ABC-VEN MATRIX ANALYSIS OF PHARMACUTICALS INVENTORY MANAGEMENT AT SELECTED PUBLIC HEALTH FACILITIES OF
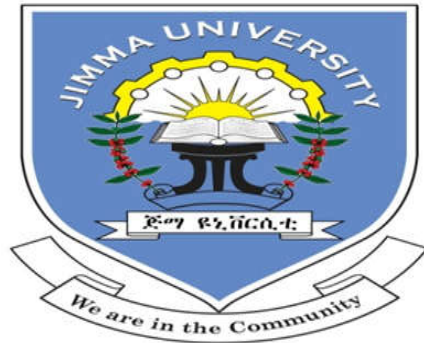
JIMMA ZONE SOUTHWEST ETHIOPIA

A MASTERS THESIS SUBMITTED TO JIMMA UNIVERSITY INSTITUTE OF HEALTH SCIENCES SCHOOL OF PHARMACY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR MASTER OF SCIENCE IN PHARMACEUTICAL SUPPLY CHAIN MANAGEMENT

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Abstract

Background: ABC-VEN matrix analysis is formulated by cross tabulating of ABC and VEN analysis and has a key role in assisting decisions making in medicine selection, purchasing and inventory management and hence help in reducing cost, identifying medicine use problems and improve efficiency in the pharmaceutical supply system. Combining ABC and VEN analysis forms a powerful tool for a critical analysis of medicine use and assists in containing the cost especially by restricting the expenditure on non-essential items.

Objective: The objective of the study was to analyze pharmaceuticals based on cost and criticality aspects and identify those which require stringent managerial control at selected public health facilities of Jimma zone for a fiscal year of 2009 E.C.

Methods and materials: Health facility based cross sectional study design using quantitative method in which ABC, VEN and ABC-VEN matrix analysis techniques were utilized to analyze pharmaceutical inventory management system at selected public health facilities of Jimma zone. The study was conducted from March 25 to April 25, 2018 at Jimma zone, Southwest Ethiopia.

Results: ABC analysis revealed that 11.38%, 14.67% and 14.89% of items consumed about 70% of annual pharmaceuticals expenditures at health centers, at hospitals and jimma university medical center respectively. VEN analysis showed that 43.13%, 60.2% and 63.68% of items were considered as vitals and consuming 32.9%, 72.3%and 85.58% for annual pharmaceutical expenditures at health centers, at hospitals and jimma university medical center respectively. From ABC-VEN matrix analysis, majority of items at different level of health facilities were Category I pharmaceuticals.

Conclusion and Recommendations: - Majority of items at different level of health facilities were Category I and most of the Category I pharmaceuticals in turn were Class A and V items which require great attention for their control and availability. ABC-VEN analysis techniques should be adopted for optimal and rational use of resources and elimination of stock out situations.

 Key words: ABC analysis, VEN analysis, ABC-VEN matrix analysis, Jimma, Ethiopia

Acknowledgment

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Acronyms

ABC - Always Better Control

APE- Annual Pharmaceuticals Expenditures

EB – Ethiopian Birr

E.C. –Ethiopian Calendar

GIN - Goods Issuing Note

HC- Health Centers

JUMC-Jimma University Medical Center

PFSA- Pharmaceutical Fund and Supply Agency

PH- Public Hospitals of Jimma zone

PHF- Public health facilities of Jimma Zone

SPSS – Statistical Package For Social Science

VEN/VED - Vital, Essential, Non-essential/Desirable

WHO –World Health Organization

1. Introduction

1.1 Background

About one third of the hospital budget is consumed on purchasing materials and supplies including medicines(1,2).This requires effective and efficient management of the medical stores through efficient priority setting, decision making in purchasing and distribution of specific medicines, close supervision on medicines belonging to important categories, and prevention of pilferage(3).

The goal of the pharmaceutical supply system is to ensure that there is adequate stock of the needed items are available and affordable so that an uninterrupted supply of all essential items is maintained(4–6). A study conducted by the Department of Personnel and Administrative Reforms in India has revealed that not only does the quantity of medicines received fall shortage, but also the supply system is often erratic. Even essential medicines are out of stock for long period of time(5).

Inventory analysis seeks to achieve maximal output with minimal investment input, based on the economic principle of stretching the limited means to meet unlimited ends(7).The analysis of the cost of the inventory can be done to characterize medicines in distinctive groups and each of the groups can be managed according to its characteristics to improve efficiency(8).

Among various selective inventory control techniques, Always, Better Control (ABC) and Vital, Essential and Desirable (VED) analysis are commonly used(6,9).ABC analysis is a method of categorize items in terms of their cost. It is also known as the V.Pareto principle "separating the vital few from the trivial many" because, for any group of things that contribute to a common effect, a relatively few contributors account for a majority of the effect (9,10).

ABC analysis guide administrators and policy makers in identifying areas where policy interventions may have the greatest impact(11). The analysis classifies the items into three categories: the first 10-20% of the items account for approximately 70-80% of cumulative value (cost) of items is category A, 10-20 of cumulative value (cost) of items are category B and the remaining 60-80% is category C items, amounting about 5-10% of the total value. A items should have tight inventory control under top level manager. Reorders should be more frequent. B items require medium attention for control. C items require minimum attention and may be kept under simple observation and Reordering is less frequent (12).

The limitation of ABC analysis is that it is based on only monetary value and the rate of consumption of the item. In a hospital, an item of low monetary value and consumption may be very vital or even lifesaving. Their importance cannot be passed over simply because they do not have high consumption value and appear in category(2,6).

Therefore, another parameter of the medicine is their importance/criticality. VEN analysis of pharmaceuticals is based on criticality and health impact for patients they could be classified into three categories: vital, essential and non-essential/ desirable. Vital items (V):- The medicines that are critically needed for the survival of the patients, which must be available in the health facility all the times and they are vital for functioning of a health care establishment and whose shortage will have serious adverse effects on routine functioning of the organization. Essential items (E) are the items whose shortage or non-availability can only be afforded for a short time and if their shortage continues for anything more than the shortest time, the facility is functioning but quality of serves would be affected seriously and adversely. Non-essential (N): The remaining medicines with lowest critically, the absence of which will not be detrimental to the health of the patients. These are items whose shortage would not affect the routine functioning of an organization even if the shortage is for a long time. For V items, a large stock of inventory is generally maintained, while, for N/D items, the minimum stock is enough(1-2,12-14).

ABC -VEN matrix analysis formulated by tabulating ABC and VEN analysis and have a key role in assisting decisions making in medicine selection, purchasing and inventory management and hence help in reducing cost, identifying medicine use problems and improve efficiency in the pharmaceutical supply system. Combining ABC and VEN analysis forms a powerful tool for a critical analysis of medicine use and assists in containing the cost especially by restricting the expenditure on non-essential items(15). Studies on analysis of pharmaceuticals expenditures throughout the country was very limited, this resulted in difficulties to know actual percentage pharmaceuticals expenditures of the country based on cost and criticality aspects, at jimma zone public health facilities no studies found yet. Therefore the purpose of this study was to analyze pharmaceuticals expenditures based on cost and criticality aspects of public health facilities of jimma zone. Jimma zone is one of the 21 zone of Oromia regional states and the zone covers total area of l99, 326.28km^2 which is administratively sub-divided into 21 woreda and 55 Keble. There were about 630 public health facilities i.e. (7 hospitals, 111 health centers and 512 health posts) in the zone with a total of 3990 health professionals.

1.2. Statement of the problem

Around one third of the population globally lacks reliable access to essential medicines and the situation is even worse in the poorest countries of Africa and Asia (16). Due to lack of essential medicines every year globally infectious diseases kill about 13 million people the prevalence is higher in developing countries (17).

Increasing expenses on pharmaceuticals is a major concern for healthcare systems globally, but the situation is more worrying in developing countries like Ethiopia, because of the insufficiency of financial resources and inefficiency in pharmaceuticals management(18). In most cases these scare resources are not used efficiently, this inadequacy and inefficient use of resources results in stock outs of essential medicine which may have serious consequences for the patients. In case of stock out patients may have to travel to other facilities which may be expensive, they may go without the medication they need, they may seek an alternative which may be appropriate or not and they may also lose confidence in the public health system for failing to provide for their needs. This will negatively affect access and quality of healthcare (15).

Ensuring medicines availability is an important goal of health care system as medicines are an important building block of health system. Some of the factors of the occurrence of stock out at health facilities were mainly due to the way of stocks are managed at health facilities and could be as a result of the inventory control methods used, information and reporting systems used, capacity of the health facilities as well as health workers and communication between key actors in the processes (19).

In Ethiopian people about 350,000 children die each year and more than 90 percent of these deaths are from preventable or treatable causes like pneumonia, diarrhea, malaria, malnutrition, HIV and AIDS, and others (20). This mainly related with number of inventory management problems reported, some of the problems are non-availability of essential drugs, poor storage, Poor stock management, irrational use, Poor dispensing and prescribing practices, Low level of patient knowledge about drugs dispensed to them; Long stock out period of essential drugs in public health care facilities, Wide variation in storage conditions of public health care facilities, some of them falling below acceptable level, and high percentage of wastage rate (8.2%) due to expiration(21). In addition to these Pharmaceutical supply systems in Ethiopia stocking items

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those are on the formulary or essential medicines list. But, often no differentiation is made between vital and non-essential items, between high-cost and low-cost items, or between items that move quickly and those that are rarely used. This lack of discrimination often leads to wastage of financial resource and these will negatively affect quality of service. Also analysis of medicine expenditures in Ethiopia public health care facilities is rarely reported, in Jimma zone no report is found yet. Hence creating a research gap; and the aim of this study was done to fill this gap.

2. Literature review

2.1. Global medicines expenditures situation

Global medicines expenditures situation Average per capita spending on pharmaceuticals in developed countries was observed to be 100 times higher compared to developing countries about US$ 400 compared with US$ 4. WHO also estimated that 15% of the world population consumes over 90% of the world's production of pharmaceuticals and these are people residing in high income countries. The report also pointed out that the persistence of unreliable medicines supply systems is one of the main reasons as to why many countries are unable to ensure a regular, sustainable supply of essential medicines. Failures at any point in the supply system can lead to shortages of medicines and avoidable suffering and deaths. In addition, inefficient procurement systems have been found to pay up to twice the global market price for essential medicines and lead to unnecessary waste of funds (22).

