Assessing the Level of Community Pharmacists' Knowledge about Medicine Inventory Management in Delta State, Nigeria

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Abstract
Purpose: *To assess the level of community pharmacists' knowledge about medicine inventory management in Delta State.*
Methods: *A cross-sectional descriptive survey of 125 community pharmacists selected using simple random sampling method. Primary data were collected with the aid of a pretested semi-structured questionnaire. Sample size was determined using Taro Yamane's formula for finite population. The questionnaire was designed using simple statements on Likert-type scale with five alternative responses having weighting scores of 0-4. Data collected were analysed using descriptive and inferential statistics at 5% level of significance.*
Results: *The response rate was 96.2% and reliability of the questionnaire was 0.97. Respondents were mostly superintendents (63.2%), computer (63.2%) usage in their premises with 84.8% being used for inventory management purpose. "Record about inventory" was the item with highest knowledge while recalled stocks recorded the least. The mean of weighted average (MWA) of items of investigation was computed to be 2.76.*
Conclusion: *Community pharmacists in Delta State exhibited limited knowledge about medicine inventory management.*
Keywords: *Community pharmacy, Inventory management, Stockout.*

I. Introduction

Medicine inventory management is crucial especially in a period of economic recession when efforts are tailored towards cost saving. Moreover, with a lot of private clinics having dispensing doctors, there is a combined pressure on community pharmacies to manage their systems more efficiently if they must not go bankrupt. It is the core of pharmaceutical supply which deals with stock reordering to facilitate business without stock out. The process is primarily used to ensure that assets are properly secured and there is concurrency among all accounting systems. In community pharmacy practice, inventory is a major investment made towards the success of the pharmacy. Adequate inventory management is therefore essential in assuring security inventory which the firm's single largest asset. It helps to improve work flow and enhances customer's satisfaction [1]. Inventory control as a process of ordering the right goods in the right time with the right quality [2]. Control of inventory is a means of ensuring that the forecasted stocks are adhered to in daily operational processes.

The objective of an inventory control system is to minimize the total running cost. It is reported that it would cost a business more to run out of an item, than to stock extra units of it, as availability and convenience may affect future transactions [1]. Most inventory decisions revolve around replenishment, which involves knowing how much and when to order. This will inform managers how much of a product to re-order, when to re-order and how frequently orders are made. The effective and efficient management of medicine entails close supervision of important drugs, prevention of pilferage and priority in purchase and distribution of drugs [3]. This will help to optimize use of resources and eventually help to improve patient care byensuring availability of essential drugs and prevent stock-out.

In the report on the attitude of pharmacists to the introduction of automated techniques in the delivery of pharmaceutical services, it was indicated that a good understanding of the various techniques in pharmacy practice positively impacted different administrative task [4] which could be extrapolated to include inventory management. Professional satisfaction, patient satisfaction, and increase in sales are factors of motivation towards patient counseling [5]. This is expected to be the same for effective and efficient inventory management. On the whole researchers have not focused on the level of knowledge of community pharmacists about medicine inventory management and reports on the area of research are rarely available.

II. Methods

2.1 Study Setting
The study was carried out in Delta State. The locations included Abraka, Agbor, Asaba, Eku, Kwale, Oleh, Ozoro, Sapele, Ughelli and Warri.

2.2 Study design
The study employed a cross-sectional design
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2.3 Study population
Descriptive survey of 125 community pharmacists selected using simple random sampling method of the registered pharmacists of the Pharmacists council of Nigerian 2016 registration data.

2.4 Sample size
Sample size of 130 was determined using Taro Yamane's formula for finite population calculated with a confidence interval of 95%.

2.5 Inclusion/ Exclusion criteria
All registered community pharmacists were included whether licensed for the year or not but those in community pharmacies not registered with the Pharmacists' Council of Nigeria (PCN) were excluded from the study.

2.6 Instrument used
Primary data were employed and were collected with the aid of a pretested semi-structured questionnaire. The questionnaire comprises three main sections in line the study objective and designed using simple statements on Likert-type scale with five alternative responses having weighting scores of 0-4. Data collected were analysed using descriptive and inferential statistics at 5% level of significance.

