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KNOWLEDGE AND ATTITUDE OF HEALTH STAFF TOWARDS SUPPLY CHAIN AND DRUG SUPPLY MANAGEMENT IN AKWA IBOM AND CROSS RIVER STATES

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ABSTRACT

Knowledge of supply chain and drug supply management is well established in developed countries and increasingly reported in developing settings; however, weaknesses in training, logistics systems, and institutional support continue to limit efficient health commodity management in Nigeria. This study assessed the knowledge and attitudes of healthcare staff toward supply chain and drug supply management in selected health facilities in Akwa Ibom and Cross River States. A descriptive cross-sectional survey was conducted among health professionals involved in supply chain management (SCM) using a structured self-administered questionnaire, and data were analyzed using descriptive statistics. Most respondents were female (62.0%). The majority were aged 18–30 years (45.1%), followed by 31–40 years (27.5%), 41–50 years (17.6%), and 51–60 years (9.8%). Younger respondents demonstrated significantly higher knowledge of SCM ($P < 0.05$). Pharmacists constituted the largest professional group and were more involved in supply chain activities than other professionals. Although 72.5% of respondents had heard of SCM, 74.0% reported no formal training. Overall, 60.8% demonstrated good knowledge of the logistics cycle, while 39.3% did not. All purchasing and supply officers and storekeepers (100%) had good logistics knowledge. In contrast, 44.4% of pharmacists, 25.0% of pharmacy technicians, 50.0% of nurses, and 50.0% of medical laboratory scientists lacked good SCM knowledge. Most respondents (87.8%) agreed that SCM training would improve efficiency, although 57.1% were uncertain about organizational support for such training. Despite reasonable awareness of SCM, substantial gaps in training, logistics capacity, and infrastructure persist across facilities in both states studied.

KEYWORDS: Supply chain management, Drug supply management, Health commodities, Logistics cycle, Inventory management, Logistics management information system (LMIS), Essential medicines.

INTRODUCTION

Supply chain management (SCM) is a critical component of modern organizational and health system performance. It refers to the movement and storage of raw materials, work-in-process inventory and finished goods from point of origin to point of consumption, through coordinated activities involving the manufacturers, wholesalers, distributors, and service providers (Mentzer, 2001; Wang et al., 2006). In healthcare systems, supply chain management ensures that medicines, vaccines, diagnostics, and other essential health commodities reach patients in the right quantities, at the right time, in the right condition, and at the lowest possible cost which is fundamental to achieving effective health service delivery and universal health coverage (WHO, 2012, Yadav & Smith, 2014).

Supply chain management has been defined as the design, planning, execution, control, and monitoring of supply chain activities with the objective of creating value, synchronizing supply with demand, building a competitive infrastructure, and improving system-wide performance (Bartsch, 2013). An effective supply chain therefore requires coordination among all participants, efficient information flow, and continuous monitoring to remove bottlenecks and reduce waste (Hines, 2004;

United States Agency for International Development, USAID, 2013; Singh et al., 2010). When supply chains are poorly managed, organizations experience stock-outs, excess inventory, expiry of products, financial losses, and poor customer satisfaction (Hines, 2004; USAID, 2013). In healthcare delivery, these failures have far more serious consequences. A poorly functioning drug supply system can lead to interrupted treatment, increased morbidity and mortality, reduced patient confidence, and waste of scarce resources (Management Sciences for Health, 1997; WHO, 2012). To prevent these problems, health supply chains are designed around the principle of the six rights of logistics: delivering the right product, in the right quantity, in the right condition, to the right place, at the right time, and for the right cost (USAID/DELIVER PROJECT, 2011; USAID, 2013). Ensuring continuous access to safe, effective, an affordable medicines remains core responsibility of national health systems WHO, 2013).

The health supply chain is typically organized as a cycle of interrelated activities, including selection, forecasting and quantification, procurement, inventory management, distribution, servicing customers, monitoring and evaluation, and quality monitoring. At the heart of this cycle is the **logistics management information system (LMIS)**, which provides the data required for decision-making, coordination, and accountability (USAID/DELIVER PROJECT, 2007; Linda et al., 2009; USAID, 2013; USAID, 2014; WHO, 2014). Without reliable information on stock levels, consumption, losses, and orders, managers cannot forecast demand, plan procurement, or ensure product availability, which remains a major challenge in many health systems (Sarley et al., 2014; Yadav & Smith, 2014).

Quality monitoring is another essential component of the logistics cycle. It ensures that health commodities are safe, effective, and properly handled at every stage, from product selection to distribution and use (USAID/DELIVER PROJECT, 2010e; WHO, 2014). Quality monitoring also includes adherence to standard treatment guidelines, proper storage conditions, appropriate transportation, and pharmacovigilance to ensure patient safety (Management Sciences for Health, 1997; WHO, 2015).

Despite the importance of supply chain systems, many developing countries continue to experience weak logistics performance due to inadequate training, limited infrastructure, and poor institutional support (WHO, 2012; Yadav et al., 2014). Rwanda provides an example of how supply chain training can transform the health workforce, where pharmacy graduates with supply chain management (SCM) skills have become highly sought after (Rwanda University, 2012). However, in many parts of sub-Saharan Africa, including Nigeria, health workers often lack the technical knowledge and legal understanding needed to operate supply chain systems effectively, leading to poor compliance with standard procedures and frequent improvisation (Aronovich et al., 2010; USAID, 2013; WHO, 2014).