In Ethiopia the annual pharmaceutical market is estimated to be worth US$ 400 to US$ 500 million by 2015 and growing at an impressive rate of 14% per annum to reach at an approximate value of just under US$ 1 billion by 2018(19). Two factors considered important in medical logistics management are cost and the criticality of the item(23).

2.2 ABC-VEN Analysis

Study conducted on drug inventory control analysis at a primary level Health care facility in Rural Tamil Nadu, India stated that about one third of hospital budget is consumed on buying supplies including medicines. The cost and need of these medicines vary widely depending on the level of health care and the population provided. Effective and efficient drug inventory management techniques are necessary for efficient health care delivery(24).

Study conducted on analysis of Inventory of drug and pharmacy department of a tertiary care hospital in India stated that the main concern of health facilities management is allocation of resources on a rational basis and management must lay focus on the cost analysis and formulate guidelines for the definitions of cost and established standards through cost analysis because cost analysis is a research tool for the financial management in a facilities(25).

Another similar study conducted on medical material inventory control analysis at university hospitals in turkey ABC analysis showed 12%, 21% and 67% medical materials as A, B and C category, respectively, accounting for 70%, 20% and 10% of annual medical materials expenditure. VED analysis found out 11%, 68% and 21% items as V, E, and D category, respectively, accounting for 20%, 54% and 26% of annual expenditure. On ABC-VED matrix analysis, 20%, 67% and 13% medical materials were found to be category I, II and III, respectively, accounting for 78%, 17% and 5% of annual medical materials expenditure and the management of class I (301 items) vital medical materials requires top managerial control and these materials must be constantly available in stock for uninterrupted health care service(26).

Another similar study conducted on drug inventory management of a pharmacy using ABC and VED analysis in Turkey, ABC analysis results revealed that, 160(10.31%) of drugs in A class and 338(21.78%) of drugs in B class constituted 89.98% of the total pharmacy expenditure. The remaining 1054 (67.91%) of drugs which are in category C, constituted only 10.01% of the ADE. VED analysis results revealed that, 167(10.67%) of drugs in V class and 706 (45.49%) of drugs in E class constituted 79.16% of the total pharmacy expenditure. The remaining 679 (43.75%) of drugs which are in category D, constituted 20.84% of the ADE ABC-VED analysis showed that 270 (17.04% drugs belong to category I and constituted about 79% of the ADE of the pharmacy. Category II consisted 526 (33.9%) of drugs, which accounts for 17.3% of the ADE of the pharmacy. The remaining 526(33.9%) drugs are in category III, accounts for only 2.57% of the total drug expenditure (27).

A study conducted on inventory management by ABC, VED and ABC-VED matrix analysis in pharmacy department of a tertiary care teaching hospital in India, ABC analysis revealed that, 21.22% 27.65% 51.13% items represented A, B and C category items, respectively, amount for 68.50%, 21.91% and 09.59% of annual drug expenditure of pharmacy. About 12.30% 15.80% 71.90% items were found to be V, E and D category items, respectively, amounting for 19.46%, 17.55% and 62.99% of annual drug expenditure of pharmacy. ABC-VEN matrix result reveled that There were 25.40% items in category I, 30.36% items in category II and 44.36% items in category III, amounting for 70.38% , 19.36% and 10.26% of annual drug expenditure of pharmacy, respectively(28).

The study conducted on ABC and VED Analysis of the pharmacy store of a Tertiary Care, academic institute of the northern India to identify the categories of drugs needing strict management control, ABC analysis revealed that out of the total drug formulary 42 (11.23%), 92 (24.6%) & 282 (75.4%) items were in the A,B & C categories respectively costing 70.19%, 19.83% & 9.98% respectively. Similarly VEN analysis shown that 47 (12.4%), 228 (60.16%) & 104 (27.4%) item were placed into the V, E & D categories and utilized 25.05%, 66.91% & 8.04% on the respective category of drugs (29).

The study conducted in Kuwait on application of ABC and VED analysis for a pharmaceutical distributor's inventory, ABC analysis revealed that 70%, 20% and 10% categorized as A, B and C account for 69.77% of the ADE VED Analysis was observed that 10% of the drugs were classified as Vital consuming 9.43% of ADE, 63% of drugs comprised "Essential items" consuming 81.42% of the ADE, and the remaining 27% of drugs were classified as "Desirable items" consuming 9.15% of the ADE. The ABC-VED matrix Category I consisted of 27 drugs consuming 71.02 % the total ADE, Category II Items, comprised 51 items consuming 27.10 % ADE, and Category III Items consisted of the remaining 22 items consuming only 1.88 % of the total ADE(10).

Study conducted at government medical college, Aurangabad drug store on ABC-VED matrix analysis, ABC analysis shown that 20 items (16.8%) in category A consume 70%, 26 items (21.8%) in category B consume 20.1% and 73 items (61.4%) in category C consume 9.9% of the total ADE. VED analysis of the drug inventory shown that 42 items (35.3%) in vital category consume 34.3%, 60 items (50.4%) in essential category consume 49.5% and 17 items (14.3%) in desirable category consume 16.2% of the annual drug expenditure. An ABC-VED matrix analysis revealed that 57 items (47.9%) consuming 82.3% of the ADE belong to Category I, 52 items (43.7%) consuming 16.5% of the ADE belong to Category II and 10 items (8.4%) consuming 1.2% of the ADE belong to Category III (1).

Study conducted on Inventory control techniques in medical stores of a tertiary care neuropsychiatry hospital in Delhi, ABC analysis revealed that, 3.45% (5), 6.9% (10) and 89.65% (130) items represented A, B and C category items, respectively, amounting for 70.5%, 19.68% and 9.83% of annual drug expenditure of the medical store. about 32.41% (47), 61.38% (89) and 6.2% (9) items were found to be V, E and D category items, respectively, amounting for 70.9%

28.72 and 0.38% of annual drug expenditure of the medical store There were 49 (33.8%) items in category I, 87 (60%) items in category II and 9 (6.2%) items in category III, amounting for 92.33%, 7.29% and 0.38% of annual drug expenditure of the medical store, respectively(3).

Study conducted in Sudan on an ABC-VEN analysis showed that small number of items account for large proportion of the fund whereas large number of items C account only for small proportion of total fund. Similarly, the VEN analysis showed that small number of items from Class V account for 5.46%, whereas Class N items that account for 26.43% of the total fund(30).

Similar study conducted at Tikur Anbessa Specialized Hospital on an ABC-VEN matrix analysis, majority of items were Category I. Most of the Category I pharmaceuticals in turn were Class A and V items which require great attention for their control and availability. The study findings clams that there are huge pharmaceuticals in TASH, which need proper control and supervision at different levels of management. The results indicate that need for routine application of scientific pharmaceutical inventory management tools such as ABC-VEN matrix analysis to improve efficiency of resource use and patient care(6).

2.3. Challenges of pharmaceutical inventory management (ABC-VEN matrix analysis)

Failures at any point in the supply system, poor information and reporting systems between key actors in the processes. lack of logistics skills in ordering, unavailability of medicines at supply point, Human resource shortages, undefined procedures on ordering frequency and quantity, which are linked to lack of knowledge of the meaning of inventory management, as well as inefficient and ineffective management, expiries due mainly to improper quantification poor inventory management were identified as common challenges with inventory managements of pharmaceuticals (19,31-33).

2.2 Conceptual Framework

This conceptual framework was developed by reviewing different literature which is related to the ABC/VEN matrix analysis of pharmaceutical inventory management at health facilities.
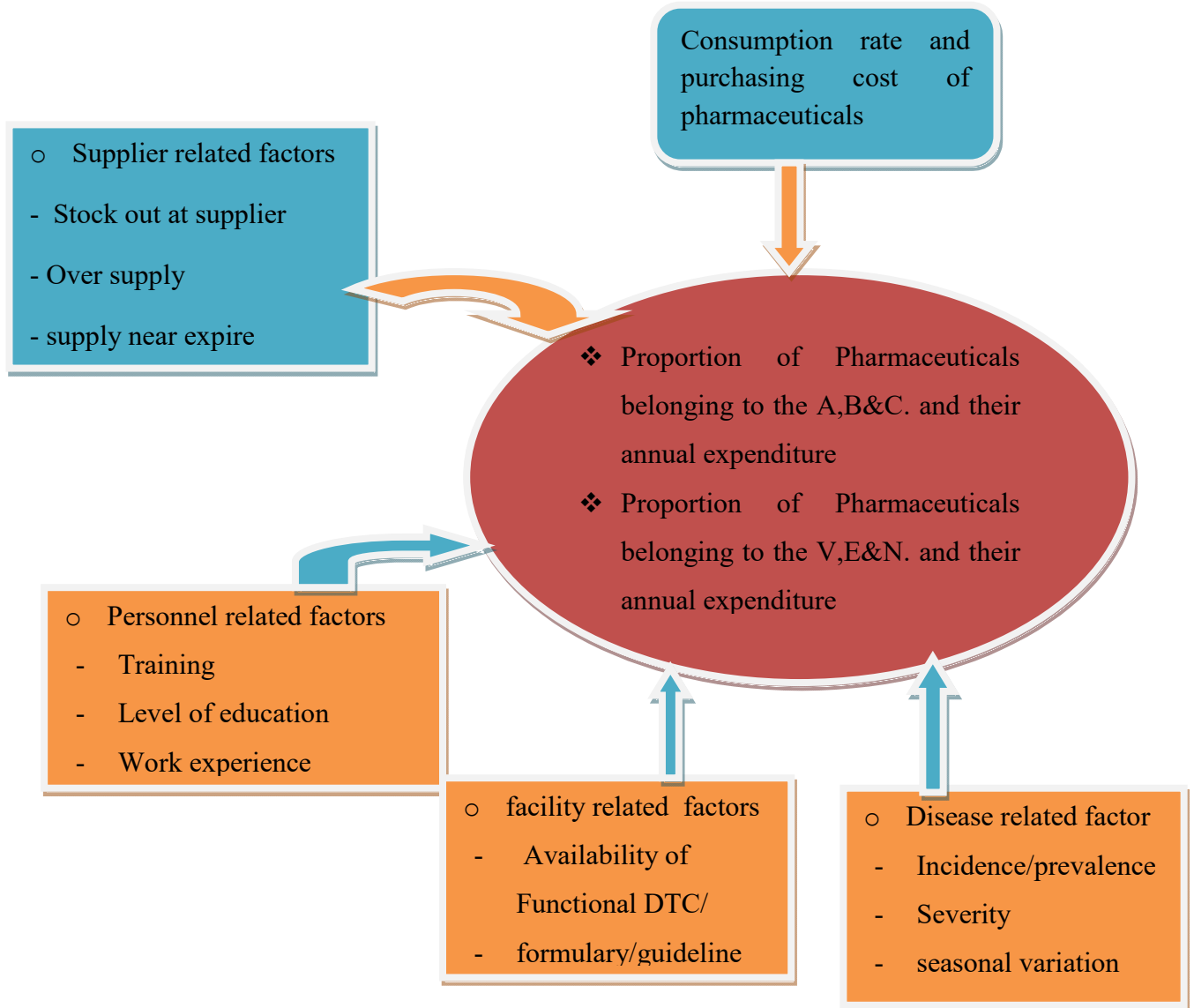
Figure 1- Conceptual frame works of factors/challenges determining ABC-VEN Matrix analysis of pharmaceutical inventory management.

