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A Pilot Study on the Assessment of the Knowledge, Practice, and Challenges of Pharmaceutical Inventory Management among Community Pharmacists

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Abstract**: Pharmacies and related supplies must always be available at the required location, in the requisite amount, and with the necessary quality for health facilities to offer comprehensive care. Efficient inventory management improves pharmaceutical product profitability by reducing procurement costs and preventing long-term storage, while poor inventory management hinders essential drug availability. The current study aims to assess the knowledge, practice, and challenges in applying inventory management methods. A mixed-method study design with sampling techniques of purposive and snowball methods was used. A semi-structured questionnaire was implemented for quantitative data and an open-ended question was employed to explore more information as qualitative data. The collected qualitative data were transcribed and identified as five major themes knowledge about inventory management, challenges faced by pharmacists in managing inventory, purchasing methods, stocking, and expiry, and the purpose of inventory control management. Most pharmacists employ the inventory management method based on their experience and the customer needs. Among the basic inventory management tools like ABC, VED, FSN, or XYZ, the use of VED and FSN methods for purchasing and stocking is high. It is noted that they lack professional training but gained more knowledge and skills through the experience. When they were asked about the inventory control methods, about 70% of them were not aware, and of those who said yes 20 % were able to answer at least 1 method and 10 % were not able to correctly mention the name. To conclude the pharmacist should start considering the modern methods along with the current methods for effective marginal profit and competitive management of the pharmacies.

***Keywords:** Pharmacies, Pharmaceutical Inventory Control, Challenges, Qualitative Analyses, Knowledge.*

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1. INTRODUCTION

Inventory refers to the stock of any resource or object used by an organization. [1] Inventory control is the most important function of inventory management. An Inventory Management System is a main element of an organization. It consists of several processes that evaluate the organization's inventory. [2] A community pharmacy is a retail pharmacy, where medicines are stored, dispensed, supplied, and sold. [3] Inventory management balances competing demands by maintaining low stock levels for funds and high stock levels for customer service. An effective inventory-control system minimizes total inventory cost through rational decisions based on realistic models, ensuring high customer service. [4, 5]
Pharmaceutical inventory management involves ensuring that medications are stored and distributed at the lowest feasible cost from the point of supply to storage facilities and from these to the point of sale. [6]
There are various methods of inventory controlling tools such as ABC (Always, Better, and Control); VED (Vital, Essential, and Desirable), FNS (Fast, Normal, and Slow-moving), XYZ (based on the value of items in storage), SDE (Scarce, Difficult, and Easy to obtain), and HML (High, Medium, and Low unit price of the material) categorization methods. Drug purchasing is based on the cost and their critical usage among the population, which can be allocated using drug inventory management methods. [7, 8]
A combination of ABC and VED analysis was found to be used in hospital pharmacies and large sectors. Along with XYZ and FSN matrix is also used these days to determine the level of inventory with high-value dead-stock or slow-moving items. [9, 10, 11]
Inventory management is a crucial aspect of management, as a lack can cause production stoppages and a high inventory can increase production costs.While savings in the cost of holding inventories can be affected by economic ordering, reducing deterioration and obsolescence in storage thereby reducing the working capital that gets blocked up with the inventory. [12] In the field of supply chain management, inventory management presents difficult issues. Inventory management aims to find the number of inventories that will fulfill the demand, avoiding overstock. [13, 14, 15]
The cost of the items in inventory at an agreement of an accounting period is known as their inventory value. Based on the expenses required to purchase and prepare the inventory for sale, a value is assigned to it. An organization can assume the inventory in hand once a fiscal year to assign the cost value of inventory. There are various methods for the valuation of the inventory. Such as non-actual cost methods, actual cost methods, weighted average at the end of the month and basic stock methods. [16, 17, 18] Information on the pharmacy's inventory sales and acquisitions during the period is provided by the inventory turnover rate. A high ratio suggests a profit. ITR provides vital data on cash inflows and outflows from the current assets. [19]
Efficient inventory management enhances the gross profit by reducing the procurement cost of pharmaceutical products without compromising the quality. This also helps in eliminating the long-term storage of the products that lead to the expiration of the product and improves the savings on the purchase. [20] Poor inventory management challenges the availability of essential drugs and shows the pharmacist’s insufficiency to provide for the customer’s needs. [21]