Nigeria's health system is undergoing continuous reforms, including decentralization and integration, which place additional demands on supply chains (USAID/DELIVER PROJECT, 2010f; World Bank, 2013). For these reforms to succeed, supply chain systems must be adaptable, resilient, and capable of functioning even during structural changes (Yadav, 2015; WHO, 2014). Unfortunately, in many facilities, weaknesses in procurement, storage, inventory control, transportation, and information management continue to compromise the availability of essential medicines (WHO, 2012; Sarley et al., 2014). Human resource capacity is a major determinant of supply chain performance. Even when policies, guidelines, and tools exist, the absence of trained and motivated personnel leads to poor implementation (USAID, 2013; WHO, 2014). Health workers must understand the logistics cycle, the principles of inventory management, forecasting methods, drug selection criteria, and the use of LMIS in order to ensure efficient supply of health commodities (USAID/DELIVER PROJECT, 2011; Management Sciences for Health, 1997; USAID, 2013; WHO, 2015). Access to essential medicines is foundational element of universal health coverage and depends heavily on the effectiveness of national pharmaceutical supply chains (Wirtz et al., 2013).

Despite the growing recognition of these issues, there is limited empirical evidence on the level of knowledge and attitudes of health care workers toward supply chain and drug supply management in many Nigerian states, particularly in Akwa Ibom and Cross River States. Understanding the extent of this knowledge, as well as the perceptions and practices of health professionals, is essential for identifying weaknesses in the system and designing effective capacity-building interventions (World Bank, 2014).

Therefore, this study was designed to assess the knowledge and attitudes of health care staff toward supply chain and drug supply management in selected health facilities in Akwa Ibom and Cross River States, Nigeria**,** with the aim of providing evidence to guide improvements in training, policy implementation, and health commodity management.

MATERIALS AND METHODS

Study design and setting

This study employed a descriptive cross-sectional survey design to assess the knowledge and attitudes of health care workers toward supply chain and drug supply management, a design widely used in health systems and workforce research (WHO, 2014; Sarley et al., 2014). The study was conducted in selected health facilities in Akwa Ibom State and Cross River State, Nigeria. The facilities included primary health centers, secondary (general) hospitals, tertiary (teaching) hospitals,

pharmacy outlets, university health institutions, medical laboratories, and medical stores reflecting the various levels of health service delivery involved in drug and commodity management (World Bank, 2013; WHO, 2015).

Study population

The study population consisted of health professionals involved in drug supply and logistics management within the selected facilities. These included pharmacists, nurses, pharmacy technicians, purchasing and supply officers, storekeepers, medical laboratory scientists, clinical officers, and medical assistants who were directly or indirectly responsible for the management of health commodities.

Sample size and sampling technique

A convenience purposive sampling technique was used to select respondents for the study. This is a form of non-probability sampling in which the researcher selects participants based on predefined criteria, including their specialist knowledge of the research topic**,** accessibility, and willingness to participate (Creswell, 2014). Using this approach, health professionals who were directly involved in drug supply and logistics management in the selected facilities were identified and invited to participate. To account for possible non-response, incomplete questionnaires, and loss of data, a total of 80 questionnaires were distributed, of which 51 were completed and returned, yielding a response rate of 63.8%**.** All properly completed questionnaires were included in the final analysis.

Data collection instrument

Data were collected using a structured, self-administered questionnaire developed based on standard supply chain management frameworks, including the logistics cycle, logistics management information system (LMIS), inventory control, drug selection, procurement, storage, and distribution.

The questionnaire consisted of sections covering:

- Socio-demographic characteristics (age, sex, profession, education, years of experience, sector and area of practice)
- Knowledge of supply chain and drug supply management
- Training in supply chain management
- Logistics cycle components
- Facility practices related to procurement, storage, transportation, and supervision
- Attitudes toward training and institutional support for supply chain management

Responses were measured using dichotomous (Yes/No), multiple-choice, and Likert-scale formats (ranging from strongly agree to strongly disagree).

Validity and reliability of the instrument

The internal consistency of the questionnaire was assessed using Cronbach's alpha reliability analysis, which is widely used to evaluate the internal consistency of measurement scales (Cronbach, 1951). The logistics cycle items showed excellent reliability with Cronbach's alpha values ranging from 0.980 to 0.981, indicating very high internal consistency. The drug/product selection scale had Cronbach's alpha values between 0.948 and 0.959, while the inventory control system scale ranged from 0.966 to 0.970, also indicating excellent reliability. These results confirm that the instrument was reliable for measuring knowledge and attitudes related to supply chain and drug supply management.

Data collection procedure

The questionnaires were administered to eligible respondents in their respective facilities. Participants were informed about the purpose of the study and assured that their responses would be treated confidentially. Participation was voluntary, and only those who consented were included in the study.

Data analysis

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS, 2017) version 25. Descriptive and inferential statistics were applied, with frequencies, percentages, tables, and figures used to summarize socio-demographic characteristics, knowledge, attitudes, and supply chain practices. Group means were expressed as mean ± SEM and compared using one-way ANOVA, with statistical significance set at $P < 0.05$. The internal consistency of the questionnaire was assessed using Cronbach's alpha for the logistics cycle, drug/product selection, and inventory control scales.

Ethical considerations

Ethical approval was obtained from the University of Uyo Health Research Ethics Committee. Informed consent was obtained from all participants. Participation was voluntary, confidentiality and anonymity were assured, and no personal identifiers were collected. Data were used solely for research purposes.

