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Supportive Supervision of Routine Immunization Service Providers, A Means to Improve Vaccine Cold Chain Management Practices in Sokoto State

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Abstract

Integral to the Expanded Program on Immunization, is the Vaccine cold chain system which is used for storing, transporting, and distributing vaccines and other biologicals in recommended temperatures until they reach beneficiaries, a chain that must not be broken for vaccine to retain their potency. The success of national immunization programmes depends largely on effective logistics management of the vaccine cold chain system. This study has investigated the dependence of supportive supervision and attendance of Vaccine management-related training on the vaccine cold chain management practices of RI Service providers in Sokoto state. A descriptive cross-sectional study design was employed 230 equipped health facilities were sampled, and results were analyzed which revealed a positive correlation between supportive supervision and better vaccine management practices amongst routine immunization service providers, with a recommendation to the State Ministry of Health to invest in capacity building and refresher training of Routine immunization service providers and take ownership of supportive supervision.

Keywords*: Cold-Chain System, Logistics Management and Supportive-Supervision, Routine Immunization, Service Providers, Vaccine.*

Introduction

The World Health Assembly established the Expanded Programme on Immunization (EPI) in 1974, an action which marked a proactive commitment to extend the protective benefits of vaccination to all [1]. In the Expanded Program on Immunization, the cold chain system is used for storing, transporting, and distributing vaccines and other biologicals in recommended temperatures until they reach beneficiaries [2].

Vaccines are sensitive to light, heat, and freezing, and they must be kept in a cold chain system within the World Health Organization's (WHO) recommended temperature ranges [3,4]. All those who work with vaccines and diluents must be sufficiently aware of the temperature sensitivities and recommended storage temperatures for all vaccines on the national schedule [5]. A cold chain that meets specific temperature requirements is used to maintain vaccine quality. The cold chain is a network of storage and transportation links designed to keep vaccines at an acceptable temperature range from the manufacturer until they are delivered to users [6,7].

The term 'vaccine cold-chain' was adopted in 1976, and as of 2012, [8] confirmed that it

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has been replaced by ‘supply chain’. The name signals that the policy of exclusive distribution and storage of vaccines is evolving towards a strategy that encompasses both vaccines and medicines. Successful immunization programs are built on a functional, end-to-end supply chain and logistics system, its essential role is to ensure effective vaccine storage, handling, and stock management; rigorous temperature control system; and maintenance of adequate logistics management information system [9].

Globally, improvements in community health are largely attributable to the provision of quality Primary Health Care (PHC) services [10]. An efficient healthcare system is measured by the improved health outcomes of citizens by making quality services available to all through the bridging of the gap in the supply of quality PHC services [11,12]. Supportive supervision is often considered an initiative that fortifies the healthcare system, allowing healthcare personnel to provide high-quality services, and enhancing performance [13]. Therefore, the institutionalization of supportive supervision within the health system structure facilitates growth in the capacity of human resources for health by playing a crucial role as performance-enhancing techniques that contribute to quality improvement, especially in low-income settings [14]. Several studies have associated positive outcomes such as improved job performance, satisfaction and motivation with supportive supervision [15].

Supportive supervision according to [16] is a process of helping staff to improve their work performance continuously. It is carried out in a respectful and non-authoritarian way with a focus on using supervisory visits as an opportunity to improve the knowledge and skills of health staff. Supportive supervision encourages open, two-way communication, and building team approaches that facilitate problem-solving and it deal with technical issues, [17]. It focuses on monitoring performance towards goals, and using data for decision-making, and depends upon regular follow-up with staff to ensure that new tasks are being implemented correctly. Furthermore, supervisors need support and authority from the central to implement supervision or make changes to improve services at a health facility [18].

Traditionally, many countries have used an authoritarian, inspection or control approach to supervision. This approach is based on the thinking that health workers are unmotivated and need strong outside control to perform correctly [19]. However, it has been shown that a supportive approach, where supervisors and health workers work together to solve problems and improve performance, delivers improved results for the immunization programme [19].