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Modern techniques like sort-based and activity-based analyses are essential for managing pharmacy inventories, containing drug costs, performing replacement-and-elimination analysis, and monitoring health system operations, while unit price and quantity are basic inventory control approaches. [22]
Current changes in inventory management under the term logistics management, play a greater role in purchasing rather than producing in-house and use more international sourcing. Changes to recording methods include using different methods of information collection and processing. Control methods are more computer-based and have become part of increasingly integrated systems. [23]

2. RELATED WORKS

1. Jobira T, Et.Al, (2022) the study discusses the Assessment of Knowledge, Practices, and Challenges of Pharmaceuticals Inventory Control among Pharmacy Professionals Working in Selected Public Health Facilities of West Arsi Zone, Oromia, Ethiopia. It concludes that 90% of pharmacy professionals knew about VEN analysis concepts, while 70 % knew about ABC analysis, 75% of respondents had practiced ABC-VED matrix analysis, but none applied FSN-XYZ matrix analysis. Challenges preventing professionals from practicing pharmaceutical inventory control included price-related, training-related, human resource-related, and managerial-related factors. [21]

2. Gizaw T, Jemal A, (2021) the study aimed to identify items requiring managerial control and evaluate the ABC-VED–FNS matrix for Ethiopian Pharmaceutical Supply Agency (EPSA) inventory control. A cross-sectional descriptive study on 393 pharmaceuticals found that 187 items account for 90% of annual sales, with Class A items accounting for 79.9%. Implementing inventory control policies can aid demand forecasting and prevent overstocking, under-stocking, and stock-outs. [6]

3. Jobira T, Et.Al, (2021) the study evaluates the pharmaceutical inventory management in selected health facilities of West Arsi Zone, Oromia, Ethiopia. ABC analysis showed that 12.1% of medicines (class A) consumed 80.1% of the total annual drug expenditure (ADE). VEN analysis classified 16.9% of medicines as vital, 67.9% as essential, and 15.2% as non-essential, consuming 35.1%, 61.3%, and 3.6% of ADE respectively. ABC-VEN matrix analysis showed that 26.6% of medicines (category I) consumed 84.7% of ADE.FSN-XYZ matrix analysis identified that 45.8% of medicines (category I) accounted for 88% of the total closing stock value, with the XN group (non-moving, high-cost drugs) having high value (20%).The study concludes that the matrix analysis is a strong tool to identify items requiring close monitoring for effective inventory management. [10]

4. Mohammed SA, Et.Al (2020) the study analyzed pharmaceutical inventory management at Dessie Referral Hospital using the ABC-VEN matrix for the years 2013 to 2017. The classification identified 310 (17%) class A, 368 (20.18%) class B, and 1146 (62.83%) class C items, with varying annual drug expenditures. Category I items, vital and essential drugs, had high costs and required strict inventory control. The total five-year ABC analysis showed

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significant costs for class A, B, and C items. A significant portion of the budget is allocated to class A and category I, indicating the necessity of thorough inventory control to avoid capital accumulation in buffer stocks and waste. ABC-VEN analysis should be performed annually to optimize inventory decisions and resource use. [11]

5. Kho BP, Et.Al, (2017) the research paper "Challenges in the Management of Community Pharmacies in Malaysia" examines the challenges faced by community pharmacists in Sarawak, Malaysia. The study utilized semi-structured interviews with community pharmacists and employed thematic analysis to identify the management challenges and corresponding coping strategies. It identifies six major management challenges, including market competition, legislative issues, customer expectations, macroeconomic impacts, and operational issues. The study suggests that improving customer service and expanding professional services are viable strategies, but current legislative and economic landscapes may hinder these. [30]

6. Pund S, Et.Al, (2016) the study presents an ABC-VED matrix analysis of the drug store at a government medical college in Aurangabad, India. The analysis categorizes the drugs based on their cost and criticality, identifying those that require stringent managerial control. The study found that 47.9% of the drugs, accounting for 82.3% of the total annual drug expenditure, belong to the top priority category requiring strict control, while the remaining drugs can be managed with middle and lower levels of control. [7]

7. Tom Jose, V, Et.Al, (2013) the research paper on the analysis of inventory control techniques a comparative study discusses the importance of proper inventory management in organizations, focusing on the link between production and distribution processes. The paper explores various inventory control techniques, particularly focusing on the EOQ technique for determining optimal order quantity and minimizing carrying costs. It highlights the inadequacy of inventory management due to non-adherence to EOQ for purchasing materials. It also concludes with the importance of maintaining inventories based on value and movement frequency which ABC and FSN analysis. [2]