2.7 Validity and reliability of instrument
This was achieved by adapting model(s) from literature and seeking judgment of project supervisor and other experts (senior academicians) in the field. Cronbach alpha values(Appendix 1) were then computed to determine the internal consistency of the items in each section of the instrument with section on the knowledge, skill and competencies giving Cronbach alpha values.

2.8 Ethical approval
Ethical approval was obtained from the Institute of Public Health, ObafemiAwolowo University Ile-Ife, Osun State. No IPH/OAU/12/856 of 23rd October, 2017. This was attached to the protocol and submitted to Delta State ministry of Health ethics committee for approval.

2.9 Methods of Data Analysis
The questionnaires were manually checked for accuracy of the data, and then analyzed using the Statistical Package for Social Sciences (SPSS) version 21.0 for Windows (SPSS, Chicago, Illinois). The analysis included frequencies of discrete variables.

The preferred measure of central tendency utilized for this study was the median simply because median takes account of the fact that respondents are ranked on ordinal variables in their responses (which in this case is 0 for neutral, 1 for strongly disagree, 2 for disagree, 3 for agree, and 4 for strongly agree). Also, considering the range of the Likert scale utilized, the potency and adequacy of the median score is affirmed. It has been observed that the one way to assess the summarizing value of the median is to look at the entire range of scores in a distribution.

The method employed in which all the respondents were categorized into four groups based on their responses to questions asked on their attitude to inventory management. A more condensed representation of respondents' level of knowledge of inventory management by categorizing all the respondents into four groups based on their responses to questions asked on their level of inventory management knowledge. The 2-question instrument used to measure respondents' level of inventory management knowledge implies that the highest score obtainable is 88 (all 4s – strongly agree) and the lowest is 0 (all 0s – neutral). Respondents were divided into four knowledge category based on this scale.

Data obtained for this section were analysed using median statistic for the individual items. Inferential statistics of selected variables SPSS (v. 21) was used to run chi-square tests of association for the selected variables. For each hypothesis/case, the null (H_0) and the alternate (H_1) hypotheses are clearly stated. It should be noted that arriving at decision in chi-square test for each hypothesis requires three basic elements which are

the chi-square test statistic (x^2), the degree of freedom (df), and the level of significance (p-value). Nonetheless, with SPSS, the decision rule states that:

- The test is significant if the p-value is less than or equal to 0.05, thus we reject the null hypothesis (H_0) in favour of the alternate hypothesis (H_1) – accept H_1;
- The test is not significant if the p-value is greater than 0.05, thus we accept the null hypothesis (H_0) and reject the alternate hypothesis (H_1).

For simplicity, null hypothesis (H_0) always posit that there is no significant association between the tested variables while the alternate hypothesis (H_1) always posit that there is a significant association between the tested variables.

2.8 Weighted average calculations

$$WA = \frac{fsd.\,xsd + fd.\,xd + fa.\,xa + fsa.\,xsa}{xsd + xd + xa + xsa}$$

III. Results

Table 1 presents the sample's response analysis. A total of 130 copies of the questionnaire were distributed and 125 copies were retrieved giving a return rate of 96.2%. The pretest gave a reliability coefficient value of 0.86. A test of internal consistency for the questionnaire gave a Cronbach's Alpha value of 0.97.

Table 2 shows the demographic profile of the respondents indicating a significant proportion (75.2%) of the community pharmacies were located in Warri and Asaba, the two largest cities in the State. The respondents were almost evenly split between the two sex categories with the male (56.0%) being slightly more. The age distribution is almost bell-shaped with the 30-39 years range being the modal range.

Majority (73.6%) of the respondents possessed B.Pharm/B.Sc as their highest educational qualification; few (4.0%) of the respondents possessed M.Sc./M.Phil. and trivial portion (0.8%), of the respondents possessed a Ph.D. degree. Almost a tenth of the respondents (8.8%) were fellows of the West African Post Graduate College of Pharmacists. Majority (80.8%) of the respondents were full-time resident pharmacists and majority (75.4%) of them were the superintendent pharmacist. Greater proportions (65.6%) of the respondents were less than fifteen years in practice. However 15.2% were above 30 years in practice. A greater percentage (68%) of those having website reported that they were hosted by internet hosting companies. Computer usage in community pharmacy practice was reported by large percentage (63.2%) of the respondents. Ofthese, majority (84.4%) used computer for inventory purposes.