RESULTS

Response rate and socio-demographic characteristics

A total of 80 questionnaires were distributed to eligible health care workers involved in drug supply and logistics management across selected health facilities in Akwa Ibom and Cross River States. Fifty-one questionnaires were completed and returned, giving a response rate of 63.8%.

The age distribution of respondents showed that the majority were aged 18–30 years (45.1%), followed by those aged 31–40 years (27.5%), 41–50 years (17.6%), and 51–60 years (9.8%) (Figure 1). Female respondents constituted a higher proportion of the study population (62.0%) compared with males (38.0%) (Figure 2).

Pharmacists represented the largest professional group among respondents, followed by nurses, pharmacy

technicians, purchasing and supply officers, storekeepers, and medical laboratory scientists (Figure 4). In terms of educational attainment, most respondents possessed graduate qualifications (49.0%), while 31.4% had postgraduate qualifications (Table 1). The remaining respondents held diploma or certificate qualifications (13.7%) or secondary school education (5.9%).

Most respondents were employed in the government sector (52.9%), followed by the private sector (43.1%), while a small proportion worked with non-governmental organizations (3.9%). With respect to area of practice, respondents were mainly from community pharmacies (34.0%) and hospital pharmacies (24.0%), with others practicing as medical representatives, health centre staff, storekeepers, private hospital staff, academics, and quality control personnel (Table 1).

Awareness and training in supply chain management

The majority of respondents (72.5%) reported that they had heard about supply chain management of health commodities, while 27.5% had not (Figure 3). Despite this level of awareness, 74.0% of respondents reported having no formal training in supply chain or drug supply management. Only 21.6% indicated that they had received formal training, while 3.9% reported neither being trained nor untrained (Figure 6).

Among respondents who had received formal training, workshops constituted the most common mode of training (50.0%), followed by undergraduate (25.0%) and postgraduate (25.0%) training (Table 2).

Knowledge of the logistics cycle

Overall, 60.8% of respondents demonstrated good knowledge of the logistics cycle, while 39.3% demonstrated poor knowledge (Table 2). Knowledge of the logistics cycle varied across professional groups. All purchasing and supply officers and storekeepers (100%) demonstrated good knowledge of the logistics cycle (Figure 4). In contrast, 44.4% of pharmacists, 25.0% of pharmacy technicians, 50.0% of nurses, and 50.0% of medical laboratory scientists demonstrated poor knowledge of the logistics cycle.

Self-assessment of logistics cycle knowledge showed that most respondents rated their knowledge as fair (39.2%), followed by poor (25.4%) and good (21.6%). Only a small proportion rated their knowledge as very good (11.8%) or excellent (2.0%) (Table 2).

Knowledge of logistics cycle components

Respondents demonstrated varying levels of knowledge across the components of the logistics cycle. High levels of knowledge were reported for servicing customers, procurement, inventory management, budgeting, supervision, monitoring and evaluation, and logistics management information systems (LMIS). The majority of respondents identified LMIS as the central component of the logistics cycle, recognizing its role in driving forecasting, procurement, and inventory decisions (Table 3).

Reliability analysis of the logistics cycle scale showed excellent internal consistency, with Cronbach's alpha values ranging from 0.980 to 0.981, indicating that the instrument reliably measured knowledge of the logistics cycle.

Drug and product selection practices

The majority of the respondents (74.0%) indicated that their facilities had an essential drug list, and 78.9% reported that the products in their supply chain were selected from the essential drug list (Table 5). Most of them reported that drug and product selection in their facilities was guided by key criteria, including prevailing disease pattern, level of care, national drug policy, qualification of prescribers, and financial resources (Table 6). Reliability analysis for the drug/product selection scale demonstrated excellent internal consistency with Cronbach's alpha values between 0.948 and 0.959.

Inventory management and logistics information systems

The majority of respondents (79.5%) reported that they were not aware of the min-max inventory control system. Among those who were aware, inventory control practices were based on the use of stock cards, quantification methods, and financial records.

The most commonly used stock-keeping tools were stock cards (41.2%), followed by bin cards (31.4%) and stock ledgers (7.8%), while some facilities used other methods or none at all. Monthly consumption was reported as the most important unit of measurement for inventory management (62.5%).

Most facilities maintained logistics records, including stock-keeping records (95.1%), requisition and issue records (80.0%), and dispense-to-user records (79.5%). A large proportion of respondents (81.4%) reported that their logistics management information systems provided information on stock on hand (Table 7).

Reliability testing of the inventory control system scale yielded Cronbach's alpha values between 0.966 and 0.970, indicating excellent internal consistency.

Procurement, storage, distribution, and supervision

More than half of respondents (58.7%) reported the availability of standard procurement guidelines in their facilities. Most respondents (82.0%) reported having adequate storage facilities, and 78.0% indicated the presence of guidelines for proper storage of health commodities.

Local suppliers accounted for the majority of product deliveries (63.8%), and facility vehicles were the most commonly used means of transportation (47.1%). Most

orders were received within less than two weeks (45.8%).

The majority of respondents reported receiving supervision within the previous six months, and 81.4% indicated that supervision activities included drug management practices such as stock card review, report checking, removal of expired products, and assessment of storage conditions (Table 7).

Challenges and attitudes toward training

Respondents identified several challenges affecting effective supply chain and drug supply management, including irregular electricity supply, drug expiration and wastage, stock-outs, inadequate storage facilities, poor documentation, delayed product delivery, inadequate staff training, weak inventory systems, and budgeting constraints.

Despite these challenges, 87.8% of respondents agreed that training in supply chain and drug supply management would improve efficiency. A majority expressed strong interest in training, although 57.1% reported uncertainty regarding whether their organizations would support or sponsor such training (Table 9).