2.3 Significance of the study

To ensure constant availability of needed drugs and medical supplies pharmaceutical store should managed efficiently using appropriate inventory management techniques. The most commonly used methods are the Always Better, Control (ABC) and Vital, Essential and Non-essential (VEN) categorization methods. This method was used in this study.

The result of this study will be used to improve knowledge on categorization of items in terms of both costs and criticality aspect, Also to create a priority system that not only improves pharmaceutical supply system but, also improves availability of essential medicines and limits negative effects of on patient due to shortages and stock outs. Study will be also useful in proposing areas of improvement in procurement of medicines and its management. It also proposes measures to facilitate better performance of pharmacy regarding assessment of plan and priorities on purchasing medicines, increase efficiency in resource use.

 It will be also source of information for pharmaceutical fund and supply agency (PFSA), for policy makers and for public health facilities those involved in the study as an input to develop selective inventory management policies, using the available resource as economical as possible without compromising quality of services provided and to develop facility specific Vital, Essential and Non-essential (VEN) lists for essential medicines.

Also there has been no previous studies done at Jimma zone public health facilities on selective inventory management techniques and this study will form a baseline for future studies.

3. Objective

3.1. General objective

- The objective of the study was to analyze pharmaceuticals based on cost and criticality aspects and identify those which require stringent managerial control at selected public health facilities of Jimma zone for a fiscal year of 2009 E.C.

3.2. Specific objectives

- To Analyze the annual pharmaceutical expenditures using ABC analysis
- To Analyze the annual pharmaceutical expenditures using VEN analysis
- To identify the pharmaceutical categories requiring greater supervisory monitoring based on ABC-VEN matrix analysis.

4. Methods and materials

4.1. Study area and period

The study was conducted in selected public health facilities of Jimma zone south west Ethiopia. Jimma zone covers total area of l99, 326.28km^2 which is administratively sub-divided into 21 woreda and 55 Keble. There were about 630 public health facilities i.e. (7 hospitals, 111 health centers and 512 health posts in the zone with a total of 3990 health professionals (92 medical doctors, 312 health officers, 1544 nurses, 310 midwifes, 141 Pharmacists, 226 laboratory professionals, 59 druggist, 1142 health extension workers, 75 environmental health practitioners 24 Anastasia, 10 biomedical engineers and 55 miscellaneous health professionals. The study was conducted from March 25 to April 25, 2018 in Jimma zone, Southwest Ethiopia.

4.2. Study design

Health facility based cross sectional study design using quantitative method was employed in which ABC, VEN and ABC-VEN matrix analysis techniques were utilized to analyze pharmaceutical inventory management system at selected public health facilities of Jimma zone.

4.3. Population

4.3.1. Source population

All health facilities of jimma zone, which includes hospitals, health centers, and health posts and all health professionals working in those health facilities were source population of the study.

4.3.2. Study population

Selected public health care facilities in jimma zone were taken as the study population. The source of data that are important to this study were collected from each selected public health care facilities pharmaceutical records (model 22), medical expertise and, key pharmacy professional working at the selected public health facilities responsible for managing pharmaceuticals.

4.4. Eligibility criteria

4.4.1. Inclusion criteria

- Pharmaceuticals which include drugs and consumable medical supplies that are purchased by public health facilities were included in the study.
- Purposely selected Medical experts and pharmaceuticals managers from selected public health facilities were included in the study.

4.4.2. Exclusion criteria

- All program drugs include antiretroviral drugs, anti-tuberculosis drugs and family planning drugs were excluded from this study.
- Health posts were also excluded because they are under the umbrella of health centers & most of the logistic practices are done at health center.

4.5. Sample size determination and sampling techniques

1. USAID deliver project logistics indicators assessment tool (LIAT) recommends to take minimum of 15% of the total health facilities in the study area(34). Therefore 18 Public health facilities were taken from a total of 118 public health facilities. Then facilities were stratified based on level of facilities in to Jimma University Medical Center (JUMC), Public Hospitals (PH) and Health Centers (HC), from which JUMC and all PH were taken purposely because they are limited in number. But, HC were stratified based on their woreda and simple random sampling technique using lottery method was employed to select health centers.

2. Medical expertise of selected facilities was taken purposively based on the level of work experiences at respective unit. Pharmaceutical managers from selected public health care facilities were also taken purposely.

4.6. Study variables

- o Proportion of Pharmaceuticals belonging to A, B&C and their annual expenditure
- o Proportion of Pharmaceuticals belonging to the V,E&N and their annual expenditure
- o Proportion of Pharmaceuticals belongs to category I,II and III and their annual expenditures

4.7. Data collection tools and Data collection procedures

1. Document review was utilized for ABC Classifications and this was done by using Goods Issuing Note (GIN) also called model 22. From model 22 total quantities of each items issued from the store along with their unit price was taken.

2. Medical expertise of selected facilities were identified cases from respective unit and formats which was developed by management for health Sciences was Customized and used as format for VEN Classification (35).

4.8. Data processing and Data analysis

Once data was collected then transcribed in a MS Excel spreadsheet. Statistical analysis was done using the MS Excel statistical functions and SPSS was done using following parameters and procedures:

4.8.1. ABC Analysis

List of all pharmaceuticals purchased and consumed by public health facilities along with their consumption quantity and unit cost for the period of 12 months i.e. Fiscal year of 2009 E.C was obtained. Then data was transcribed in an MS Excel spread sheet and aggregated based on the level of facility (health centers, public hospital, Jimma university medical center and public health facilities of Jimma zone (PHF (public hospitals and health centers)). then a total cost of each item was calculated by multiplying cost of each unit by the total quantity of that item. Then items were arranged in descending order of their costs. Cumulative cost of the list, as well as the cumulative percentage of expenditure was calculated. Then categorized according to their costs based on ABC analysis.

Cut-off points or boundaries for Class A, B and C items were chosen; using study conducted in Aurangabad drug store India, items were classified as follows: items that had highest annual usage, with only about 10% of the items that coasted about 70% of the total utilized pharmaceuticals budget were classified as Class A items. Class B items were those that accounted for approximately 20% of the items and used about 20% of the funds. Lastly the Class C items; these accounted approximately 70% of the items but used only 10% of the budget (1).

4.8.2. VEN Analysis

Pharmaceuticals for identified cases from different level facilities were aggregated based on level of facilities and criticality analysis was conducted by using VEN classification format on MS Excel spread sheet (35). As follows

- Those pharmaceuticals which were used to prevent and cure or to prevent serious disease was taken as vital (V) items. Pharmaceuticals which were vital in one ward's of a given facilities continued to be vital for this facilities, even if it is essential or Non-essential at different ward's of a given facilities.

- Those pharmaceuticals which were used to cure serious and self limiting disease or cure serious disease were taken as Essential (E) items. Pharmaceuticals which were essential in one ward's of a given facilities continued to be essential for this facilities, even if it is non-essential at different ward's of a given facilities.

- Those pharmaceuticals which were used to treat self limiting disease were taken as non essential (N) items. Then once criticality analysis of pharmaceuticals was done on MS Excel spread sheet, data from MS Excel spread sheet exported to SPSS and descriptive analysis was done.

4.8.3. ABC-VEN Matrix Analysis

The data was couple into an ABC-VEN matrix by cross-tabulating the ABC and VEN analysis on MS Excel spread sheet. This resulted in categorization of items into three main categories (I, II and III). Category I include of items belonging to AV, AE, AN, BV and CV subcategories. The BE, CE and BN sub-categories were included in category II, and the category III were represented by items in the CN subcategory. The first alphabet of these subcategories represents its position in the ABC analysis, whereas the second alphabet represents its place in the VEN analysis.

4.9. Data Quality Management

Data abstraction format was designed carefully to enable the data collectors to collect all necessary information needed to address study objectives. Pre-test was conducted in one hospital and selected health centers and the facility in which pretest was done not includes in to study population. One day Training on data abstraction format and general procedures of data

collection was given. Supervisor was strictly supervising data collectors and facilitates the daily activities. Standard format for data collections was utilized, missing value for price data was handled by cross checking price data from finance section and missing value for treatment of choice for identified cases handled by cross checking with standard treatment guide lines and medications prescribed by different prescribers for the same case. Every day after data collection, the formats was reviewed and checked for completeness by the principal investigator.

4.10. Dissemination plan

The final result of the study was presented to Jimma University, Institute of health science, school of pharmacy and the documents will be disseminated to the University community, Jimma zone PFSA hub, Jimma zone health bureau and public health facilities included in the study through submission of hard copy and finding of study will be published in to reputable professional journal for publication so as to serve as base line for further studies.

4.11. Ethical consideration

The research proposal was approved by Institutional Review Board of Jimma University and ethical clearance was given by Jimma University. Supportive letters was obtained from jimma zone health bureau and Jimma town health bureau to all facilities included within the study and written and oral permission was obtained from health facility administrators after informed about the objective of the study before starting data collection.

The willingness of the study participants was asked to participate in the study with written consent. Confidentiality was assured by using codes instead of writing the name of the persons involved.

4.12. Operation Definition and definition of Terms

A items – stock of items those utilized 70% annual pharmaceutical expenditures**.**

Always Better Control (ABC) –selective inventory control technique in which pharmaceuticals were classified based on their annual consumption value, A items were most costly and C items were least costly.

Annual pharmaceutical expenditures – is annual expenditures spent by a given level of health facilities for all pharmaceuticals included in the study.