Table 3 presents the responses level of knowledge of inventory management possessed by community pharmacists in Delta State. The item for which the respondents recorded the highest level of knowledge is "record about inventory"(Mdn = 4,WA = 3.37) followed by "methods of determining reorder quantities" (Mdn = 4, WA = 3.25) and "selection of items to be stocked" (Mdn = 4, WA = 3.21).The items with the least scores about level of knowledge possessed by the community pharmacists were "Recalled stock"(Mdn=2, WA= 1.63), "control of stock holding costs"(Mdn=3,WA = 1.99) and "suppliers/warehouse lead time (Mdn=3,WA= 2.22) respectively.The mean of weighted averages (MWA) for level of knowledge of community pharmacist's about inventory management is 2.76 which show that the respondents generally agreed with the statement measuring their knowledge about inventory management.

Table 4 presents the effects of demographic variables on knowledge of community pharmacists about inventory management in Delta State. The result shows that the level of knowledge of the community pharmacists was significantly affected by age (x^2 =7.39, p = 0.03), sex (x^2 = 10.41, p = 0.01) and years of practice (x^2 = 8.66, p= 0.01).

Table 1.Response analysis of sampled community pharmacists in Delta State.

Location	No of Population	Calculated Sample	No of questionnaire administered	No of questionnaire returned	Response rate (%)
Abraka	3	2	2	1	50.00
Asaba	40	29	33	25	75.75
Agbor	8	6	6	2	33.33
Eku	5	4	4	4	100.00
Kwale	2	1	2	2	100.00
Oleh	2	1	2	2	100.00
Ozoro	2	1	2	1	50.00
Sapele	10	7	8	7	87.50
Ughelli	14	10	12	12	100.00
Warri	71	52	69	69	100.00
Total	157	113	130	125	96.16

Table 2.Demographic characteristics of community pharmacists in Delta State**.**

Variable	Category	Frequency	Percentage
Community pharmacy location	Warri	69	55.20
	Asaba	25	20.00
	Ughelli	12	9.60
	Sapele	7	5.60
	Eku	4	3.20
	Agbor	2	1.60
	Kwale	2	1.60
	Oleh	2	1.60
	Ozoro	1	0.80
	Abraka	1	0.80
	Total	125	100.00
Sex	Male	70	56.00
	Female	55	44.00
	Total	125	100.00
Age	Less than 20	3	2.40
	20-29	23	18.40
	30-39	45	36.00
	40-49	20	16.00
	50-59	21	16.80
	60 and above	13	10.40
	Total	125	100.00
Qualification(Highest)	B.Pharm	92	73.60
	Pharm.D	26	20.80
	M.Sc/M.Phil.	5	4.00
	M.B.A	1	0.80
	Ph.D	1	0.80
	Total	125	100.00
Fellow of Postgraduate College	No	114	91.20
	Yes	11	8.80
	Total	125	100.00

CP = Community pharmacy

Table 2. Demographic characteristics of community pharmacists in Delta State (Cont.)

Variable	Category	Frequency	Percentage
Job Status	Full-time pharmacist	101	80.80
	Locum	24	19.20
	Total	125	100.00
Superintendent Pharmacist	Yes	98	78.40
	No	27	21.60
	Total	125	100.00
Year of practice	5 and below	45	36.00
	6-10	22	17.60
	11-15	15	12.00
	16-20	7	5.60
	21-25	12	9.60
	26-30	5	4.00
	Above 30	19	15.20
	Total	125	100.00
Community pharmacy website	No	93	74.40
	Yes	32	25.60
	Total	125	100.00
CP's website's host	CP itself	10	31.30
	Internet hosting Company	22	68.70
	Total	32	100.00
Computer usage at CP premises	Yes	79	63.20
	No	46	36.80
	Total	125	100.00
Computer for inventory Purpose	Yes	67	84.80
	No	12	15.20
	Total	79	100.00

CP = Community pharmacy

IV. Discussion

The actual sample size for this study is a little more than the calculated sample size and therefore could be said to be sufficient to make the results of this study generalizable to the population. From the sample size and pretest's reliability coefficient, as well as the high Cronbach's Alpha value for internal consistency

obtained, this study satisfies the requirements for internal and external validity and therefore generalizable to the study population.