8. Nigah, Et.Al, (2010) the study examines the use of ABC and VED analysis in managing a tertiary care hospital's pharmacy store. It analyzed the annual consumption and expenditure of 421 pharmacy items in 2007-08, identifying categories A, B, and C, 13.78%, and vital, essential, and desirable items. The ABC-VED matrix analysis identified 22.09%, 54.63%, and 23.28% of items as categories I, II, and III, accounting for 74.21%, 22.23%, and 3.56% of ADE, respectively. The analysis revealed that ABC and VED analysis are crucial for effective inventory management and preventing stock-outs in the hospital pharmacy. [9]

3. METHODOLOGY

The pilot study involved 20 community pharmacists in Chennai. To have a well-rounded viewpoint, respondents were chosen using purposive sampling to make sure that the final cohort varied in terms of gender, age, position in the pharmacy, and experience. Later,

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participants were selected using snowball sampling, in which they were asked to assist in identifying other potential subjects.

The semi-structured interview guide was developed based on the literature review. Qualitative research methodology was employed as it helps to have an open conversation between the pharmacists and the researchers. This gives a greater opportunity to explore more data from the respondents. The interviews were recorded at their workplace for 10 – 20 minutes on a face-to-face basis. The participants were explained about the interview and recorded in their mother tongue to obtain more viewpoints that were easy for them to explain. All interviews were recorded and subsequently transcribed. The transcript was produced and analyzed. The transcribed data were analyzed for emergent themes. The raw data is then summarized using codes created for concepts in preparation for further research. This entails checking for code co-occurrence as well as evaluating the relative frequency of themes or subjects within a data set. Thematic analysis was done as per the steps and approach recommended by Braun and Clarke. [24] The data analysis was done using Nvivo version 10.

1.	Are you aware of the following inventory-controlling tools?
	(a)Concept of ABC
	(b)Concept of VED
	(c)Concept of FSN
2.	Have you practiced any of the following inventory-controlling tools?
	(a)Yes
	(b)No
3.	How many times are emergency purchases done?
4.	What are all the methods you use for purchasing?
5.	What are the challenges faced by the pharmacist in managing the inventory?
	(a)Price or budget-related
	(b)Human resource related
	(c)Training or knowledge
	(d)Managerial related
	(e)All of the above
6.	What is the purpose of inventory management?
	(a)To know when to order stock
	(b)To know how much stock to order
	(c)To avoid shortage of products
	(d)To avoid unwanted expenses in overstocking and damaged or expired drugs
	(e)All of the above
7.	How frequently do you replace or return damaged or expired products/drugs?

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8.	Does the use of inventory control models, helps in reducing annual expenses on bulk products?
9.	Do you use any software to purchase stock for your pharmacy?
10.	How much of the total purchase involves non-prescription products/drugs?

Table 1: Semi Structured Questionnaire

4. RESULT AND DISCUSSION

Thematic analysis of the responses identified as knowledge about inventory management, challenges faced by pharmacists in managing inventory, purchasing of the goods, stocking, and expiry, and the purpose of inventory control management. To maintain anonymity, a few participant quotes that highlight the themes were included in the results.

S.No	Characteristics	N = 20	%
1	Gender		
	Female	6	30
	Male	14	70
2	Age Range		
	20-30	6	30
	30-40	9	45
	>50	5	25
3	Position in Pharmacy		
	Owner	12	60
	Employee	8	40
4	Experience		
	Fresher	2	10
	1-5 Years	5	25
	6-10 Years	7	35
	>10 Years	6	30

Table 2: Demographic characteristics of respondents

Thematic Analysis

1. Knowledge about Inventory Management

The respondents were asked about the concept of inventory management such as ABC analysis, VED analysis, FSN analysis, and others. On explaining each methods they could be able to recognize the methods they practice. But in real only few were aware about the method ABC. They were so unsure about the other methods that are available.

Some pharmacists are aware of the inventory-controlling tools but not practicing them daily. Most of them opt for stocking or purchasing based on the supply movement among the population.

“I have not practiced any particular inventory-controlling tools, but I am aware of ABC analysis. We purchase based on fast-moving and slow-moving supplies.”

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Small retail pharmacist reports that there is no necessity for the implementation of inventory management tools. Since their purchase and expenditure are less valuable.
"These inventory controlling tools have not done any greater impact unless they are combined with other tools."
Whereas wholesale pharmacists say that the use of inventory management tools reduces the annual expenses and the purchase cost.
"Many inventory tools in combination helped in reducing the annual expenses on bulk purchase."
With experience and knowledge, some pharmacists find these tools useful. It is also the awareness of the latest technologies in managing the inventory.