Supportive supervision plays a key role in ensuring high-quality service delivery in community health worker (CHW) programs. It emphasizes regular and consistent interactions between CHWs and supervisors, constructive feedback, and joint problem-solving. Moreover, it is associated with increased motivation, better work engagement, higher levels of job satisfaction, and improved performance among CHWs [20].

There is a paucity of data on the theme of how supportive supervision influences the vaccine cold chain management practices of service providers and vaccine handlers, this study titled “Supportive Supervision of Routine Immunization Service Providers, a Means to Improve Vaccine Cold Chain Management Practices in Sokoto State” attempts to provide some light in this part of North-western Nigeria.

Methods

Study Area and Period

This study was conducted in Sokoto North, Sokoto South and Sokoto East Senatorial zones of Sokoto state. Sokoto State has twenty-three Local Government Areas (LGAs); all 23 LGAs were equally sampled

for uniformity and equity in data distribution. The study was carried out from May 2022 to October 2023.

Study Design

A descriptive cross-sectional study design was used in this research, where the facility-based, mixed self-reported and actual practice-evaluation cross-sectional study was conducted at only equipped primary health centers providing Routine Immunization services in Sokoto State.

Study Population and Sample Size

The study population for this study included Routine Immunization service providers who worked in equipped primary public health centres, clinics and dispensaries in Sokoto State. All EPI service providers who fulfilled the criteria were included.

10 equipped facilities were sampled per LGA in Sokoto State, this represented over 80% of all equipped facilities in the State; this therefore shows a good representation of the entire population of equipped facilities; Sokoto State has 23 LGAs, and 230 health facilities were sampled for this study.

Inclusion Criteria

All participants were above the age of 18, and they were Routine Immunization service providers in their designated health facilities that were equipped with cold chain equipment thus they could be healthcare professionals who worked in the EPI service provision system or in the vaccine and cold chain management systems.

Exclusion Criteria

Non-routine immunisation service providers or health workers in health facilities that were not equipped.

Ethical Approval and Participants' Consent

This research work was approved by the Department of Health Planning Research and Statistics, Sokoto State Ministry of Health, Sokoto; informed consent was administered to all respondents at the beginning of the interview. No participant was not exposed to harm at any point in time because of their participation. They were free to withdraw their participation during the interview. Confidentiality of collected information was kept and maintained.

Data Collection

A semi-structured questionnaire was developed and uploaded on Kobo collect two data collection methods were used to collect the data. Primary data was collected through face-to-face interviews using structured questionnaires. Secondly, the actual practices of vaccine and cold chain management at selected health facilities were evaluated by onsite observation of their management practices of cold chain, storage conditions, logistic information systems, and availability of necessary equipment and logistics.

Data Analysis

Trained enumerators collected data with the free Kobo collect mobile data kit, and data was exported to Excel for cleaning. Cleaned data was entered into SPSS (IBM SPSS Statistics 20, United States) and MS Excel for the analysis of the data which gave the descriptive statistics.

Independent Variables: Includes the demographic characteristics such as age, sex, educational status, Cadre of respondents, Years of experience as Health workers and RI Service providers, Familiarity with Vaccine Cold chain systems, Attendance of Vaccine management training

Outcome Variables: These include Possession of a functional fridge tag, Possession of a Temperature Monitoring Chart (TMC), Correct frequency of Recording on the Temperature Monitoring Chart, Documentation of Temperature Monitoring Charts, Analysis of the filled TMC for decision making, Documentation of vaccine

received and vaccine used, Analysis on vaccine utilization for decision making, Possession and display of Standard Operating Procedures on Vaccine cold chain management (VCCM), Possession and display of VCCM contingency plan, Conduct Routine Planned preventive maintenance CCEs; Chi-square test was then used to determine the inter-dependence of the variables the outcome variables and the independent variables.

Results

230 health facilities were sampled, and consequently, 230 Routine Immunization Service providers were interviewed and observed for their vaccine cold chain management practices. 19 vaccine cold chain management practices were assessed and the responses were scored according to World Health Organization, UNICEF and Effective Vaccine Management Assessment (EVMA) standards. Scores of 80% and above were considered "very good", 50 – 79% were considered "fair" while 49% and below were taken as poor (Figure 1 and Table 1). From Figure 1, it is evident that only 37% of the sampled health workers scored the desired mark, while the percentage of those who scored less than the acceptable mark is 21%.