B items - stock of items those utilized 20% annual pharmaceutical expenditures**.**

C Items - stock of items those utilized 10% annual pharmaceutical expenditures**.**

Category I - are high priority group items, requires greatest attention it contain all the vital and costly items, whose shortage may adversely affect the functioning of the facility or whose over stocking and pilferage may lead to financial loss.

Category II - are items under moderate management and moderate attention are devoted. These items are essential but are less costly and can have lesser stringent controls.

Category III - items which are desirable but would not affect the functioning of the facility even if they are not available for a long time and they are under simple management and receives loose attention.

Essential (E) Items – Those pharmaceuticals which were used to cure series and treat self limiting disease or cure serious disease were taken as Essential (E) items.

Inventory - the stock of pharmaceutical products retained to meet future demand.

Non- essential (N) - pharmaceuticals which were used to treat self limiting disease were taken as non-essential (N) items

Pharmaceuticals - Medical items which includes drugs and consumable medical supplies

Medical expertise – health practitioners working in medical area and have direct contact with patient.

Public health facilities -are places where in which healthcare serves was provided. For this study it includes public hospitals and health centers,

Vital (V) - Those pharmaceuticals which were identified by medical expertise to prevent and cure or to prevent series disease was taken as items.

Vital, Essential and Non-essential/Desirable (VEN/D) Analysis -This is selective inventory categorization method where pharmaceuticals are classified according to their importance into vital, essential and non-essential/desirable categories.

5. Results

This study was conducted in eighteen selected public health facilities of Jimma zone among which five of them were hospitals and thirteen of them were health centers. A total 346 and 227 pharmaceuticals were identified for ABC and VEN analysis at selected public health facilities of Jimma zone, 202 and 102 pharmaceuticals were identified for ABC and VEN analysis at selected health centers of Jimma zone, 327 and 181 pharmaceuticals were identified for ABC and VEN analysis at selected public hospitals of Jimma zone, 329 and 179 pharmaceuticals were identified for ABC and VEN analysis at JUMC respectively. Finding of the study focused on ABC, VEN and ABC-VEN Matrix analysis of Pharmaceuticals inventory management and the finding of the study presented based on the level of health facilities.

5.1. ABC Analysis

5.1.1. ABC Analysis for Selected Public Health Facilities of Jimma Zone (PHF)

About 346 items were utilized and consumed 12,266,061.67 EB in 2009 E.C. The ABC analysis shows that class A items accounted for 53(15.3%) number of items and consumed 8,581,673.85 (69.96%) EB of annual pharmaceuticals expenditures (APE). Whereas class B and C items accounted for 72(20.8%) and 221(63.8%) number of items that consumed 2,445,932 (19.97%) and 1,240,145.5(10.1%) EB of APE at selected public health facilities of jimma zone.

Table 1. Summary of Pharmaceuticals expenditures by ABC classification at selected public health facilities of Jimma zone, May 2018.

ABC Analysis	Class A	Class B	Class C	Total
Number of items (%)	53(15.3%)	72(20.8)	221(63.8%)	346(100%)
Annual consumption	8,581,673.85	2,445,932	1,240,145.5	12,266,061.67
Value In birr (%)	(69.96%)	(19.97%)	(10.1%)	(100%)

Out of 53 A class items two items (amoxicillin -500mg capsule and 0.9% sodium chloride) were utilized 12.38% of total APE.

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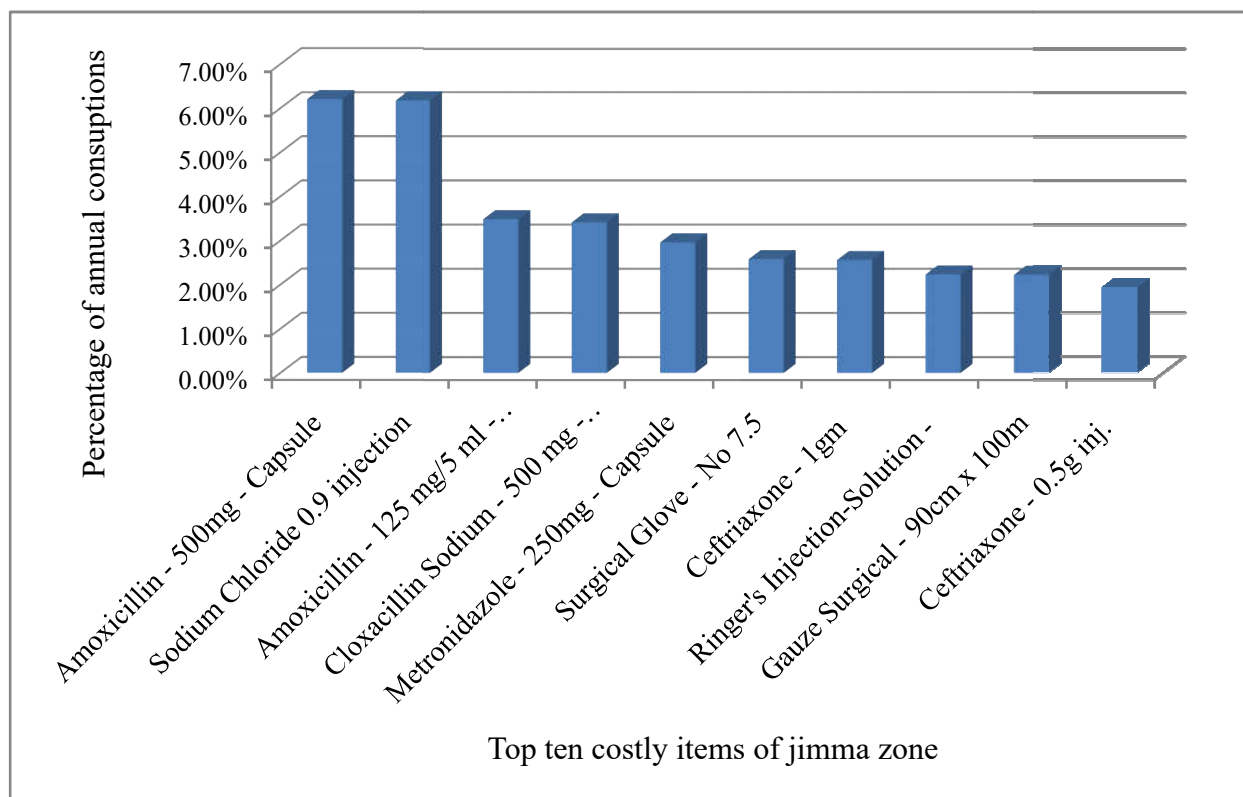
Figure 2. Top ten most cost items of selected public health facilities of jimma zone, May 2018.

5.1.2. ABC Analysis of selected Health Centers (HCs)

About 202 pharmaceuticals were utilized and consumed 2,307,539.41EB in 2009 E.C. ABC analysis shows that class A items accounted for 23(11.38%) number of items and consumed 1,602,076 birr (69.42%) of annual pharmaceuticals expenditures. Whereas class B and C items accounted for 47(23.3%) and 132(65.3%) number of items that consumed 470,092 (20.37%) and 235,370(10.2%) EB of APE at selected health centers in jimma zone.

Table 2. Summary of annual pharmaceuticals expenditures at health centers by ABC classifications, May 2018.

ABC Analysis	Class A	Class B	Class C	Total
Number of items (%)	23(11.38%)	47(23.3%)	132(65.3%)	202(100%)
Annual consumption	1,602,076	470,092	235,370	2,307,539
Value In Birr (%)	(69.42%)	(20.37 %)	(10.2%)	(100%)

Class A items were observed to be of an interest since they consumed large part of the budget and therefore the study went further on looking at the composition of the class.

The findings show that 10(4.9%) of items consumed about 50.79% of the annual Pharmaceuticals budget. Tetanus Antitoxin (Human) Equine - 1500 Units – Injection had a percentage total value of 10.20%, Amoxicillin - 500mg – Capsule used 10% whereas Metronidazole - 250mg – Capsule and Amoxicillin - 125 mg/5 ml - Suspension had the 6.96% and 5.23% percentage of APE respectively.
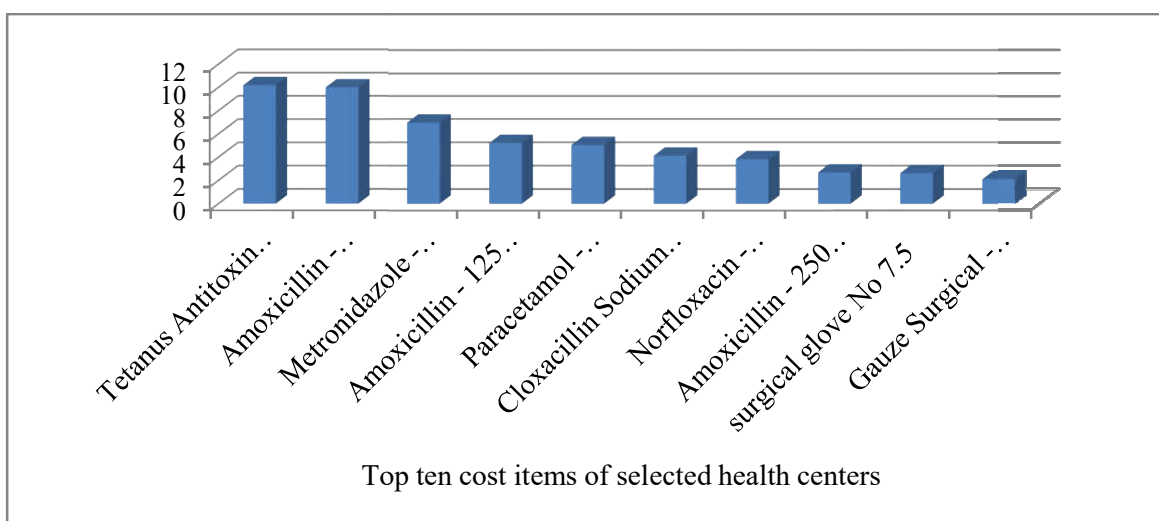
Figure 3 Top ten costly items of selected health centers among A class items, May 2018.

5.1.3. ABC Analysis for Selected Public Hospitals of Jimma Zone (PH)

A total of 327 items were utilized and consumed 10,552,665.81 EB in a fiscal year of 2009 E.C. ABC analysis shows that Class A items accounted for 48(14.67%) number of items and consumed 7,359,619.3 (69.7%) EB of APE. Whereas Class B and C items accounted for 69(21.1%) and 210(64.2%) number of items that consumed 2,129,503(20.1%) and 1,063,543.14 (10.07%) EB of APE respectively at PH.