Table 1: The Socio-demographics values (data) of respondents.

Questionnaire Category	Response Category	Number of Respondents	Percentage of Respondents
Age	18 – 30yrs	23	45.10%
	31 – 40yrs	14	27.50%
	41 – 50yrs	9	17.60%
	51 – 60yrs	5	9.80%
	>60yrs	-	-
Gender	Female	31	62.00%
	Male	19	38.00%
Profession	Pharmacist	27	52.90%
	Pharmacy Technician	4	7.80%
	Nursing	12	23.50%
	Medical laboratory Scientist	2	3.90%
	Purchasing & supply	3	5.90%
	Store keeping	3	5.90%
Education	Primary	-	-
	Secondary	3	5.90%
	Tertiary	25	49.00%
	Postgraduate	16	31.40%
	Diploma/Certificate	7	13.70%
Qualifications	B. Pharm.	18	35.30%
	B.Sc.	9	17.60%
	RN	13	25.50%
	M.sc	5	9.80%
	MBA	-	-
	MPH	5	9.80%
	SSC	1	2.00%
Working Environment	Government	27	52.90%
	Private	22	43.10%
	NGO	2	3.90%
Area of Practice	Hospital Pharmacy	12	24.00%
	Community Pharmacy	17	34.00%
	Store keeping in hospital and other places	4	8.00%
	Production	-	-
	Medical Representatives	5	10.00%
	Private hospital	3	6.00%
	Quality control	2	4.00%
	Health centre	4	8.00%
	Academics	3	6.00%
Years of Experience	1 – 3yrs	17	33.30%
	4 -5yrs	16	31.40%
	6 – 10yrs	7	13.70%

	11-15yrs	3	5.90%
	16 – 20yrs	2	3.90%
	> 20yrs	6	11.80%

Table 2: Awareness and Training in SCM, Drug Management, SOPs and Knowledge of the Logistics Cycle.

Questionnaire Category	Response	Percentage Response
Awareness of Supply Chain Management (SCM)	37 (Yes)	72.5% (Yes)
	14 (No)	27.5% (No)
Formerly trained in SCM	11 (Yes)	21.6% (Yes)
	38 (No)	74.5% (No)
	2 (Don't know)	3.9% (Don't know)
Type of supply chain training received	3 (Undergraduate)	25.0%(Undergraduate)
	3 (Postgraduate)	25.0%(Postgraduate)
	6 (Workshop)	50.0%(Workshop)
Type of health facility	11 (PHC)	22.0% (PHC)
	13 (General Hospital)	26.0% (General Hospital)
	12 (Tertiary)	24.0% (Tertiary)
Principal person responsible for medical supplies	4 (Nurse)	8.0% (Nurse)
	10 (Clinical Officer)	20.0% (Clinical Officer)
	1 (Pharmacy Technician)	2.0%(Pharmacy Technician)
	1 (Pharmacy Assistant)	2.0% (Pharmacy Assistant)
	30 (Pharmacist)	60.0% (Pharmacist)
	3 (Medical Assistant)	6.0% (Medical Assistant)
	1 (Messenger)	2.0% (Messenger)
Rating of drug/product management performance	8 (Excellent)	15.7% (Excellent)
	22 (Very Effective)	43.1% (Very Effective)
	17 (Good)	33.3% (Good)
	3 (Average)	5.9% (Average)
	1 (Poor)	2.0% (Poor)
Availability of standard operating procedures for logistics management	18 (Yes)	38.3% (Yes)
	29 (No)	61.7% (No)
Type of standard operating procedures available	Logistics cycle, bulk purchase, Combined Report/Requisition Issue and Receipt Form (CRRIRF)	
Key challenges affecting drug and product management	Inconsistent power supply (electricity), drug expiration (drug wastage), brand name prescription, lack of documentation, inadequate storage facility, stock-out, inadequate product information/confirmation, lack of formal training for staff, delay in product delivery, budgeting, inventory, dust, air conditional problems	-
Knowledge of the logistics cycle	31 (Yes)	60.8% (Yes)
	20 (No)	39.2% (No)
Self-rated knowledge of the logistics cycle	1 (Excellent)	2.0% (Excellent)
	6 (Very good)	11.8% (Very good)
	11 (Good)	21.6% (Good)
	20 (Fair)	39.2% (Fair)
	13 (Poor)	25.4% (Poor)

Table 3: Knowledge of Elements of Logistic Cycle.

Questionnaire Category		Response Category	Excellent (5)	Very Good (4)	Good (3)	Fair (2)	Poor (1)
Knowledge of logistics cycle components	A	Servicing Customers	21(42.0%)	20(40.0%)	7(14.0%)	2(4.0%)	-
	B	Selection	2(4.2%)	22(45.8%)	17(35.4%)	4(8.3%)	3(6.3%)
	C	Forecasting	1(2.0%)	19(38.8%)	17(34.7%)	12(24.5%)	-
	D	Quantification	6(12.0%)	19(38.0%)	22(44.0%)	3(6.0%)	-
	E	Supply planning	5(11.6%)	12(26.1%)	25(54.3%)	4(8.7%)	-
	F	Procurement	1(2.3%)	20(46.5%)	18(41.9%)	4(9.3%)	-
	G	Inventory Management	5(11.6%)	15(34.9%)	18(41.9%)	5(11.6%)	-
	H	Logistic Information Management system	5(12.2%)	5(12.2%)	24(58.5%)	7(17.1%)	-
	I	Organization & Staffing	1(2.4%)	17(40.5%)	21(50.0%)	3(7.1%)	-
	J	Budgeting	4(10.5%)	11(28.9%)	19(50.0%)	4(10.5%)	-
	K	Supervision	7(15.9%)	23(52.3%)	9(20.5%)	5(11.3%)	-
	L	Monitoring & Evaluation	11(23.4%)	16(34.0%)	16(34.0%)	3(6.4%)	1(2.1%)
	M	Quality monitoring	5(12.2%)	16(39.0%)	18(43.9%)	1(2.4%)	1(2.4%)
	N	Policy environment	3(7.1%)	10(23.8%)	22(52.4%)	6(14.3%)	1(2.4%)
	O	Adaptability	5(11.1%)	19(42.2%)	17(37.8%)	1(2.2%)	3(6.7%)

