

Original Research Article

Always, better control-vital, essential and non-essential matrix analysis of pharmaceuticals inventory management at selected public health facilities of Jimma zone southwest Ethiopia: facility based cross sectional study design

Alem Endeshaw Woldeyohanins^{1*}, Awol Jemal²

¹Department of Pharmaceutics and Social Pharmacy, College of Medicine and Health Science Gondar, Ethiopia

²Department of Pharmacy, Jimma University, Institutes of Public Health, Ethiopia

Received: 26 November 2019

Accepted: 07 January 2020

*Correspondence:

Alem Endeshaw Woldeyohanins,

E-mail: aleend2008@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Always, better control (ABC)-vital, essential and non-essential (VEN) matrix analysis 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. Studies on analysis of pharmaceuticals expenditures throughout the country were very limited, in Jimma zone no studies found yet. The objective of the study was, therefore, 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 Southwest Ethiopia.

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

Results: The ABC analysis shows that class A items accounted for 53 (15.3%), whereas class B and C items accounted for 72 (20.8%) and 221 (63.8%) number of items at selected public health facilities of Jimma zone. VEN analysis showed that 132 items (59.7%) were categorized as vital and consumes 61.4% (\$248,372) of the annual pharmaceuticals expenditures (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% (\$126,020) and 7.4% (\$30,008) respectively. From ABC-VEN matrix analysis, the majority of items were category I pharmaceuticals.

Conclusions: Majority of items at a selected public health facility 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.

Keywords: ABC analysis, VEN analysis, ABC-VEN matrix analysis, Jimma zone

INTRODUCTION

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 analysis of the cost of the medicines can be done to characterize them in distinctive groups and each of the category can be managed according to its characteristics to improve efficiency.⁴ Among different selective inventory control techniques, always, better control (ABC) and vital,

essential and desirable (VED) analysis are commonly used.^{5,6} ABC analysis is a technique of characterizing 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.^{6,7} 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.⁸

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.²⁻⁵

Therefore, another parameter of the medicine is their importance/criticality, vital, essential and non-essential (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) are the medicines that are critically needed for the survival of the patients, which must be available in the health facility all the time, and they are vital for the functioning of a health care establishment. 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. Non-essential (N) are the remaining medicines with lowest critically, the absence of which will not be detrimental to the health of the patients.¹⁻¹⁰

ABC-VEN matrix analysis formulated by cross-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.¹¹ Studies on analysis of pharmaceuticals expenditures throughout the country were 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 medicine expenditures based on cost and criticality aspects of public health facilities of Jimma zone.

METHODS

The study was conducted in selected public health facilities of Jimma zone Southwest Ethiopia. Jimma zone covers a total area of 199, 326.28 km² which is administratively subdivided into 21 District and 55 villages. 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. This research was a retrospective facility-based cross-sectional study in which ABC, VEN and ABC-VEN matrix analysis techniques were utilized to assess the 1 year (2016-2017) pharmaceutical inventory management system by using Facilities secondary GIV data (model 22).

Data collection procedures and data analysis

ABC analysis

The data was collected from model 22 by trained pharmacists for ABC analysis and 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. the Fiscal year of 2017. Was obtained. Then data was transcribed in an MS Excel spreadsheet then a total cost of each item was calculated by multiplying the cost of each unit by the total quantity of that item. Then items were arranged in descending order of their costs. The 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 the highest annual usage, with only about 10% of the items that costed 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; accounted for approximately 70% of the items but used only 10% of the budget.¹

VEN analysis

Pharmaceuticals for identified cases from different level facilities were aggregated based on the level of facilities and criticality analysis was conducted by using the VEN classification format on MS Excel spreadsheets.¹² As follows. Those pharmaceuticals which were used to prevent and cure or to prevent serious disease were taken as vital (V) items. Pharmaceuticals that were vital in one wards of a given facility continued to be vital for these facilities, even if it is essential or Non-essential at different wards of a given facility. Those pharmaceuticals which were used to cure serious and self-limiting disease or cure serious disease were taken as Essential (E) items. Pharmaceuticals that were essential in one wards of a given facility continued to be essential for these facilities, even if it is non-essential at different wards of a given facility. Those pharmaceuticals which were used to treat the self-limiting disease were taken as non-essential (N) items. Then once criticality analysis of pharmaceuticals was done on MS Excel spreadsheet.

ABC-VEN matrix analysis

The data was couple into an ABC-VEN matrix by cross-tabulating the ABC and VEN analysis on MS Excel

spreadsheets. This resulted in the categorization of items into three main categories (I, II and III). Category I include items belonging to AV, AE, AN, BV and CV subcategories. The BE, CE and BN sub-categories were included in category II, and category III was 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.

Ethics approval and consent to participate

The research proposal was approved by the Institutional Review Board of Jimma University and ethical clearance was given by Jimma University. Supportive letters were obtained from the 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.

RESULTS

ABC analysis for selected public health facilities of Jimma zone (PHF)-about 346 items were utilized and consumed \$454,343.3 in 2017. The ABC analysis shows that class A items accounted for 53 (15.3%) number of items and consumed \$317,839.8 (69.96%) 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 \$90,590 (19.97%) and \$45,913.3 (10.1%) of APE at selected public health facilities of Jimma zone.

Table 1: Summary of pharmaceuticals expenditures by ABC classification.