Table 3 Summary of annual pharmaceuticals expenditures by ABC classification at selected hospitals of jimma zone, May 2018.

ABC Analysis	Class A	Class B	Class C	Total
Number of items (%)	48(14.67%)	69(21.1%)	210(64.2%)	327(100%)
Annual consumption	7,359,619	2,129,503	1,063,543.14	10,552,665.81
Value In Birr (%)	(69.7%)	(20.1 %)	(10.07%)	(100%)

Out of 48 A class items Tetanus Antitoxin (Human) Equine - 1500 Units – Injection consumed 12.52% of budget by A class items, Sodium Chloride - 0.9% injection and Amoxicillin - 500mg – Capsule consumed 10.15% and 7% of A class expenditures respectively.
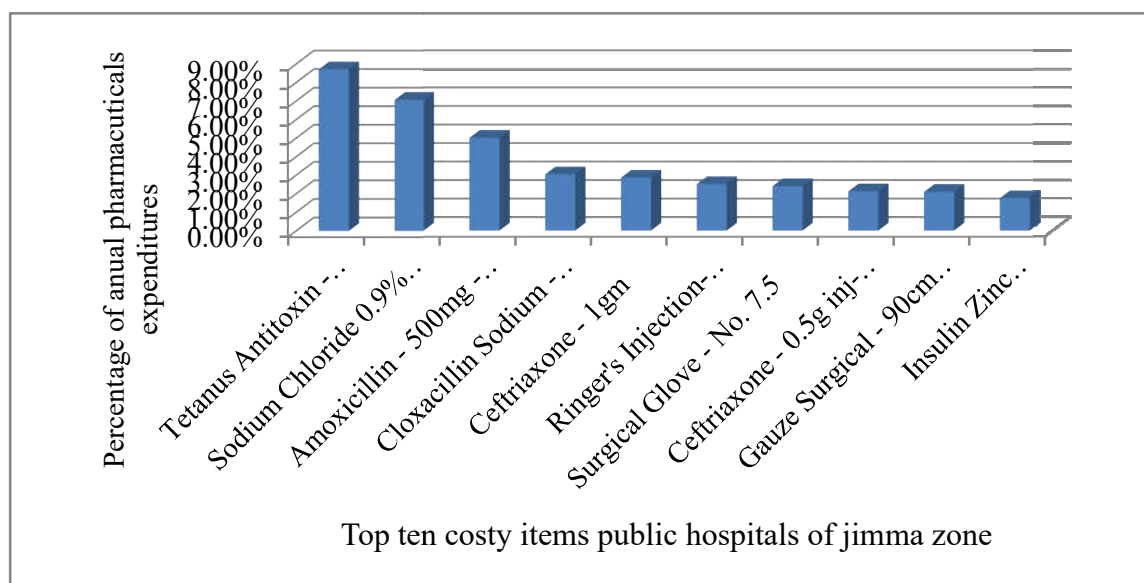
Figure 4 Top ten costly items public hospitals of jimma zone, May 2018.

5.1.4. ABC Analysis of Jimma University Medical Center (JUMC)

Jimma university medical center consumed about 329 Pharmaceuticals and utilized 22,765,511 EB in 2009 E.C. ABC Analysis shows that class A items accounted for 49(14.89%) number of items and consumed 15,898,134 EB (69.83%) of annual Pharmaceuticals expenditures, Whereas class B and C items accounted for 67(20.36%) and 213(64.7%) number of items that consumed 4,562,533 (20%) and 2,304,844 (10.12%) EB of APE respectively.

Table 4. Summary of Pharmaceuticals expenditures by ABC classification, at Jimma University Medical Center May 2018.

ABC Analysis	Class A	Class B	Class C	Total
Number of items (%)	49(14.89%)	67(20.36%)	213(64.7%)	329(100%)
Annual consumption	15,898,134	4,562,533	2,304,844	22,765,511
Value In Birr (%)	(69.83%)	(20%)	(10.12%)	(100%)
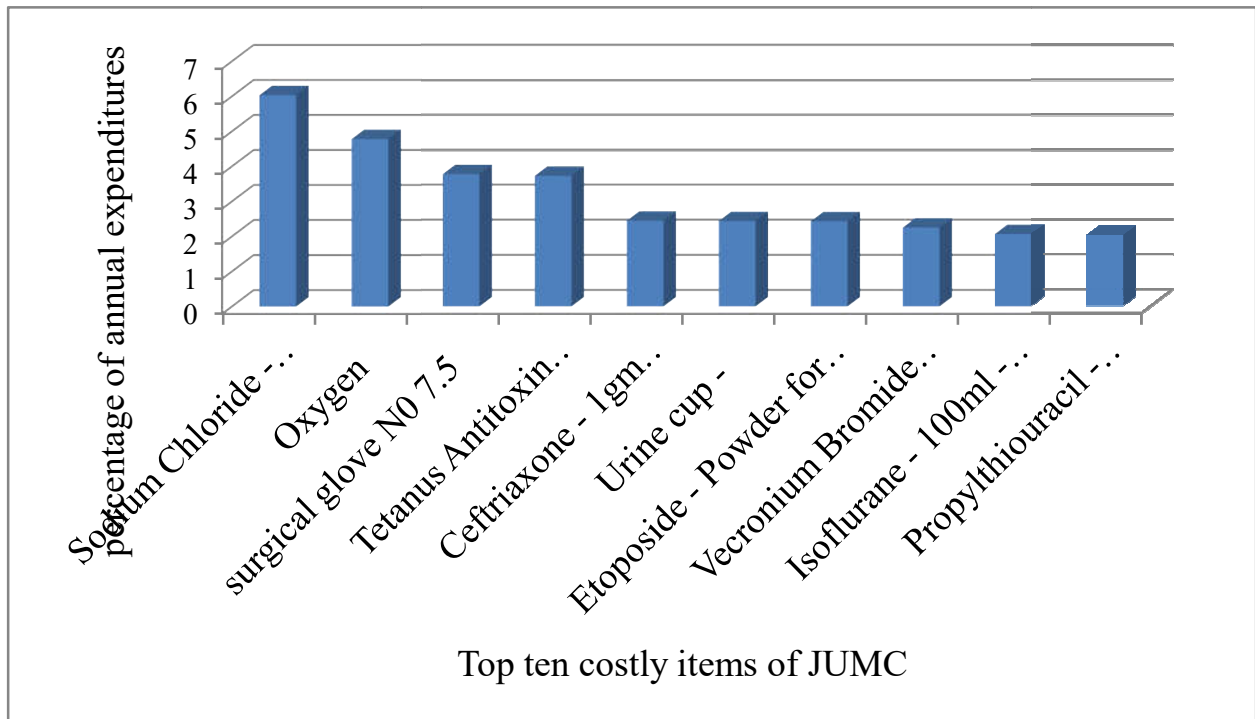
Figure 5 Shows Some of A class items those utilized majority of pharmaceuticals expenditures of Jimma university medical center, May 2018.

5.2. Vital, Essential and Non-essential (VEN) classifications pharmaceuticals and analysis of their expenditures using VEN analysis.

5.2. 1 VEN analysis of pharmaceuticals at Public Health Facilities of Jimma Zone (PHF)

VEN analysis findings at selected public health facilities in Jimma zone reveal that a total of 221 pharmaceuticals were identified by participants. From the total items 132 (59.7%), 55(24.8%) and 34(15.3%) of them were fall under vital, essential and non-essential categories respectively. Those items in vital category consumed 6,706,044(61.4%), EB of APE and the remaining 3,402,533(31.1%) and 810,215.68(7.41%) were consumed by essential and non-essential category items respectively.

Table 5: Shows VEN analysis of pharmaceuticals at public health facilities in jimma zone May 2018.

VEN Analysis	Class V	Class E	Class N	Total
Number of items (%)	132 (59.7%)	55(24.8%)	34(15.3%)	221(100%)
Annual consumption	6,706,044	3,402,533	810,215.68	10,918,794.15
Value In Birr (%)	(61.4%)	(31.1 %)	(7.41%)	(100%)
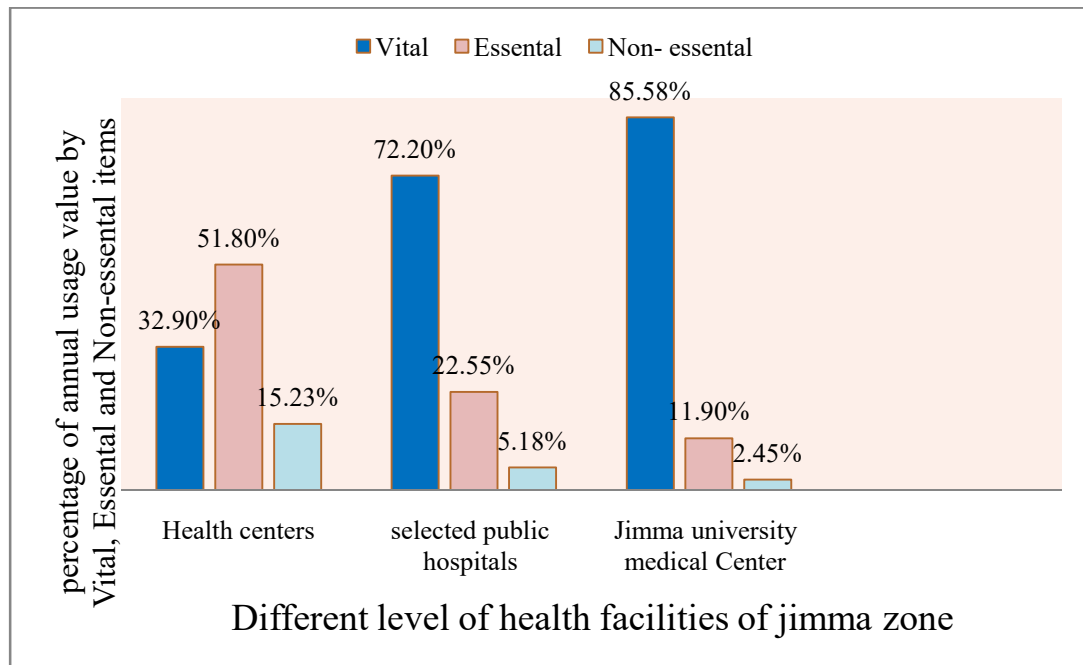
Figure 6. Shows pharmaceuticals expenditures by VEN classification at different level of health facilities of jimma zone May 2018.