Table 4: Knowledge of Rights of Logistics system.

Questionnaire Category	Response	Percentage Response
Awareness of rights of a Logistic system	12 (Yes)	66.7%(Yes)
	6 (No)	33.5(No)
Rights of a Logistic system	The rights of logistics include; the right goods, quantities, condition delivered, place, time and cost	-
Suggestions on expected rights	The expected rights include; the right of satisfaction, supervision, etc	-

Table 5: Drug Selection Practices and Use of the Essential Drug List (EDL).

Availability of an Essential Drug List (EDL)	Yes	37	74.00%
	No	10	20.00%
	Not applicable	3	6.00%
Medicines Selected from EDL	Yes	30	78.90%
	No	3	7.90%
	Not applicable	5	13.20%

Table 6: Drug Selection Practices and Use of the Essential Drug List (EDL).

Questionnaire Category	Response Category	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Criteria in drug/product selection	Prevailing disease pattern	35(72.9%)	11(22.9%)	-	2(4.2%)	-
	Level of care (1°, 2°, 3°)	8(18.6%)	25(58.1%)	4(9.3%)	5(11.6%)	1(2.3%)
	Cost effectiveness	16(34.0%)	29(61.7%)	2(4.3%)	-	-
	Available human resources	3(6.7%)	31(68.9%)	11(24.4%)	-	-
	Registration Status	9(18.4%)	19(38.8%)	12(24.3%)	7(14.3%)	2(4.1%)
	Salary of prescribers	7(16.3%)	12(27.9%)	12(27.9%)	10(23.2%)	2(4.7%)
	Qualification of prescribers	12(26.7%)	22(48.9%)	5(11.1%)	6(13.3%)	-
	Age of prescribers	5(12.5%)	17(42.5%)	7(17.5%)	7(17.5%)	4(10.0%)
	National drug policy	7(16.7%)	22(52.4%)	10(23.8%)	3(7.1%)	-
	Financial resources	20(44.4%)	16(35.6%)	7(15.6%)	1(2.2%)	

Table 7: Awareness of Minimum-Maximum (Min-Max) Inventory control system.

Questionnaire Category	Response Category	Response	Percentage Response
Awareness of Minimum-Maximum (Min-Max) Inventory control system	Yes	8	20.50%
	No	31	79.50%
Min-Max inventory control system used			
	-	-	-
Most important unit of measurement of stock in inventory management	Number of items	-	-
	Monthly consumption	20	62.50%
	Month of Stock	3	9.40%
	Quality of items	9	28.10%
Type of stock-keeping system used	Stock card	21	41.20%
	Bin card	16	31.40%
	Stock ledger	4	7.80%
	POS machine	2	3.90%
	None	8	15.70%
Data elements included in LMIS reports	Stock on hand	21	41.20%
	Quantities used	18	35.30%
	Losses and adjustments	12	23.50%
	None	-	-
Frequency of LMIS reporting	Monthly	18	47.40%
	Quarterly	9	23.70%
	Annually	9	23.70%
	Bimonthly	2	5.20%
Time since last order submission	Never	4	10.50%
	Within the last one month	25	65.80%
	Two months ago	3	7.90%
	>3 months ago	6	15.80%
Method of training on record keeping	During a logistics workshop	15	37.50%
	On-the-job training	15	37.50%
	Never been trained	10	25.00%
Frequency of emergency orders	None	7	18.90%
	1	7	18.90%
	2	12	32.40%
	3	4	10.80%
	More than 3	7	18.90%
Responsible for determining resupply quantities	The facility itself	26	61.90%
	Higher-level facility	15	35.70%
	Pharmacist	1	2.40%
Method used to determine resupply quantities	Formula (any calculation)	10	20.40%
	Do not know	22	44.90%
	Estimation	14	28.60%
	Consumption pattern	3	6.10%
Formula used for resupply calculation	Formula used in quantity determination	(i) Max stock quantity = Average Monthly Consumption (AMC) x max stock level (ii) Max stock quantity - stock on hand = Order/issue quantity	-
Time since last	Never received	5	12.20%

supervision visit	Within the last month	8	19.50%
	1 – 3 months ago	12	29.30%
	3 – 6 months ago	12	29.30%
	More than 6 months ago	4	9.70%
Supervisory authority	How was responsible for supervision:	United State Agency for International Development (US AID) Contractors, Pharmacists' Council of Nigeria (PCN), Budgets and Auditors; Managing Director, Store Officer, Hospital Management.	-
Drug management included during supervision	Yes	35	81.40%
	No	5	11.60%
	Don't know	3	7.00%

Table 8: Health Professional's Knowledge of Logistics Cycle.

