5=Strongly Agree, 4= Agree, 3= Not Sure, 2= Disagree and 1=Strongly Disagree. The returned questionnaires formed the basis for the analysis presented in this chapter. The questionnaires were collected electronically using ODK, then verified, automatically coded, and tallied according to the research objectives. The questions were thereafter summarised into answers with a scale 1-2 as Disagree and 4-5 as Agree. Data Quality Index was calculated by aggregating all the scores for timeliness, accuracy, and completeness. For good data, the response was 1=Yes across the 3 data quality aspects. For poor data, the response was 0 = No for either of the 3 data quality aspects. A study by Perumal also used DQI to measure the quality of anthropometric data between surveys that affect population estimates for malnutrition.(Perumal et al., 2020)

This was later analysed using SPSS (Statistical Package for Social Sciences) version 25. Data was

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summarised for descriptive statistics, measures of central tendencies (mode, mean, median) and measures of dispersion (standard deviation and range). Inferential statistics, i.e., Pearson chi-square, was used to determine the associations at a 95% confidence interval and P-value of >=0.05 of the data quality index and the technological factors. Graphs and tables were generated to show the results of the analysis.

Logistical and Ethical Considerations

Ethical clearance was sought from Kenyatta University graduate school, Kenyatta University Ethics and Review Committee (KUERC), National Commission for Science, Technology, and Innovation (NACOSTI) and a clearance letter from the Siaya County research department. All the respondents were asked for their consent before participating in the study. The respondents were also briefed on the purpose of the study and assured of anonymity.

RESULTS

Out of the 224 sampled health facilities, respondents from only 202 facilities were able to respond, thus a response rate of 90.1%. This was because the facilities were VMMC outreach facilities, and they only provided the VMMC services on a need basis, whereby a team from another facility came to provide the services and report.

Socio-Demographic Characteristics of the Respondents

The majority of the respondents were male at 53.0%, while females were 47.0%. Most of the respondents were aged between 30-39 years at 46.0%. The cadres of the respondent varied, with the majority of them being clinicians, with a representation of 29.7%. The majority of the respondents had a college Diploma education (73.8%). Most of the respondents had worked at the health facility between 1-5 years, with a representation of 89.1%..

Table 1: Socio-Demographic characteristics of the respondents

Variable	Categories	Frequency (n)	Percent (%)
Gender	Female	95	47.0
	Male	107	53.0
	Total	202	100.0
Age	20- 29 years	68	33.7
	30-39 years	93	46.0
	40-49 years	37	18.3
	50-59 years	3	1.5
	60 years and above	1	0.5
	Total	202	100.0
Cadres	Clinician	60	29.7
	Medical Doctors	20	9.9
	Health Records Officers	34	16.8
	Nursing Officers	36	17.8
	Other (HTS Counsellors, data clerks)	52	25.7
	Total	202	100.0
Education Level	College Diploma	149	73.8
	High School certificate	6	3.0
	Bachelor's Degree	41	20.3
	Master's degree	6	3.0
	Total	202	100.0
Length of stay at the facility	1 - 5 years	180	89.1
	6-10 years	20	9.9
	11-15 years	2	1.0
	Total	202	100.0

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Data Quality Dimensions

The three constructs (Accuracy, Timeliness and Completeness) that were used to measure data quality for the VMC program were analysed, and the results showed that less than half of the facilities (44.1%) had good data in terms of accuracy; 77.2% of the facilities had timely data, and 80.2% of facilities had complete data.