5.2.2. VEN analysis of selected Health Centers

VEN analysis findings at health center revealed that a total of 102 items were identified and they were consumed 1,935,997 Ethiopian birr, among those items 44(43.13%) of them were vital, 34(33.3%) considered as essential and 24(23.5%) of them as the non-essential items. From the total APE 637,840(32.9%) EB were utilized for Vital class and the remaining 1,003,198 (51.8%) and 294,957 (15.23%) budget were utilized by essential and non- essential items respectively.

VEN Analysis	Class V	Class E	Class N	Total
Number of items (%)	44(43.13%)	34(33.3%)	24(23.5%)	102(100%)
Annual consumption	637,840	1,003,198	294,957	1,935,997
Value In Birr (%)	(32.9%)	(51.8 %)	(15.23%)	(100%)

Table 6: VEN Analysis at selected health centers of Jimma Zone

6.2.3. VEN Analysis at selected Public Hospitals of Jimma Zone (PH)

VEN analysis findings at hospitals reveal that 181 items were identified to treat common cases and they were consumed a total of 8,846,181 EB. From the total items 109 (60.2%), 46(25.4%) and 26(14.36%) of them were fall under vital, essential and non-essential categories respectively. Those items in vital category consumes 6,392,283(72.3%) EB of APE and the remaining 22.55% and 5.18 % were consumed by essential and non-essential category items respectively.

Table 7 . VEN analysis of pharmaceuticals at selected public hospitals of jimma zone, May 2018.

VEN Analysis	Class V	Class E	Class N	Total
Number of items (%)	109(60.2%)	46(25.4%)	26 (14.36%)	181 (100%)
Annual consumption	6,392,283	1,995,216	458,681	8,846,181
Value In Birr (%)	(72.3%)	(22.55%)	(5.18%)	(100%)
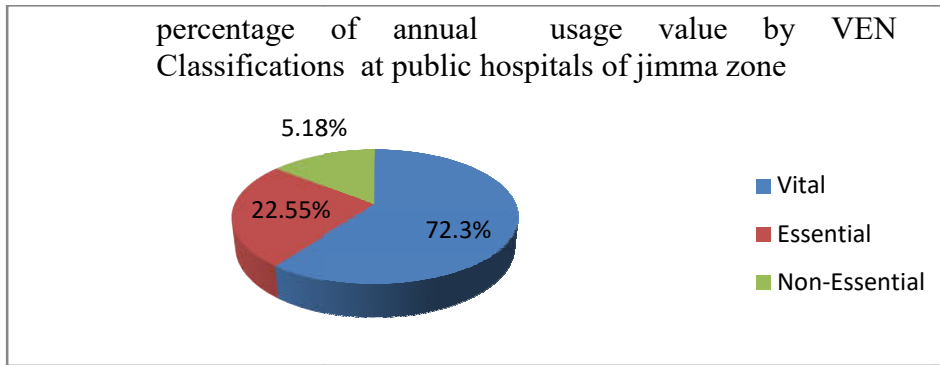
Figure 7 Annual usage value pharmaceuticals by VEN classification at public hospitals of jimma zone, May 2018.

5.2.4. VEN analysis for Jimma University Medical Center (JUMC)

VEN analysis findings reveal that a total of 179 items were utilized at selected wards of JUMC. From the total items 114(63.68%), 47 (26.25%) and 18(10.05%) of them were fall under vital, essential and non-essential categories respectively. Those items in vital category consumes 14,407,207.3(85.58%), EB of APE and the remaining 2,014,991.25(11.9%) and 411,659.2 (2.45%) were consumed by essential and non-essential category items respectively.

Table 8.VEN analysis of Pharmaceuticals of Jimma University medical centers, May 2018.

VEN Analysis	Class V	Class E	Class N	Total
Number of items (%)	114(63.68%)	47(26.25%)	18(10.05%)	179(100%)
Annual consumption	14,407,207	2,014,991.25	411,659.2	16,833,858
Value In Birr (%)	(85.58%)	(11.9 %)	(2.45%)	(100%)

5.3. ABC-VEN| Matrix analysis

6.3.1. ABC-VEN Matrix Analysis of Pharmaceuticals at Selected Public Health Facilities of Jimma Zone

ABC-VEN matrix analysis at selected public health facilities in Jimma zone finding shows that Category I items accounted for 147(66.5%) with annual usage value of 9,717,202(88.99%) EB. Category II and category III items accounts for 51(23.07%) and 23(10.47%) of total items using annual usage value of 1,016,445.26(9.3%) and 185,144.6(1.81%) EB respectively.

Table 9 : ABC-VEN Matrix analysis of sub-category of pharmaceuticals at selected public health facilities of Jimma zone. May 2018.

ABC-VEN matrix	V			E			N			Total number of item	Total annual expenditures	Percentage of items
	Combined category	Number of items	Annual expenditures	Combine category	Number of items	Annual expenditure	Combine category	Number of items	Annual expenditure			
A	AV	32	5,048,745	AE	12	2,665,392	AN	3	345,766	47	8,059,903	21.2%
B	BV	36	1,183,221.36	BE	16	585,844	BN	8	279,304	60	2.048369.36	27.1%
C	CV	64	474,078.38	CE	27	151,297.25	CN	23	185,144.6	114	810,520.23	51.83
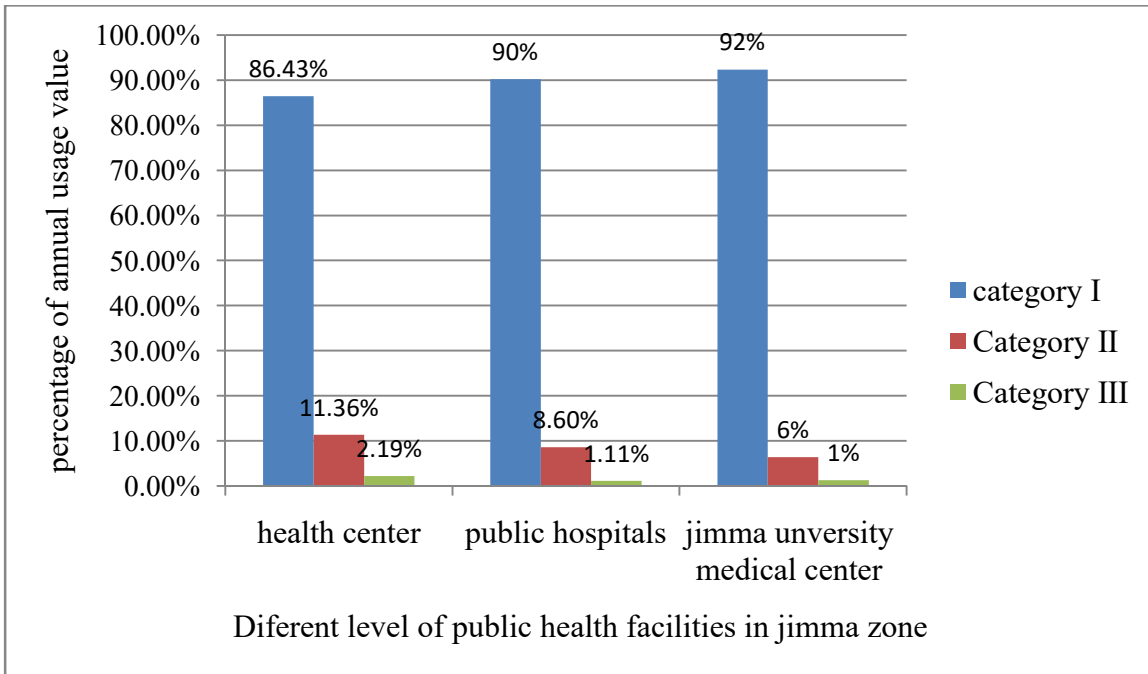
Figure 8: ABC-VEN Matrix analysis at different level of public health facilities of Jimma zone, May 2018.

5.3.2. ABC-VEN Matrix analysis of Pharmaceuticals at Selected Health centers of jimma zone

ABC-VEN matrix analysis finding at selected health centers shows that Category I items accounted for 59(57.84%) of total items with annual consumption value of 1,673,356(86.43%) EB. Category II and category III accounts for 31(30.39%) and 12(11.76%) of total items with annual usage value of 220,114(11.36%) and 42,523.5 (2.19%) EB respectively

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Table 10 ABC–VEN Matrix analysis of Sub–Category of Pharmaceuticals at Selected Health Centers of Jimma Zone May 2018.

ABC-VEN matrix	V			E			N			Total number of item	Total annual expenditures	Percentage of items
	Combined category	Number of items	Annual expenditure	Combine category	Number of items	Annual expenditure	Combine category	Number of items	Annual expenditure			
A	AV	7	487,790	AE	12	875,500	AN	3	160,018	22	1,523,227	21.568%%
B	BV	11	93755	BE	9	92,636	BN	9	92416	29	278,807	28.43%
C	CV	26	56,375	CE	13	35,062	CN	12	42,523	51	133,960	48.07%
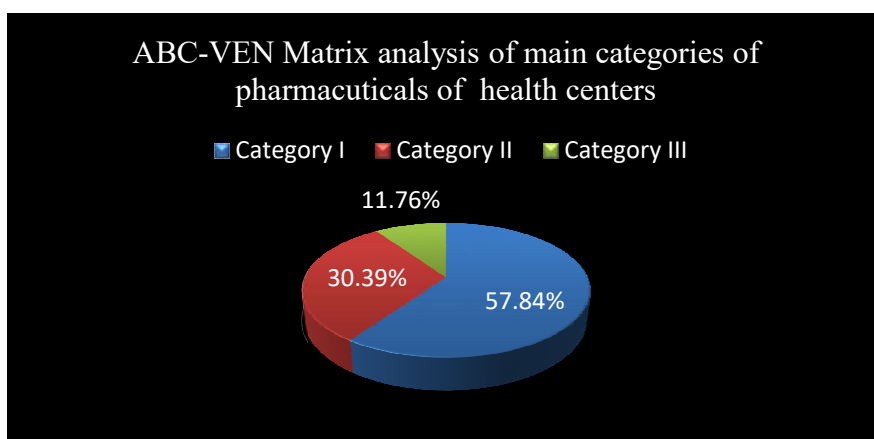
Figure 9: ABC-VEN Matrix Analysis for main categories of pharmaceuticals at health centers of jimma zone, May 2018.