Professionals	Yes	No	Total
Pharmacist	15(55.6%)	12(44.4%)	27
Pharmacist technician	3 (75%.0%)	1 (25.0%)	4
Nurse	6 (50.0%)	6 (50.0%)	12
Medical laboratory scientist	1 (50.0%)	1(50.0%)	2
Purchasing and supply officer	3 (100%)	-	3
Stock keeper	3 (100%)	-	3

Table 9: Attitudes Toward Training and Institutional Support

Questionnaire Category	Response Category	Response	Percentage Response
Training in Supply Chain/Drug Supply Management would improve your efficiency at managing relevant products	Yes	43	87.80%
	No	1	2.00%
	Can't decide	5	10.20%
Interest in attending a workshop on Supply Chain/Drug Supply Management	Highly interested	28	59.60%
	Moderately interested	17	36.10%
	Mildly interested	2	4.30%
	Not interested	-	-
	Undecided	-	-
Your organization will support or sponsor such training	Yes	12	24.50%
	No	9	18.40%
	Can't say	28	57.10%

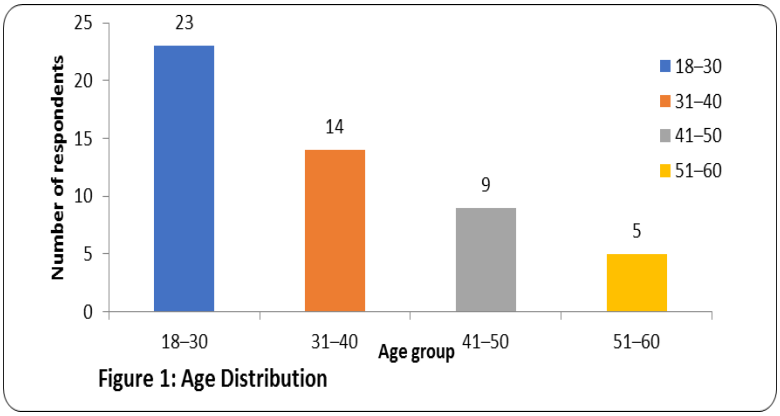

Figure 1: Age Distribution

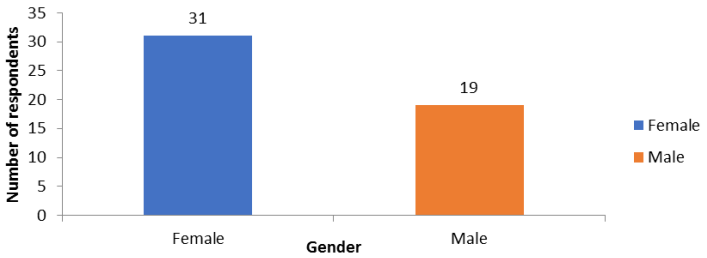

Figure 2: Gender Distribution

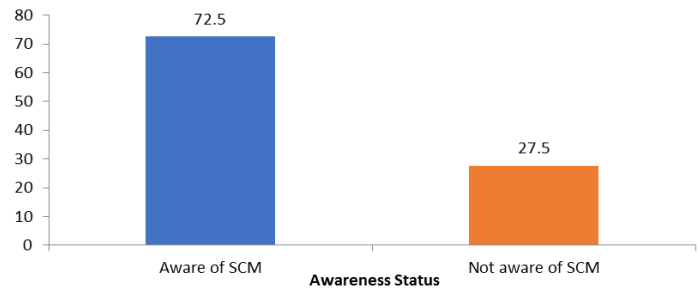

Figure 3: Awareness of Supply Chain Management (SCM)

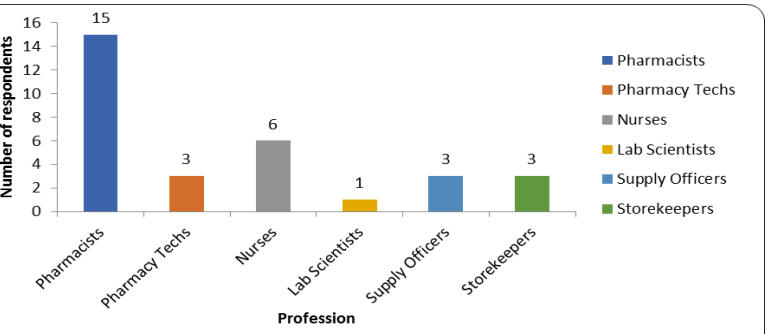

Figure 4: Number of Professionals with good Knowledge of SCM

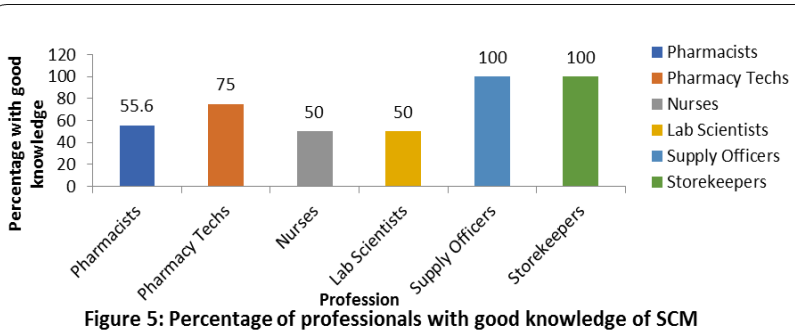

Figure 5: Percentage of professionals with good knowledge of SCM

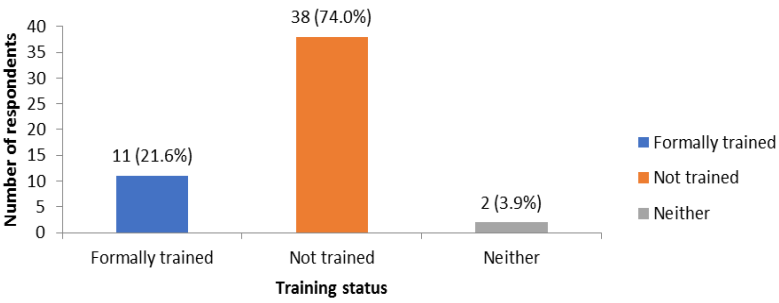

Figure 6: Training status in supply chain management.