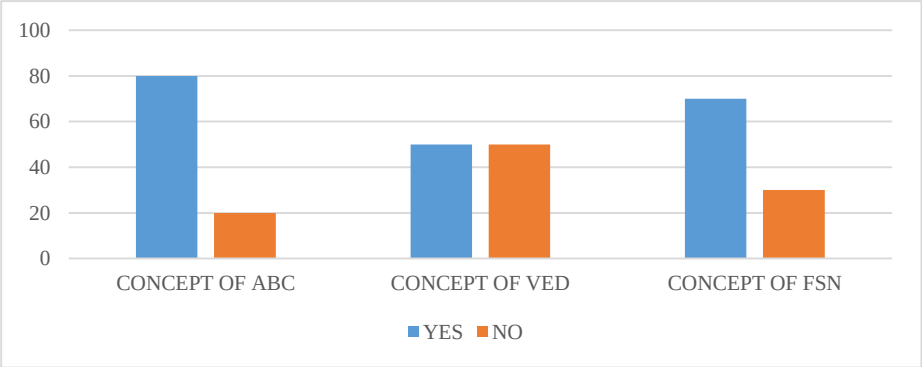

Figure 1: Awareness about the Inventory Controlling Tools

2. Challenges Faced by Pharmacists in Managing Inventory
Based the answers given by them we could find that there are about 35% have challenges with all the factors, 25% with price and budgeting factor, 20% with human resource management, 10% with the difficulty with training and knowledge, and 10% with the managerial role.
In a large-scale pharmacy, managing the administration, finances, human resources, and inventory by one person is more difficult and that leads to error.
"It is difficult when there is no or less staff to work. Because it is hard to manage administration, dispensing, and stocking by a single man. Obtaining part-timers also stays difficult."
"Few staff to maintain both administration and dispense or stocking makes everything difficult and slow. It makes the customer wait for a long time which most of them don't like"
Knowledge about the drugs, stock management, inventory control, and purchase methods is important since that takes a lot time to learn and manage.
"Also the part-timers, who are slow learners, also have poor knowledge on drugs and handling, learning that in a short period is harder for some days…but many will quit right after they learn some stuff and we are pushed back to the situation where we have to hire someone again and teach everything from the beginning." This leads to less manpower in the pharmacies. "Price/ budget, staff to work and their knowledge are major challenges in running a pharmacy with proper inventory. Also, the managerial role is important in running

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A pharmacy successfully."

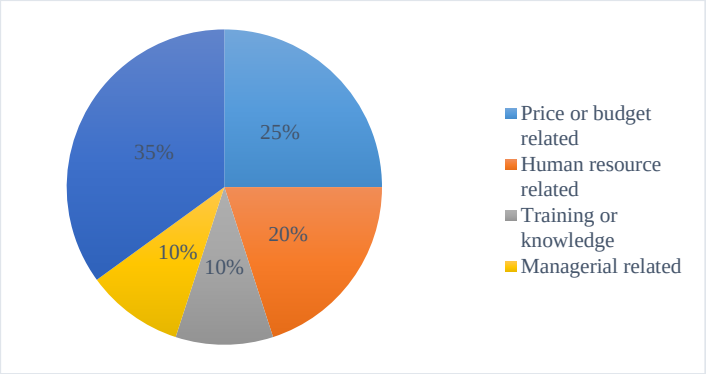

Figure 2: Challenges Faced By the Pharmacist

3. Procurement of the Drug

The purchasing of goods can be done in many ways such as online purchases using software, through medical representatives, and also from the direct manufacturer.

From our study, we found that there is a balance between online purchases and purchases through medical representatives since most of the retail shops place orders through them. In contrast, few chain pharmacies purchase bulk orders from direct manufacturers.

"Buying materials from medical representatives is profitable and that lessen the unwanted purchase. I use to put emergency purchases often, because we give what the customer need they come with various brands that are not available with us, so to not lose the customer we purchase for them. Some single pieces lies for long time that will be lose to us"

A chain pharmacy is also a community pharmacy that consists of four or more stores. They have a reasonable marginal profit by purchasing in bulk from a direct manufacturer.

Wonder soft, Varthagam, and Gofrugal technologies Pvt.Ltd were used for the online purchasing of the goods. In which majority of the participants reported on using the Wondersoft and Varthagam as their online platform for inventory management.