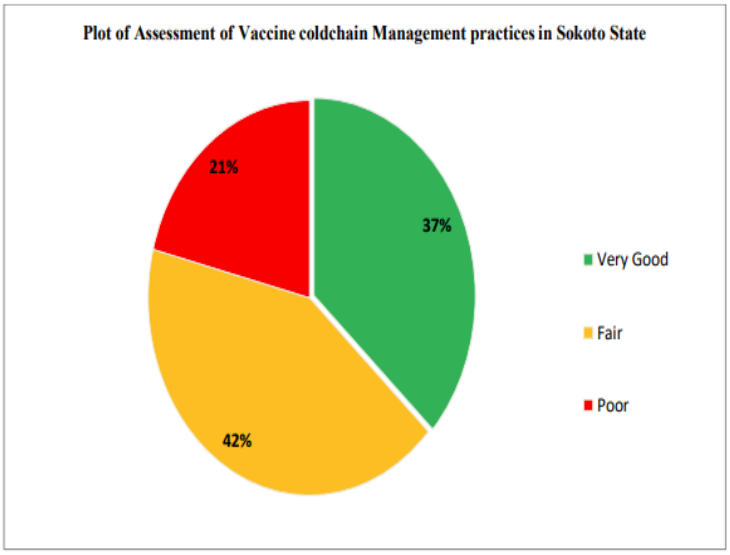

Figure 1. Plot of Assessment of Vaccine Cold Chain Knowledge and Management Practices of Respondents in Sokoto State

Table 1. Assessment of Knowledge of Vaccine and Cold Chain Management

Vaccine cold chain management practices	Total Sampled(n)	Correct	Incorrect	Percentage Correct (%)
1. Vaccine storage temperature at the health centre	230	190	40	83
2. Vaccine sensitivity to Heat	230	147	83	64
3. Storage of Heat sensitive vaccines	230	100	130	43
4. Vaccine sensitivity to Light	230	134	96	58
5. Storage of Light sensitive vaccines	230	90	140	39
6. Vaccine sensitivity to Freezing	230	135	95	59
7. Storage of Freeze sensitive vaccines	230	100	130	43
8. Knowledge of Vaccine Vial Monitor	230	215	15	93
9. Knowledge of Vaccine Vial Monitor Stages	230	208	22	90
10. Knowledge of Vaccine Vial Monitor Usable Stages	230	218	12	95

11. Knowledge of the Shake Test	230	203	27	88
12. Knowledge of How to conduct a Shake test	230	163	67	71
13. Knowledge on which vaccines is Shake test conducted upon	230	141	89	61
14. Knowledge of Monitoring and recording of Vaccine refrigerator's temperature	230	218	12	95
15. Knowledge of the FEFO principle	230	136	94	59
16. Practice of the FEFO principle	230	175	55	76
17. Knowledge of Multi-Dose Vial policy	230	191	39	83
18. Knowledge of which Multi-Dose Vial policy is implemented on	230	151	79	66
19. Knowledge of the advantages of the Multi-Dose Vial policy	230	40	190	17

Table 2 shows the Chi-square analysis to determine the relationship between Supportive supervision of Vaccine and Cold chain Management practices, and the correlation between the attendance of Vaccine Cold chain Management training and Planned Preventive CCE Management.

Table 2. Chi-square Analysis to Determine the Relationship between Supportive Supervision of Vaccines and Cold Chain Management Practices