DISCUSSION

This study examined the knowledge and attitudes of health care workers toward supply chain and drug supply management in Akwa Ibom and Cross River States. The results show that although awareness of supply chain management was relatively high, with 72.5% of respondents having heard of supply chain management, actual competence was lower, as only 60.8% demonstrated good knowledge of the logistics cycle. This gap between awareness and technical competence is consistent with previous reports that health workers in low- and middle-income countries often have limited practical supply chain skills despite being aware of logistics concepts (Aronovich et al., 2010; USAID/DELIVER PROJECT, 2011; Yadav & Smith, 2014).

Pharmacists constituted the largest professional group in this study and were significantly more involved in supply chain activities than other professionals. This is expected, as pharmacists are the custodians of medicines and pharmaceutical products in health systems. However, marked differences in knowledge were observed across professional groups. All purchasing and supply officers and storekeepers (100%) demonstrated good knowledge of the logistics cycle, reflecting their routine involvement in procurement and stock management. In contrast, 44.4% of pharmacists, 25.0% of pharmacy technicians, 50.0% of nurses, and 50.0% of medical laboratory scientists had poor knowledge of the logistics cycle. The finding that 44.4% of pharmacists demonstrated poor knowledge of the logistics cycle highlights an important gap between professional responsibility and logistics competence. This is consistent with previous reports that health professionals often lack the technical logistics skills needed to effectively manage modern supply chains (Aronovich et al., 2010). The observed knowledge gaps among Pharmacists and other clinical staff reflect a broader problem in many health systems, where supply chain responsibilities are assigned without sufficient formal logistics education (WHO, 2012; Sarley et al., 2014). Similar gaps in logistics competence among clinical and pharmaceutical staff have been reported in other developing country settings, where supply chain responsibilities are often concentrated among non-clinical logistics personnel (USAID/DELIVER PROJECT, 2007; Management Sciences for Health, 1997).

Age and education also influenced knowledge of supply chain management. The highest proportion of respondents were aged 18-30 years (45.1%), and this group showed significantly better knowledge ($P < 0.05$) than older age groups. This supports earlier findings that younger professionals may be more familiar with modern logistics and information systems due to recent training (Walden, 2014). Furthermore, respondents with tertiary (49.0%) and postgraduate (31.4%) education demonstrated better knowledge than those with diploma or secondary education, reinforcing the role of formal education in building supply chain capacity.

Despite the importance of training, 74.0% of respondents reported that they had no formal training in supply chain management. Among those trained, 50.0% received training through workshops, while only 25.0% were trained at undergraduate or postgraduate levels. This reliance on short-term workshops rather than structured education has been identified as a major limitation to sustainable capacity building in health supply chains (USAID/DELIVER PROJECT, 2011; Aronovich et al., 2010; WHO, 2015). The strong agreement by 87.8% of respondents that training would improve efficiency further confirms that health workers recognize their need for additional skills.

With respect to drug selection, most respondents indicated that decisions were guided by disease pattern (72.9% strongly agree), national drug policy, and level of care, and 78.9% reported that medicines were selected from the essential drug list. This suggests reasonable compliance with national pharmaceutical policy, which is consistent with the principles of rational drug use outlined by Management Sciences for Health (1997) and USAID/DELIVER PROJECT (2011).

However, weaknesses in inventory management were evident. A large majority (79.5%) were not aware of the min-max inventory control system, a basic tool for preventing stock-outs and overstocking. Although 41.2% of facilities used stock cards and 31.4% used bin cards, the lack of knowledge of standard inventory control methods limits the effectiveness of these tools. According to USAID/DELIVER PROJECT (2011), effective inventory control depends on understanding minimum and maximum stock levels, lead times, and consumption rates, which were poorly understood by most respondents in this study.

Operational challenges further undermined supply chain performance. Respondents reported problems such as irregular electricity supply, drug expiration and wastage, stock-outs, inadequate storage facilities, delayed deliveries, and poor documentation. These challenges are widely recognized as key barriers to effective health supply chain systems in developing countries (Management Sciences for Health, 1997; USAID/DELIVER PROJECT, 2010e; Yadav & Smith, 2014).

Despite these challenges, attitudes toward improvement were positive. A large majority (87.8%) believed that training in supply chain and drug supply management would improve efficiency, and 59.6% were highly interested in attending training. However, 57.1% were uncertain whether their organizations would support such training, highlighting the need for stronger institutional and policy-level commitment to capacity development.

Overall, the findings indicate that while the basic structures of supply chain management exist in the study area, significant gaps in knowledge, training, and infrastructure persist. Addressing these gaps through targeted training, improved logistics systems, and stronger institutional support is essential for improving the availability and effective management of health commodities in Akwa Ibom and Cross River State. Global assessments continue to show that weaknesses in governance, financing, workforce capacity, and information systems remain major barriers to effective health supply chain performance in many low- and middle-income countries (USAID, 2015; World Bank, 2014).