5.3.3. ABC–VEN Matrix analysis for selected public Hospitals in jimma zone

ABC–VEN matrix analysis at public hospitals of jimma zone finding shows that Category I items accounted for 121(66.85%) of total items with annual consumption value of 7,985,841 (90.2) EB. Category II and category III accounts for 42(23.2%) and18 (9.94%) of total items with annual usage value of 761,742(8.6%) and 98,593(1.11%) EB respectively

Table 11 Shows ABC-VEN Matrix analysis of sub-categories of pharmaceutical at selected public Hospitals of jimma zone, May 2018.

ABC-VEN matrix	V			E			N			Total number of item	Total annual expenditures	Percentage of items
	Combined category	Number of items	Annual expenditures	Combine category	Number of items	Annul expenditures	Combine category	Number of items	Annual expenditures			
A	AV	29	5,196,444	AE	10	1,405,159	AN	2	188400	41	6,790,003	22.65%
B	BV	28	771,665	BE	13	453622	BN	6	171687	47	1,396,974	25.96%
C	CV	52	424,173	CE	23	136,433	CN	18	98,593	93	659,199	51.38%

ABC -VEN Matrix analysis of main category of pharmacuticals at Selected Public Hospitals of Jimma Zone

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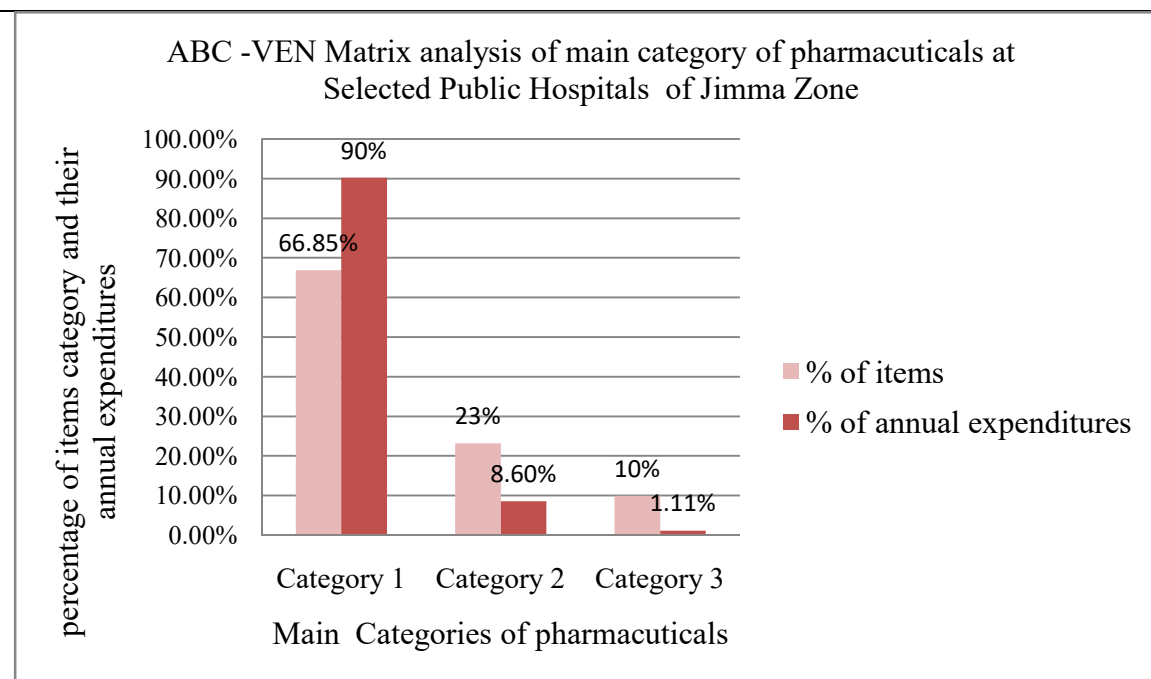
Figure 10: Shows ABC-VEN Matrix analysis of main categories Pharmaceuticals at selected public hospitals of Jimma z one, May 2018.

5.3.4. ABC–VEN Matrix analysis of pharmaceuticals of Jimma University medical center.

ABC–VEN matrix analysis findings of JUMC shows that Category I items accounted for 121(67.59%) of total items with annual usage value of 15,544,852(92.34%) EB. Category II and category III items accounts for 42(23.4%) and 16(8.93%) of total items using annual usage value of 1,077,217(6.4%) and 211,786(1.258%) EB respectively.

Table 12 Shows ABC-VEN Matrix analysis of Sub-Category of pharmaceuticals at Jimma University Medical Center, May 2018.

| ABC-VEN matrix | V | | | E | | | N | | | Total number of item | Total annual expenditures | Percentage of items |
	Combined category	Number of items	Annual expenditures	Combine category	Number of items	Annul expenditures	Combine category	Number of items	Annual expenditures			
A	AV	32	11,750,870	AE	6	981,824	AN	1	155821	39	12,888,515	21.78%
B	BV	27	1,921,172	BE	11	721,278	BN	1	44051	39	2,686,501	21.78%
C	CV	55	735,165.65	CE	30	311,888	CN	16	211786	101	1,258,839	56..42%

Table 13 : ABC-VEN Matrix analysis of main categories of pharmaceuticals at Jimma University Medical Center, May 2018.

Category	number of items	% of items	annual expenditures	% of annual expenditures
I(AV+AE+AD+BV+CV)	121	67.59%	15,544,852	92.34%
II(BE+BN+CE)	42	23.46%	1,077,217	6.39%
III(CN)	16	8.93%	211,786	1.258%

6. Discussion

Provision of health care serves at health care facilities is sensitive to the timely availability of facilities, including medicines. Besides the cost factor, the criticality factor must also be taken into consideration, as can be seen from present study, about 15% of the items consumed 70% of APE at all level of Health facilities. This is the group requiring greater monitoring as it has fewer Items consuming most of the annual budget. Also noted that not all the pharmaceuticals in this group were vital or essential. It also had items from the non-essential/desirable category. Categorization of pharmaceuticals by the ABC-VEN matrix model helps to identifications of items requiring stringent control.

6.1. ABC Analysis

From this study it was found that a total of 346 pharmaceuticals were utilized to provide health services in selected health facilities of Jimma Zone. Among the total pharmaceuticals consumed, 202 (58.38%) of them were used at health center that consume 18.2% (2,307,539.41EB) of the total APE of jimma zone, while 327(94.5%) were used at hospitals that accounts 85.7% (10,522,665.81EB) of the APE. This result indicates that the annual consumption value of pharmaceuticals at five hospitals was 4.56 times higher than the annual consumption value at thirteen health center. The big gaps observed in the APE between health center and hospitals might be product unavailability at health center because of limited budget allocation as indicated in key informant interview and the poor referral practice which is common in our country where patients visit hospital from the very beginning of cases by passing the PHC given at health center.

The ABC Analysis of those pharmaceuticals in jimma zone revealed that 53 items (15.3%) in category A consumes 69.96% (8,581,673EB), 72 items (20.8%) in category B consumes 20% (2,443,932 EB) and 221 items (63.8%) in category C consumed 10.1% (1,240,145.5 EB) of the total APE. In health center and hospital, 23 items (11.38%) and 48 items (14.67%) in category A consumes 69.42% (1,602,076 EB) and 69.7% (7,359,619.3 EB) of APE respectively. While the remaining category B (47 items (23.3%)) and C (132 items (65.3%)) for health center consume 20.37% and 10.2% of APE respectively. Whereas 69 items (21.1%) and 210 items (64.2%) that consume 20.1% and 10.07% of APE were formed category B and C items of hospitals respectively. At Jimma university medical center Analysis shows that class A items accounted

for 49(14.89%) number of items and consumed 15,898,134 EB (69.83%) of annual Pharmaceuticals expenditures, Whereas class B and C items accounted for 67(20.36%) and 213(64.7%) number of items that consumed 4,562,533 (20%) and 2,304,844 (10.12%) EB of APE respectively.

The above findings were similar with the other studies done in Goa Medical College in India and Teaching and Referral Healthcare Institute of India((9, 14) [(A class items accounted 18(12.77%), B class items accounted 24(17.21%) and C class items accounted 99(70.21%) of items and utilized 69.84%,19.85% and 10.28% of APE respectively at Goa Medical College and A class items accounted 58(13.78%), B class items accounted 92(21.85%) and C class items accounted 271(64.31%) of items and utilized 69.97%, 19.95% and 10.08% of APE respectively at Teaching and Referral Healthcare Institute of India)]. since ABC categorization follows V. Pareto way of classifying the percentage of class A, B and C items, results done in different facilities may show related percentage of items. But magnitude of total budget show difference since there may be different representative pharmaceuticals and budget in each health setting because of level of service and field of specialty given different facilities were varies

This study also revealed that among the top ten items of high consumption value (category A) at health center antimicrobials takes 2nd to 4^{th}leading ranks accounting 32% of category A items operating budget. This might be related to high prevalence of infectious diseases in the study area and also practice of empirical therapy for all suspected infections due to lack of well equipped laboratory service in all of the facilities to identify the specific strain of microorganisms. Among the A category items high consumption value were also observed in hospital for antimicrobials mainly Amoxicillin 500mg capsule (7.4%), Cloxacillin 500mg capsule (4.37%) and Ceftriaxone 1gm injection (4.11%). Similar reasons can be applied as most of the hospitals were recently upgraded from health center and except for few same professionals were providing the service. At jimma university medical centers the result was quite different from health centers and hospitals in terms of composition of top ten costly items. These might be because of JUMC were referral hospitals and mainly provides specialty service.

6.2. VEN Analysis

Categorization of pharmaceuticals based on their public health importance play a great role in terms of providing uninterrupted health service and ensuring patient satisfaction by giving full attention to the most critical items during each logistic activities. However, none of the health facilities included in the assessment have list of pharmaceuticals categorized accordingly. Therefore, categorizations of those pharmaceuticals consumed in 2009 EC were conducted using VEN/D analysis.