Independent Variables	**X^2 value**	**P – value**	**Decision**
Supportive supervisory visits to RI service providers			
Possession of functional fridge tag	2.701	0.004	Significant
Possession of a Temperature Monitoring Chart (TMC)	2.933	0.018	Significant
Correct frequency of Recording on the Temperature Monitoring Chart	2.776	0.045	Significant
Documentation of Temperature Monitoring Charts	3.406	0.109	Not significant
Analysis of the filled TMC for decision-making	1.873	0.384	Not significant
Documentation of vaccine received and vaccine used	6.614	0.085	Not significant
Analysis of Vaccine utilization for Decision-making	2.746	0.031	Significant
Possession and display of Standard Operating Procedures on VCCM	6.183	0.056	Significant
Possession and display of the VCCM contingency plan	3.015	0.557	Not significant
Conduct Routine Planned preventive maintenance on CCEs	5.907	0.038	Significant
Attendance of Vaccine Cold Chain Management Training			
Conduct routine planned preventive maintenance of CCE	2.309	0.315	Not significant
Possession of a planned preventive maintenance logbook	4.169	0.012	Significant
Attendance of Planned Preventive Management Training			
Conduct routine planned preventive maintenance of CCE	10.285	0.006	Significant
Possession of a planned preventive maintenance logbook	11.660	0.003	Significant

Data on the frequency of supportive supervision was also determined, as well as the

sources for the supervision (Tables 3 and 4) and as represented in Figures 2 and 3 respectively.

Table 3. Last Supportive Supervisory Visit on Vaccine Cold-Chain Management

Last supportive supervisory visit on Vaccine Cold-chain Management							
Period in months	**2 m below**	**2 - 3m**	**4 - 6m**	**6m - 1yr**	**> 1yr**	**Never**	**Total data (n)**
	124	43	16	20	23	4	230
Percentage (%)	54	19	7	9	10	2	100

Table 4. Source of Supportive Supervisory Visit

Source of Supportive Supervisory Visit on Vaccine Cold-chain Management		
	Government	**Partners**
Total number of Visits	758	1180
Average	3.3	5.1

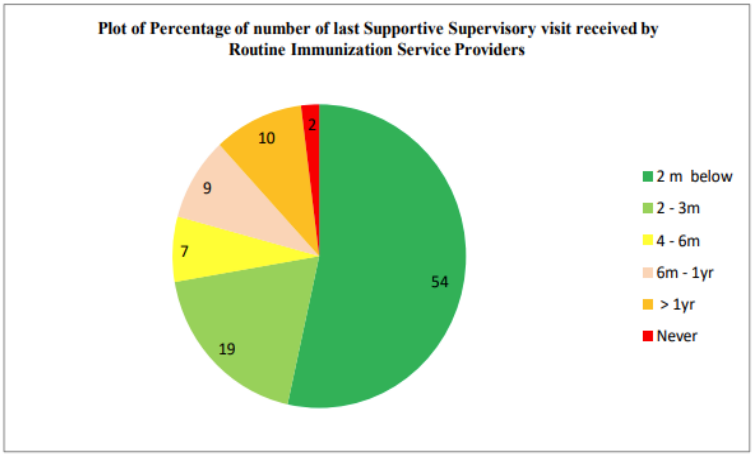

Figure 2. Plot of Percentage of Number of Last Supportive Supervisory Visits Received by Routine Immunization Service Providers

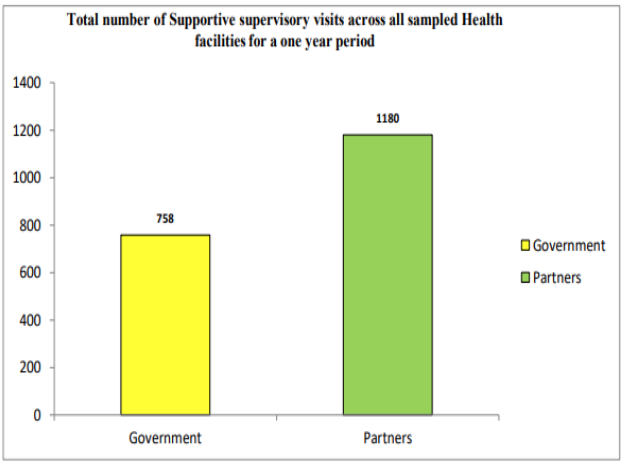

Figure 3. Total Number of Supportive Supervisory Visits Across All Sampled Health Facilities for One Year

Data for RI Service providers' Attendance of Vaccine Cold-chain related training were also collected for Attendance of Vaccine Cold-chain management training and Attendance of Planned Preventive management training (Table 5) and represented in Figure 4.