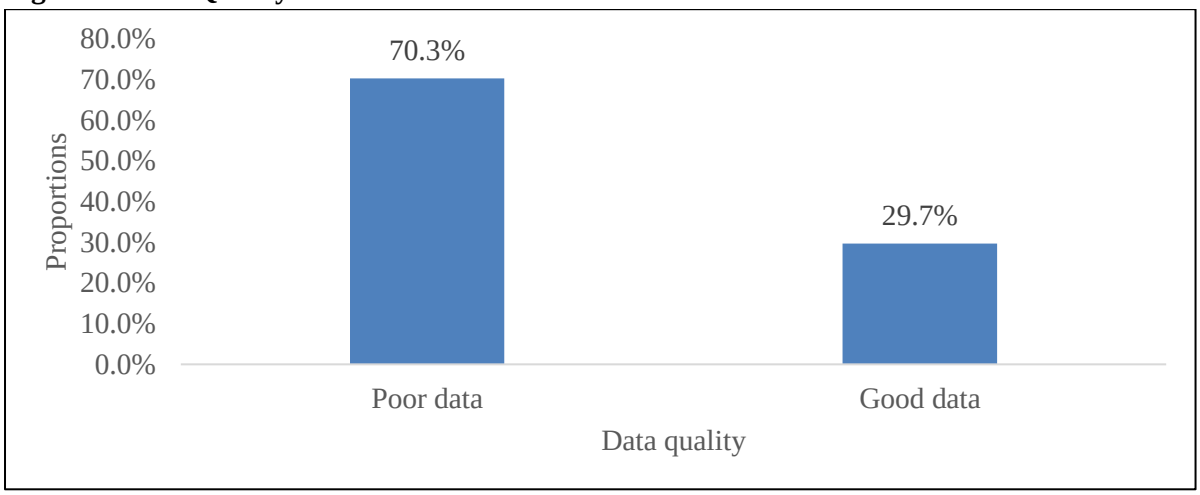
Table 2: Data Quality Dimensions

Data Quality	Good =1 (N=202)		Poor=0 (N=202)	
	f	%	f	%
Accuracy	89	44.1	113	55.9
Timeliness	156	77.2	46	22.8
Completeness	162	80.2	40	19.8

Data Quality Index

The Data Quality constructs were aggregated into an index. A facility was declared to have good data quality if all three constructs were achieved and poor data quality if any of the constructs was not achieved. 29.7% of the 202 facilities had good data quality, while 70.3% had poor data quality.

Figure 1: Data Quality Index



Socio-demographics Associated with Data Quality in the VMMC program

The level of education ($\chi 2$=5.25, df=3, p-value=0.02), cadres ($\chi 2$=7.22, df=4, p-value=0.01) and length of stay at the health facility ($\chi 2$=6.48, df=2, p-value=0.04) were significantly associated with good data. (see *Table 3*)

Technological Factors Influencing the Quality of Data for the VMMC Program

Most of the technological factors were not significantly associated with data quality except one factor –staff are trained on the national EMR system. The proportion of the respondents who agreed that staff are trained on the national EMR System (64.2%) was significantly associated with good data quality than those who did not ($\chi 2$=9.10, df=1, p-value=0.001) (see *Table 4*)

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Table 3: Socio demographics associated with data quality for the VMMC program

Socio-Demographics		Data Quality Index				χ2	df	P-Value
		Poor data		Good data				
		N	%	N	%			
Gender	Female	53	55.8	42	44.2	0.01	1	0.93
	Male	59	55.1	48	44.9			
Age	20- 29 Years	41	60.3	27	39.7	3.40	4	0.49
	30-39 Years	52	55.9	41	44.1			
	40-49 Years	17	45.9	20	54.1			
	50-59 Years	1	33.3	2	66.7			
	60 years and Above	1	100.0	0	0.0			
Level of Education	College Diploma	88	59.1	61	40.0	5.25	3	0.02*
	High School certificate	3	50.0	3	50.0			
	Bachelor's Degree	20	48.8	21	51.2			
	Master's degree	1	16.7	5	83.3			
Cadres	Clinician	38	63.3	22	36.7	7.22	4	0.01*
	Medical doctor	7	35.0	13	65.0			
	Health Records Officer	22	64.7	12	35.3			
	Nursing Officer	20	55.6	16	44.4			
	Other (HTS counsellors, data clerks)	25	48.1	27	51.9			
Length of stay at the facility	1-5Years	105	58.3	75	41.7	6.48	2	0.04*
	6-10Years	7	35.0	13	65.0			
	11-15Years	0	0.0	2	100.0			

Table 4: Technological factors associated with data quality for the VMMC program

Technological factors		Data quality index				χ2	Df	P-Value
		Poor data		Good data				
		n	%	n	%			
Data collection is done electronically at the facility level	Agree	30	55.6	24	44.4	3.61	1	0.05
	Disagree	60	40.5	88	59.5			
Data analysis is done electronically at the facility level	Agree	59	41.5	83	58.5	1.75	1	0.19
	Disagree	31	51.7	29	48.3			
Staff are trained on the national EMR system	Agree	43	35.8	77	64.2	9.10	1	0.01*
	Disagree	47	57.3	35	42.7			
Staff are aware of existing EMRs on VMMC	Agree	58	41.1	83	58.9	2.21	1	0.14
	Disagree	32	52.5%	29	47.5			

DISCUSSION

The study established that the gender representation was fairly balanced with male respondents at 53.0% while females were 47.0%. This far, there was gender equity in line with Kenya's constitutional provision, which stipulates that no gender should exceed a third in group composition (Hailu et al., 2023). The study also showed that most of the respondents were aged between 30-39 years at 46.0%. The representation of the cadres of the respondents was in line with those involved in data management for VMMC within Siaya County, i.e., Clinicians were 29.7%, nursing officers 17.8%, and Health Records Officers 16.8%. According to the VMMC strategy in Kenya (NASCOP-Kenya, 2015), the Clinicians are in charge of the actual circumcision of the clients and take the primary role in data entry at the facility level. Depending on the type of facility, data management is usually in the hands of different people; for example, the Health Centres, Sub County, and County Hospitals may have a dedicated health records officer in charge of data management.