Accordingly, form the total of 346 pharmaceuticals used for provision of health services in selected public health facilities of jimma zone only 221 (63.87%) were included in to this list by professionals to manage cases of the study area. In hospitals and health centers from a total of 327 and 202 pharmaceuticals consumed only 181(55.52%) and 102 (50.5%) of them were included in to VEN lists of the facilities respectively. This variation between available list and selected VEN lists of pharmaceuticals might be because of unavailability of functional DTC, poor communication between pharmacy service and user department and lack of regular follow up between pharmaceuticals procured and those prescribed. Among the 221 items included in to the VEN list of the Zone, 132 items (59.7%) were categorized as Vital (V) and consumes 61.4% (6,706,044.75EB) of the APE. Whereas, 55 items (24.8%) and 34 items (15.3%) were categorized under Essential and Less/non essential with a total APE of 31.1% (3,402,533 EB) and 7.4% (810,215EB) respectively. Among the 181 items included in to VEN list of hospitals 109 (60.2%), 46 (25.4%) and 26 (14.4%) items were categorized as Vital, Essential and Non-essential consuming an APE of 72.3%, 22.6% and 5.2% respectively from a total APE of 8,848,181EB. Similarly in health center from 102 items include in to VEN lists 44 (43.34%), 34 (33.33%) and 24 (23.53%) items were categorized as Vital, Essential and Non-essential consuming an APE of 32.9%, 51.8% and 15.23% respectively from a total annual usage value of 1,935,997 EB.

Similarly in jimma university medical center from the total 179 items included in VEN list 114(63.68%), 47 (26.25%) and 18(10.05%) of them were fall under vital, essential and non-essential categories respectively. And vital items consumed 85.58% of APE and the remaining 11.9% and 2.45% were consumed by essential and non-essential category items respectively.

When we compare this finding with similar studies conducted in different part of our world, the result were a little bit different in terms of the number of items included in each category. For example the study conducted in India Medical College shows that 10 (7.09%), 63 (44.68%), and while 68 (48.23%) were classified Vital, Essential and desirable drugs (9). also similar study conducted in northern India shows that 46(12.3%), 230 (61.5%) & 98 (26.2%) items were grouped into V, E & D categories respectively (29). Similarly study done at Kenya shown that the 177(21%), 443(53.3%) and 202(24.9%) were classified as Vital, Essential and desirable drugs (36). and this variation might be because of the difference between level of specialty between the health facilities, knowledge and skill gaps in categorization of pharmaceuticals and the type of tools that we used as it includes all cases visiting the health facilities.

6.3. ABC-VEN Matrix Analysis

ABC and VEN analysis alone is not an end by itself ensuring the continuous availability with stringent control of the most importance items in health facilities. ABC analysis usually misses the control of vital items in B and C classes as it provide more emphasis to consumption value of each items whereas the VEN analysis misses the economic importance of each item. Therefore, the ABC-VEN Matrix analysis is important to address the above mentioned limitations and provide a better control over the items by making balanced classification of the drug inventory into three based on criticality and cost.

Accordingly, the ABC -VEN matrix analysis of pharmaceutical inventory showed that from the total pharmaceuticals issued for provision of health services in selected health facilities 147 items (66.5%) were identified as category I consuming 88.99% (9,717,2026EB) of APE. While the remaining 51 (23.07%) and 23 (10.47%) items form category II and III and consume 9.3% (1016445.26 EB) and 1.81% (185144.6.00) of APE respectively. From this study it can be seen that 66.5% of the items with annual consumption value of 88.99% were identified as category I showing their public health importance with significant economic value. And it is clear that stringent control for these products in forecasting, inventory management and during utilization is the best mechanism for provision of effective health services with simultaneous assurance of efficient resources utilization. Therefore, avoiding stock out, minimizing buffer stock and frequent inventory taking for these products should be practiced.

Consistent results have been observed when the analysis was done based on type of facilities, in which larger proportion of the items [121(67.59%) in JUMC, 121(66.85%) in hospital and 59 (57.84%) in health center] have high consumption value (92.34% in JUMC, 90.27% in hospital and 86.43% in health center). This can be an indication of similarity in prescribing practice for similar cases by different professionals since most of the selected items have high consumption value (A class). The analysis can also help and simplify the duty of top managers and logisticians to identify and follow those items with criticality and economic value.

Category II items were found to be 42(23.4%) in JUMC, 32 (17.68%) in hospital and 41 (40.19%) items in health center with APE of 6.4%, 8.61% and 11.37% respectively. category II items were found relatively smaller in terms of number of items and budget consumption. However, since most of the items were essential (BE and CE) a moderate inventory control is need. Whereas category III items from all facilities were very small in terms of number and budget consumption (JUMC, 16 items with APE of 1.26%, hospitals, 18 items with APE 1.11% & health center, 12 items with 2.2% APE).

The above results were found similar to study done in Tikur Anbessa Specialized Hospital, Ethiopia on inventory analysis of pharmaceuticals used from 2009 – 2013(6). In which majority of the items were in category I. This can be an indication of similarity in prescribing practice for similar cases by different professionals since most of the selected items have high consumption value (A class) and also may be due to common supply by governmental pharmaceuticals supplier, pharmaceuticals fund supply agency (PFSA).

However, significant difference was observed when compared to study done in Sudan 17.83% items in category I, 50.53% items in category II and 31.64% items in category III (30). also similarly study done in Turkey where only 20.05% of the items with 78% APE form a category I whereas 67.36% and 12.59% items in category II III respectively(26). Another similar study conducted at Lodar country referral hospital shown that 37%, 55% and 8% items were categorized as class I, class II and class III items respectively (15). The observed difference might be because of the difference in the type of pharmaceuticals included for analysis and differences in level of service specialty provided.

7. Limitation of the study

➢ Some pharmaceuticals which were Vital in one facility were essential in other facilities so it resulted in difficult to make an association based on number of vital, essential and non-essential items.

8. Conclusion

Based on ABC analysis we can conclude that about 70% of annual pharmaceuticals expenditures were utilized by 10% of items at all level public health facilities of jimma zone and the majority of items at all level public health facilities of jimma zone were Vital. ABC-VEN matrix result indicated that in the majority of items were Category I items and which require great attention for their control and availability.

The study found that there is a need for conducting such analysis regularly, and applying the inventory management tools for effective and efficient management of the pharmacy, along with close supervision on items belonging to important categories

9. Recommendations

Based on the result of this study the following recommendations can be forwarded to the concerned Body.

- o To Health Facilities
    - ✓ The facility should conduct the ABC and VEN analysis periodically so as to manage the pharmaceutical expenditures effectively and efficiently. This allows emphasizes given to priority setting and decision making in the procurement and purchase should be based on application of these scientific tools of inventory management (ABC and VEN tools).
    - ✓ Inventory analysis should be done for items those are not included in to VEN list, because their ending balances probable high because of low utilizations practices and the risk of expire is high.

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Annexes

Annex 1: Assurance of principal investigator

The undersigned agrees to accept responsibility for the scientific ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of Institutional Health Science Research Review Committee of Jimma University in effect at the time of grant is forwarded as the result of this application.

Name of the student: _____

Date . _____   Signature _____

Approval of the Advisor

Name and Signature of the advisor

_____

_____

Name and Signature of the examiner

_____

Annex II: Information sheet and consent form

This is research project of JU for partial fulfillment of Master of Science in pharmaceutical supply chain management

Purpose of this study: This study is aimed is categorization pharmaceutical based on cost and criticality aspects and identify products that requires great managerial control in jimma zone public health facilities southwest Ethiopia.

Procedure: in order to collect our data, we invite you to take part in our project. If you are willing, you need to understand and sign the consent form.

Risk and /or discomfort: by participating this project you may feel some discomfort on scarifying your time otherwise, no risk in participating in this research project, so your response provide an important input to show the gap and efficient resource utilization .

Benefits: if you are participating in this research project, the result of this study will be submitted to concern bodes and will improve resource utilization for your facilities.

Payment/incentives for participating: you will not be provided any incentive or payment to take part in this project.

Confidentiality: The information that we collect from this research project will be kept private. Any information about you will have a number on it instead of your name. Only the researchers will know what your number is and we will lock that information up with a lock and key. It will not be shared with or given to anyone except research sponsors, advisor and data collector.

Right to Refuse or Withdraw: You have full right to refuse from participating in this research.
Person to Contact: If you want to know more information, you can contact the following:

[Alem Endeshaw   Mobil 0920292874 email aleend@gmail.com]

Consent form

With due understanding of the above information are you willing to participate in the study?

Yes ---------------   No------------

Annex III Data collection tools

Part I. Data collection format for ABC (always better control) Classification of pharmaceuticals

Jimma University

Institutes of Health

School of Pharmacy

Pharmaceuticals supply chain management postgraduate programme

Date: _____

Facility type: _____

Name of the facility: _____

First ask to speak to Head of the pharmacy after explaining your purpose asks the questions, then contact store person, keep telling the purpose of the study for store person.

Item No.	Description of item	Unit	Unit price	Total consumption	Annual usage Value (unit price x Total consumption
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
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Part III. Data collection format for VEN (vital essential and Non-essential

Jimma University

Institute of Health

School of Pharmacy

Pharmaceuticals supply chain management postgraduate programme

Date: _____

Facility type: _____

Name of the facility: _____

First ask to speak to medical directors after explaining your purpose asks the questions, then visit all concerned departments, keep telling the purpose of the visit for concerned medical experts.

1. Department _____

2. Number of year working in this facilities_____

S/N	Conditions Treated	Severity of Target Condition					
		Life treating			Disabling		
		Yes	Occasionally	Rarely	Yes	Occasionally	Rarely
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

S/N	Conditions Treated	Severity of Target Condition					
11							
		Life treating			Disabling		
		Yes	Occasionally	Rarely	Yes	Occasionally	Rarely
12.							
13.							
14.							
15							
16							
17							
18							
19							
20.							

➢ Please rate the medications used for the treatment (based on treatment outcome) of each of the above cases based on a given parameter/options in the table below.

- Yes/No

- Yes/No

- Possibly/No

- Always/Usually/May or May not

- Never/Rarely/May or May not

Cases	Name, strength, dosage/vol. of medications	Prevents serious diseases (A)	Cure serious diseases (B)	Treat minor, self-limited symptoms and conditions (C)	Has proven efficacy (D)	Has unproven efficacy (E)
Case 1.						
Case 2.						
Case 3.						
Case 4.						
Case 5						
Case 6						
Case 7						
Case 8.						
Case 9						
Case 10.						
Case 11.						

Cases	Name, strength, dosage/vol. of medications	Prevents serious diseases (A)	Cure serious diseases (B)	Treat minor, self-limited symptoms and conditions (C)	Has proven efficacy (D)	Has unproven efficacy (E)
Case 12.						
Case 13.						
Case 14.						
Case 15.						
Case 16						
Case 17.						
Case 18						
Case 19.						
Case 20.						

Source management for health science

Thank You for your collaboration!