CONCLUSION

This study assessed the knowledge and attitudes of health care workers toward supply chain and drug supply management in selected health facilities in Akwa Ibom and Cross River States. Although awareness of supply chain management was relatively high, important gaps were identified in formal training, technical knowledge, and practical application of logistics principles. Only 60.8% of respondents demonstrated good knowledge of the logistics cycle, and large proportions of pharmacists, nurses, pharmacy technicians, and medical laboratory scientists had poor understanding of key supply chain functions. Despite the availability of essential drug lists and basic logistics records in many facilities, weaknesses in inventory control, limited awareness of standard stock management systems, and persistent operational challenges such as stock-outs, drug wastage, inadequate storage, and unreliable electricity continue to undermine effective health commodity management. Nevertheless, the strong interest expressed by health workers in training highlights a valuable opportunity to improve supply chain performance through targeted capacity-building and institutional support.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are proposed:

Health care workers involved in drug and commodity management should receive regular, structured training in supply chain and drug supply management, with particular emphasis on the logistics cycle, inventory control systems, forecasting, and the use of logistics management information systems.

Supply chain management should be fully integrated into pre-service and in-service training curricula for pharmacists, nurses, pharmacy technicians, and other relevant health professionals to ensure sustained improvement in logistics competence. Health facilities and regulatory authorities should strengthen the implementation of standard operating procedures for procurement, storage, distribution, and reporting in order to promote consistency, accountability, and quality assurance.

Greater institutional and financial support should be provided to enable staff to attend training programs and apply modern supply chain practices in their daily work. Also, investments should be made in infrastructure, including storage facilities, electricity supply, and information systems, to reduce drug wastage, prevent stock-outs, and improve the reliability of health commodity supply chains.

Routine supervision, monitoring, and evaluation of supply chain activities should be strengthened to ensure compliance with guidelines and to identify and address problems early.

Conflict of Interest

The authors declare no conflict of interest.

REFERENCES

1. Aronovich, D. G., Kinzett, S., & Nguyen, A. (2010). *Using logistics system assessments to improve health supply chains*. USAID | DELIVER Project.
2. Bartsch, A. (2013). *Supply chain management: A strategic overview*. Springer.
3. Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Sage Publications.
4. Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*(3): 297–334. https://doi.org/10.1007/BF02310555
5. Hines, T. (2004). *Supply chain strategies: Customer-driven and customer-focused*. Elsevier Butterworth-Heinemann.
6. Linda, S., Allain, L., & Gray, A. (2009). *Logistics management information systems (LMIS): A guide for program managers*. USAID | DELIVER Project.
7. Management Sciences for Health. (1997). *Managing drug supply: The selection, procurement, distribution, and use of pharmaceuticals* (2nd ed.). Kumarian Press.
8. Mentzer, J. T. (2001). *Supply chain management*. Sage Publications.
9. Rwanda University. (2012). *Pharmacy education and supply chain training in Rwanda*. University of Rwanda Press.
10. Sarley, D., Allain, L., & Akkihal, A. (2014). Estimating health commodity supply chain costs. *Global Health: Science and Practice, 2*(3): 247–261.
11. Singh, R., Sanderson, M., & Bower, P. (2010). *Business logistics and customer service management*. Pearson Education.
12. USAID. (2013). *National supply chain systems strengthening framework*. United States Agency for International Development.
13. USAID. (2014). *Logistics management information systems handbook*. United States Agency for International Development.
14. USAID. (2015). *Global health supply chain assessment*. United States Agency for International Development.

15. USAID | DELIVER Project. (2007). *The logistics handbook: A practical guide for supply chain managers in family planning and health programs*. USAID.
16. USAID | DELIVER Project. (2010e). *Guidelines for managing the supply chain for public health products*. USAID.
17. USAID | DELIVER Project. (2010f). *Supply chain systems and health sector reform*. USAID.
18. USAID | DELIVER Project. (2011). *The logistics handbook: Six rights of logistics and the logistics cycle*. USAID.
19. Walden, S. (2014). *Modern health logistics and workforce development*. Global Health Press.
20. Wang, X., Chan, H. K., & Pettit, S. (2006). Managing supply chain uncertainty: A framework. *International Journal of Logistics Management, 17*(3): 368-389.
21. World Bank. (2013). *Improving public sector pharmaceutical supply chains*. World Bank.
22. World Bank. (2014). *Supply chain management in health systems*. World Bank.
23. World Health Organization. (2012). *The world medicines situation 2011-2012: Access to essential medicines as part of the right to health*. WHO.
24. World Health Organization. (2013). *Access to medicines and health products*. WHO.
25. World Health Organization. (2014). *Assessment of medicines regulatory systems in sub-Saharan Africa*. WHO.
26. World Health Organization. (2015). *WHO guideline on procurement of medicines*. WHO.
27. Wirtz, V. J., Hogerzeil, H. V., Gray, A. L., et al. (2013). Essential medicines for universal health coverage. *The Lancet, 389*(10067): 403-476.
28. Yadav, P. (2015). Health product supply chains in developing countries. *Operations Research for Health Care, 5*: 1-16.
29. Yadav, P., Tata, H. L., & Babaley, M. (2014). The world's medicines supply chains: Managing uncertainty. *Harvard Business Review, 92*(6): 102-108.
30. Yadav, P., & Smith, K. (2014). Supply chain management for essential medicines. *Health Systems & Reform, 1*(2): 142-154.