"Buying from the online wholesalers helps in reducing the expenses and investment. The various offers from them come under the budget and some profit can be taken out of it"

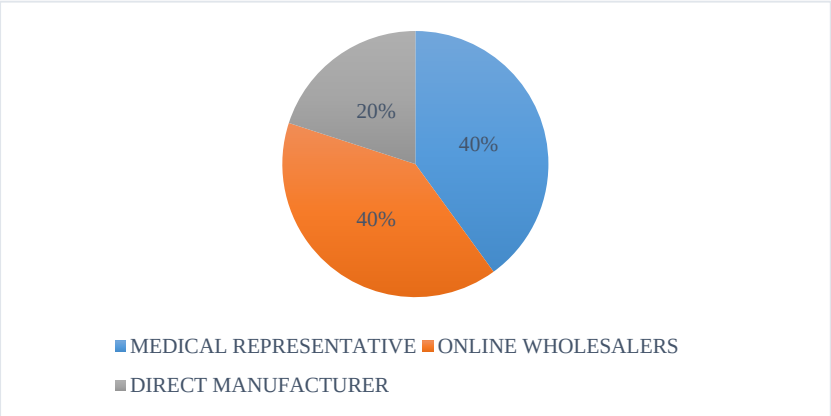

Figure 3: Purchasing Methods Used

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4. Stocking and Expiry

The damaged or expired products must be checked immediately while receiving them so that there is no harm to the health of the patient and the pharmacy doesn't face any profit loss.

"The damaged or misplaced or expiry products those things are checked while receiving the stocks and are returned or exchanged immediately."

Technology has exposed the human impact on the day-to-day handling of inventory. The initial manual work of the purchasing department included generating purchase orders, delivery orders, and monthly reports. As soon as possible, these tasks were moved to computers. Using computers for forecasting improves the profitability of an inventory management system.

"Computers mainly help in managing the stocks, it shows a dialogue box if we are out of stock. Also shows how much stock/quantity is present right at the moment."

Professionals in charge of regulating inventory must keep accurate records of it since it is essential to the pharmaceutical supply chain and contributes significantly to the risk of stock-outs and overstocking. An organization with a good inventory management system can determine what levels to maintain, when the inventory should be replenished, and the size of the order. Inventory levels for finished goods are viewed as a direct function of demand.

"Important to know how to stock and track down the availability to avoid out of stock, also to and avoid over stocked products that cause loss. Thus monthly expiry checking, and daily stock checking help is maintaining the needs."

Most of the respondents reported that the stocks are usually checked once in 2 days to identify the expiry and to purchase the fast-moving and frequently dispensed supplies. They also mentioned that the expired products are returned within 3 months.

"Expired drugs are returned within 3 months and we usually check stocks every day to stay in stock of products."

5. Purpose of Inventory Control Management

Companies use inventory management as a tool to plan, store, and replenish stock it maintain a sufficient supply of products while also reducing costs. Companies use keeping stock as a key approach to satisfy customers' needs while avoiding the risk of frequent shortages and upholding good service standards.

"Inventory Tools like FSN, ABC, and VED are used to avoid shortage of products."

"It helps in avoiding overstocking and also in tracking the stocks available."

Inventory management helps to avoid the ordering of the available stock which leads to the over-stocking. Hence, it majorly helps to reduce the annual investment of the pharmacy.

"It helps in reducing the annual investment and to know when to purchase."

Utilizing inventory management can help you provide better customer service and handle erratic demand. Uncertainty in demand is a possible issue that raises inventory cost and carrying costs, which results in an increase in prices and lower customer satisfaction and, ultimately, a less profitable firm.

"To run a pharmacy with less problem it is necessary to know from where the drugs are to be purchased with the less price and good quality and that are fast moving in the market. As low-moving will only stay on the shelves for a longer time and a waste of money."