Some pharmacists complained of busy schedule in the filling of questionnaire. This resulted in repeated visits to community pharmacies before collection of filled questionnaire is achieved, and in some cases, the questionnaire could not be retrieved. There is need for pharmacist to imbibe the culture to volunteer information freely [6].

Community pharmacies are usually established to meet organisational goals. The strategy normally includes but not limited to the location, organizational operational processes, resources availability and utilisation. These are vital to the organisation goal pursuits. The location of pharmacies in a city is a reflection of the extent of economic viability of the city. This was reported in the situation of the urban location of pharmacies in Ghana [6]. Warri is a petroleum industrial city of Delta State. It is not therefore surprising that Warri had the highest number of pharmacies in the State. The capital city of the State, Asaba is expected to attract large number of pharmacies. In this study, Asaba recorded the second highest number of pharmacies. It could be deduced that the importance and economic value of oil rather than political content accounted for the high viability of the city. While Asaba determines the polity of the State, Warri determines the economy. Moreover, it could be deduced from this study that the low number of pharmacies in Asaba is an indication of superintendent pharmacists are not resident in the city of practice (Register and Go syndrome "R and G") a practice that have negatively impacted community pharmacy practice in Nigeria. The fact that there

Table 3: Level of knowledge of inventory management among communitypharmacists in Delta State

Variables	X	N 0	SD 1	D 2	A 3	SA 4	Mdn	WA
Inventory management(IM) is the management of the ordering process	F	9	2	0	62	52	3	3.17
	%	7.20	1.60	0.00	49.50	41.60		
Items relating to IM effectiveness/efficiency								
Type of the supply system	F	23	1	2	48	51	3	2.82
	%	18.40	0.80	1.60	38.40	40.80		
Records about inventory	F	9	0	1	41	74	4	3.37
	%	7.20	0.00	0.80	32.80	59.20		
Reports about inventory	F	15	0	1	41	68	4	3.18
	%	12.00	0.00	0.80	32.80	54.40		
Selection of items to be Stocked	F	15	0	0	39	71	4	3.21
	%	12.00	0.00	0.00	31.20	56.80		
Stockout cost	f	30	1	1	48	45	3	2.62
	%	24.00	0.80	0.80	38.40	36.00		
Ordering cost	f	21	3	3	37	61	3	2.91
	%	16.80	2.40	2.40	29.60	48.80		
Stock holding costs	f	33	0	4	48	40	3	2.50
	%	26.40	0.00	3.20	38.40	32.00		
Policy on when to order	f	13	0	2	55	55	3	3.11
	%	10.40	0.00	1.60	44.00	44.00		
Policy on how much to order	f	20	0	2	46	57	3	2.96
	%	16.00	0.00	1.60	36.80	45.60		
Method of determining re-order quantity	f	11	0	0	49	64	4	3.25
	%	8.87	0.00	0.00	39.52	51.61		
Method of determining re-order interval	f	17	0	1	43	63	4	3.09
	%	13.71	0.00	0.81	34.68	50.81		
Control of stockout cost	f	41	1	5	39	39	3	2.27
	%	32.80	0.80	4.00	31.20	31.20		
Items relating to computation of order quantities								
Average monthly consumption	f	24	1	2	35	63	4	2.90
	%	19.20	0.80	1.60	28.00	50.40		
Suppliers/warehouse lead time	f	40	0	11	40	34	3	2.22
	%	32.00	000	8.80	32.00	27.20		
Safety stock	f	32	0	6	48	39	3	2.50
	%	25.60	0.00	4.80	38.40	31.20		
Stock on order	f	26	0	3	55	41	3	2.68
	%	20.80	0.00	2.40	44.00	32.80		
Stock in inventory	f	22	0	4	53	46	3	2.81
	%	17.60	0.00	3.20	42.40	36.80		
Recalled stock	f	61	0	7	38	19	2	1.63
	%	48.80	0.00	5.60	30.40	15.20		
Mean of weighted average (MWA)								**2.76**

Key: SA= Strongly Agree, A= Agree, N= Neutral or No response, D= Disagree, SD= Strongly Disagree, Mdn = Median, f= frequency, %= Row N percentage.

Table 4. Effects of demographic characteristics on community pharmacists' level of knowledge about inventory Management in Delta State.