However, at dispensaries and some health facilities, the data management role is usually

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taken by different people, such as the facility in charge and nursing officers. The data collection thus did have a varied representation and can therefore inform the factors influencing data quality for VMMC. This was statistically associated with good data quality ($\chi2$=7.22, df=4, p-value=0.01). This is consistent with a study conducted in Uganda that shows the level of education affects the VMMC service provision (Nanteza et al., 2020). This study also revealed that the majority of the health providers had attained a college diploma education with a representation of 73.8% and with 20.3% having a university bachelor's degree. This was significantly associated with good data quality ($\chi2$=5.25, df=3, p-value=0.02). This study showed that most of the respondents had worked at the health facility between 1-5 years with a representation of 89.1% which significantly associated with good data quality ($\chi2$=6.48, df=2, P-value=0.04) and thus provided valid opinions about VMMC service provision in Siaya county. This is consistent with a study conducted in Uganda showed that the level of stay at an institution influences performance(Kim et al., 2021).

The study established that on technological factors, the proportion of the respondents who agreed that staff are trained on the national EMR System (64.2%) was significantly associated with good data ($\chi2$ =9.10, df=1, p-value=0.01). This agrees with a study done by (Mashoufi et al., 2023) to evaluate the implementation of EMR for the management of non-communicable diseases that showed the EMR not only enhanced assurance of patient information safety but also supported decision-making and standard of care. This means that staff who are trained on using the national EMR system appropriately have minimal reporting errors and this results in good data that can be used for decision-making. The EMR has validation checks to ensure data that is entered is accurate and complete. The KHIS also has a reporting deadline of the 15th of every month, and thus, the reporting rates can show when data has not been submitted on time from the facilities.

The other technological factors on data collection done electronically at the facility level were not significantly associated with good data quality. A study by (Zeleke et al., 2021), however, revealed that electronic data collection was cost-effective in terms of fast data submission and onsite data prevention, challenges like technical difficulties, accidental data loss, device theft, security concerns, power surges, and internet connection problems still remained. This means that whether data is collected manually or electronically, it may necessarily affect the quality of data. The factor of data analysis done electronically at the facility level was also not significantly associated with good data quality. The study by Swaleh et al. (2023), on the contrary, showed that electronic data analysis can be powerful in establishing clinical practice patterns and informing data-driven quality improvement; however, other factors like inaccurate data entry, coding, collation, and information not captured correcting in the databases will affect the quality. The factor of staff awareness of existing EMRs on VMMC was not significantly associated with good data quality. In relation to a study conducted in Nigeria (Afolaranmi et al., 2020), healthcare workers should have good knowledge of EMRs so as to bring to light the existence of a good knowledge base in the light of future EMR implementation. This means that staff who are trained on using the national EMR system appropriately have minimal reporting errors, and this results in good data. However, these EMRs have different coding system and data protection act that limit sharing of any data. This means that as much as staff may be aware of other EMRs on VMMC, they may not necessarily use them due to the limitations, and this may not influence good data quality.

CONCLUSION AND RECOMMENDATION

The study found that good data quality for the VMMC data in Siaya was 29.7%. There is a significant association between those who have been trained and data quality of the data. The use of the EMR has ensured that all the data is in the national KHIS system, and this has helped in planning and decision-making both at the county

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and national levels. The study recommends that the health records officers should be provided with adequate training on all available EMRs and on the data protection act that limits sharing of any data. Staff trained appropriately on EMR systems to ensure the quality, completeness and timeliness of data collected. The county Department of Health should integrate VMMC Data Quality Assessments with other health services to improve the data quality. The national VMMC Program should ensure that all the indicators are included in the national EMR at the facilities and all staff are trained to improve reporting. Data collection and reporting should also be done electronically to improve efficiency. The Ministry of Health should use the data derived from different sources to inform national surveys such as Kenya Population-Based HIV Impact Assessment (KENPHIA) to inform policy and other programmatic decisions and also ensure facilities are well equipped to provide the VMMC service.

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