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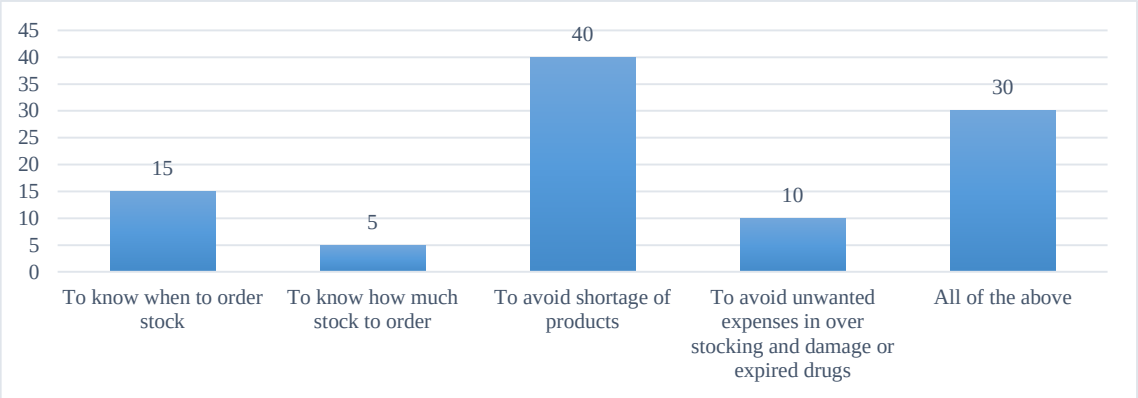
The responses given by the pharmacist regarding the purpose of the inventory. The majority of them that is around 40% use inventory to avoid shortage of the products in the pharmacy.

Figure 4: Purpose of Inventory According To Respondents in Percentage



Discussion

Inventory investment, a significant portion of a company's budget, is often neglected due to inadequate management. This results in excess cash due to long-standing merchandise build-up, negatively impacting a company's cash flow and its overall financial health.[25] The knowledge of inventory control management tools and methods is assessed by open-ended questions and along with the questionnaire. According to the results, there are only a few who practice these methods and others just work with their experience and skill. Young pharmacists are well aware of the inventory methods but are less likely involved in the purchasing or procurement of the drug. [26] 80% of them were aware of ABC, 50% were aware of VED, and 70% were aware of the FSN. They purchase based on the need and the movement of the drug among the customer. There is always a positive impact on organizational performance and inventory management. They objectify competitiveness through quality customer service, and product, reduction of cost, and meeting market demand in a flexible manner. [27] This result shows no relation between the study results of Jobira, where 15% of the overall respondents are unaware of the inventory management tools. [21] Studies show that a combination of the ABC-VED or XYZ-FSN matrix often had a better impact on the management of the inventory than using a single method.[10,11] The drug procurement methods and frequency of emergency purchasing were all similar to one another. Emergency purchases are often done only when the customer needs or there is a demand for that particular drug. In this study, about 40% were purchasing through medical representatives, 40% through online manufacturers, and 60% through direct manufacturers. The increase in the safety stock always decreases the occurrence of the shortage. Time and quantity are related to the changes in demand at present. [28] There are policies regarding the product return and purchases from the vendors. That includes the credits on purchase, replacement of the products in a given period, offers or cashback on purchase, and credits on future orders. [29] Given the purpose of inventory management, about 40% of them have said it helps to avoid shortage of the products, and 30% of them accepted all the reasons. Market competition, legislative issues, customer knowledge and expectation, microeconomic impacts,

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operational challenges, and coping strategies are quoted as some real challenges in the study conducted in Malaysia. [30] And based on the study conducted in Ethiopia, the challenges that are quoted as a theme are taken as an important challenges for this study such as managerial role, price and budgeting, poor training and knowledge, and inadequate human resources to work. [21] It is a crucial process to plan, organize, lead, and process management-related work with fewer human resources. Studies show that 13.6 % of pharmacists spend time in managerial roles like administration, organizing, or planning. They need to focus on both to achieve optimum productivity. [19] Thus a Community pharmacist needs to manage the administrative activities along with the total routine. In comparing these 2 studies, there is a gap between the professional knowledge and practice of inventory control management tools among pharmacy professionals, which impacts the pharmaceutical supply system's effectiveness. There are various studies conducted to analyse the effectiveness of inventory control tools but only a few mention the difficulty in practical applicability.

5. CONCLUSION

The core of the pharmaceutical supply chain is inventory control. The need for more understanding and appreciation of ill pharmaceutical inventory control by the proper organizations is directly linked to problems with it. Improved inventory management may address any issue that arises with inventory and assist the business in resolving issues by employing the right procedures and controls. This will lessen the significant financial investment issues and pave the path for averting similar situations. Almost all of the pharmacy personnel in the survey, according to the current findings, knew very little about inventory management. Although their lack of professional training was underlined they were able to obtain additional knowledge and skills from the experience. The pharmacy should begin considering modern and established strategies for managing pharmacies competitively and generating an effective marginal profit.

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