		CP's level of knowledge about Inventory Management			Total	x^2 (df)	p-value
		Poor	Average	Excellent			
Age	Less than 40 years	10 (43.5%)	41 (69.5%)	20 (46.5%)	71 (56.8%)	7.391 (2)	0.025*
	40 years & above	13 (56.5%)	18 (30.5%)	23 (53.5%)	54 (43.2%)		
	Total	23 (100%)	59 (100%)	43 (100%)	125 (100%)		
Sex	Female	17 (73.9%)	23 (39.0%)	15 (34.9%)	55 (44.0%)	10.405 (2)	0.006*
	Male	6 (26.1%)	36 (61.0%)	28 (65.1%)	70 (56.0%)		
	Total	23 (100%)	59 (100%)	43 (100%)	125 (100%)	8.662	
Year of practice	1- 10 years	6 (26.1%)	36 (61.0%)	25 (58.1%)	67 (53.6%)	(2)	0.013*
	More than 10 years	17 (73.9%)	23 (39.0%)	18 (41.9%)	58 (46.4%)		

*test is significant at p< 0.05

were more male community pharmacists than females is contrary to the reported ratio of 60:40 in favour of female pharmacists in Great Britain in 2011 in the number of pharmacists generally investigated [7]. It could be deduced from this study that the female pharmacists are not very interested in community pharmacy practice because of the managerial task required for the community pharmacy practice. Moreover, the male community pharmacists bear the financial burdens of the family and are more likely to be involved in community pharmacy which has more managerial demand.

The fact that majority of the community pharmacist had first degree as highest qualification possessed without fellowship of the Post Graduate College of Pharmacy is in agreement with the reviewed literature which stated that majority of community pharmacists lack additional educational qualifications [6].

The finding that superintendent pharmacists had working experience of below four years implied that majority of pharmacy newly opened are within the past four years. In this study, the instrument did not indicate if community pharmacies were wholesale outlet or retail. It could also be reduced that there are annual transition of superintendent pharmacists, a situation that is indicating that community pharmacies are not pharmacist owned. This is contrary to the situation in Ghana, where community pharmacies are pharmacists owned [6].

The majority of community Pharmacists having no website implied poor knowledge and negative attitude to inventory management which is indicated in the low awareness of inventory management procedures the problem of inabilities to use inventory models [8].

Good understanding of professional task resulting from understanding of managerial techniques and principles provides positive impact on administrative task [9], will reflect their administrative task of inventory management as observed in this study.

In this study, community pharmacists in Delta State showed that they possessed knowledge of inventory management with respect to "record about inventory management", "methods of determining reorder quantities" and "selection of items to be reordered". This is expected to provide effectiveness and efficiency in inventory management as stipulated by Capice and Sheffi (1994)[10].

In this study the "control of stock holding and suppliers/ware house lead time" data utilisation in inventory management is very weak. This is in conformity with the report by Suleiman and Onaneye (2011)[11], which attributed this to the complexity and time required for the processes involved in inventory management. Adequate professional skill is required for effective inventory management [12]. The level of knowledge with respect to "records about inventory" recorded by the respondents, appears to indicate that the respondents know how to efficiently manage their inventory. This is in conformity with the report of Akindipe (2014) that efficient management of stock will be achieved through determination of stock levels by skilled personnel [8].

V. Conclusion

The study shows that community pharmacists in Delta State have limited knowledge of medicine inventory management. They also showed understanding in inventory management in terms of what and how to order, however the implementation of what and how to order was weak.

There are good purchase principles and good stocking procedures however the reordering of stocks was through estimation rather than by calculation.

Acknowledgment

Conflict of Interest
No conflict of interest is associated with this work.

Contribution of Authors

We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will borne by the authors. Study concept and design: AEI, NJO. Acquisition of data: AEI. Analysis and interpretation of data: AEI, NJO. Drafting of manuscript: AEI, NJO. Critical revision: AEI, NJO.

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Appendices
App. 1.1.Reliability Statistics of Pretest

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.892	.894	83

App. 1.2. Reliability Statistics of study.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.969	.973	65

Austine E Ighorodje." Assessing the Level of Community Pharmacists' Knowledge about Medicine Inventory Management in Delta State, Nigeria." IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS) 14.3 (2019): 14-20.