Table 5. Attendance of Vaccine Cold-Chain Related Training

Attendance of Vaccine Cold-chain-related training		
Attendance of at least one Vaccine Cold-chain management training		
	Yes	No
Total number of Visits	181	49
Percentage (%)	79	21
Attendance of at least one Planned Preventive management training		
Total number of Visits	179	51
Percentage (%)	78	22

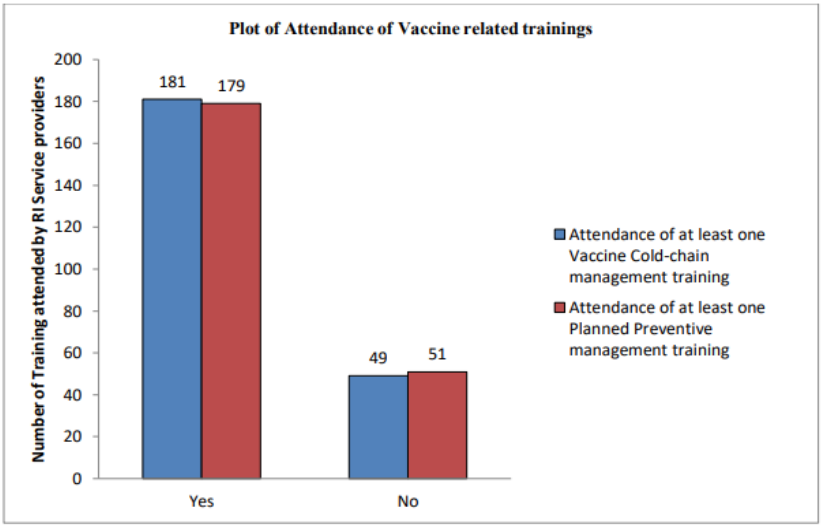

Figure 4. Plot of Attendance of Vaccine-Related Training

Discussion

Data collected shows that approximately 79% of respondents have attended the Vaccine-cold chain management training, while 78% of respondents have also attended the planned preventive management training, statistically, the two variables namely *Conduct of routine planned preventive maintenance of CCE and Possession of a planned preventive maintenance logbook*, have shown dependence on the Attendance of Vaccine Cold chain management training and Planned preventive management training. It, therefore, follows that RI Service providers who have attended these training are more likely to have better deposition of taking care of their cold chain equipment as well as having better vaccine Cold chain management practices. These findings are in concurrence with [21] where study participants with requisite training lead to better vaccine and cold chain management practices which include preventive management practices. Supportive supervisory visits on Vaccine cold chain management system to RI Service providers were determined for one year, this probes revealed that about 54% of RI Service providers have received supervisory visits within the last month as at the time of this study was carried out, while 10% of the RI Service providers have not received such supervisory visits for over a year, and 2% of them have never received supervisors. From the chi-square test conducted, It can be observed that out of the

ten variables analyzed for dependence only four did not show any relationship with the supportive supervision intervention, they include: *Documentation of TMC, Analysis of the filled TMC for decision making, Documentation of vaccine received and vaccine used,* and *Possession and display of VCCM contingency plan*. It therefore follows that RI service providers who received supportive supervision at their health facility are more likely to have good vaccine cold chain management practices; this is in resonance with [21] who opines that stakeholders and regulatory bodies are encouraged to support and provide continuous supervision of EPI service providers' actual Vaccine and cold chain management practices.

It can be observed that partners in Sokoto state provide the majority of the supportive supervisory visits, State is therefore enjoined to take the driver's seat and ownership, the more supportive supervision the better [22, 23] for the vaccine cold chain management system that will translate to better service delivery at the lowest level of the immunization supply chain.

Conclusion

In conclusion, this study sought to determine how supportive supervision influences Vaccine cold chain management practices amongst Routine Immunization Service providers in Sokoto State. The findings revealed a positive correlation between supportive supervision and better vaccine management practices amongst routine immunization service providers, with a recommendation that the State Ministry of Health invest in capacity building and refresher training of the routine immunization service providers and take ownership of supportive supervision.

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Conflict of Interests

Authors declared no conflict of interest.

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