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 in USA \$	317,839.8	90,590	45,913.3	454,343.3
Value in %	69.96	19.9	10.1	100

Table 2: VEN analysis of pharmaceuticals.

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 in USA \$	248,372	126,019.7	30,008	404,400
Value in %	61.4	31.1	7.41	100

Table 3: 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	\$186,990.5	AE	12	\$98,718.2	AN	3	\$12,806.2	47	\$298,515	21.2
B	BV	36	\$43,823	BE	16	\$21,698	BN	8	\$10,344.6	60	\$75,865.6	27.1
C	CV	64	\$17,558.5	CE	27	\$5,603.6	CN	23	\$6,857.3	114	\$30,019.4	51.83

VEN analysis of pharmaceuticals

VEN analysis findings at selected public health facilities in the 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 fall under vital, essential and non-essential categories respectively. Those items in vital category consumed

\$248,372 (61.4%), of APE and the remaining \$126,019.7 (31.1%) and \$30,008 (7.41%) were consumed by essential and non-essential category items respectively.

ABC-VEN matrix analysis

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 \$359,896.4 (88.99%) category II and category III items account for 51 (23.07%) and 23 (10.47%) of total items using annual usage value of \$37,646.13 (9.3%) and \$6,857.3 (1.81%) respectively.

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 the present study, about 15% of the items consumed 70% of APE at selected public 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 or desirable category. The categorization of pharmaceuticals by the ABC-VEN matrix model helps to identifications of items requiring stringent control.

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. The ABC Analysis of those pharmaceuticals in Jimma zone revealed that 53 items (15.3%) in category A consumes 69.96% (\$317,839.8), 72 items (20.8%) in category B consumes 20% (\$90,590) and 221 items (63.8%) in category C consumed 10.1% (\$45,913.3) of the total APE.

The above findings were similar to the other studies done in Goa Medical College in India and Teaching and Referral Healthcare Institute of India.^{6,10} (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 the related percentage of items. But the magnitude of total budget show difference since there may be different representative pharmaceuticals and budget in each health setting because of the 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 the leading rank. This might be related to the high prevalence of infectious diseases in the study area and also the practice of empirical therapy for all suspected infections due to a lack of well-equipped

laboratory service in all the facilities to identify the specific strain of microorganisms.

VEN analysis

Categorization of pharmaceuticals based on their public health importance plays 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 activity. However, none of the health facilities included in the assessment have a list of pharmaceuticals categorized accordingly. Therefore, the categorizations of those pharmaceuticals consumed in 2009 EC were conducted using VEN/D analysis.

Accordingly, form a total of 346 pharmaceuticals used for the provision of health services in selected public health facilities of Jimma zone only 221 (63.87%) were included in to VEN list. This variation between available list and selected VEN lists of pharmaceuticals might be because of the 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 the VEN list of the Zone, 132 items (59.7%) were categorized as vital (V) and consumes 61.4% (\$248,372) 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% (\$126,019.7) and 7.4% (\$30,008) respectively.

When we compare this finding with similar studies conducted in different part of our world, the result was a little 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.⁶ Also, a similar study conducted in northern India shows that 46(12.3%), 230 (61.5%) and 98 (26.2%) items were grouped into V, E and D categories respectively.¹³ Similarly, study done at Kenya shown that 177 (21%), 443 (53.3%) and 202 (24.9%) were classified as vital, essential and desirable drugs.¹⁴ And this variation might be because of the difference between the level of specialty between the health facilities, knowledge and skill gaps in the categorization of pharmaceuticals and the type of tools that we used as it includes all cases visiting the health facilities.

ABC-VEN matrix analysis

ABC and VEN analysis alone are not an end by itself ensuring the continuous availability with stringent control of the most important items in health facilities. ABC analysis usually misses the control of vital items in B and C classes as it provides more emphasis on the consumption value of each item 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 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 the provision of health services in selected health facilities of Jimma zone 147 items (66.5%) were identified as category I consume 88.99% (\$359,896.4) of APE. While the remaining 51 (23.07%) and 23 (10.47%) items form category II and III and consume 9.3% (\$37,646.13) and 1.81% (\$6,857.3) of APE respectively. From this study it can be seen that 66.5% of the items with an annual consumption value of 88.99% were identified as category I show 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 the provision of effective health services with simultaneous assurance of efficient resource utilization. Therefore, avoiding stock out, minimizing buffer stock and frequent inventory taking for these products should be practiced. The above results were found similar to a study done in *Tikur Anbessa* Specialized Hospital, Ethiopia on inventory analysis of pharmaceuticals used from 2009 to 2013.⁵ 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, a significant difference was observed when compared to the study done in Sudan 17.83% items in category I, 50.53% items in category II and 31.64% items in category III.¹⁵ also, similarly study done in Turkey where only 20.05% of the items with 78% APE from a category I whereas 67.36% and 12.59% items in category II III respectively.¹⁶ Another similar study conducted at *Lodwar* country referral hospital showed that 37%, 55%, and 8% items were categorized as class I, class II and class III items respectively.¹¹ The observed difference might be because of the difference in the type of pharmaceuticals included for analysis and differences in the level of service specialty provided.

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 the number of vital, essential and non-essential items.

CONCLUSION

Based on ABC analysis we can conclude that about 70% of annual pharmaceuticals expenditures were utilized by 15% of items at selected public health facilities of Jimma zone and the majority of items at 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.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Pund SB, Kuril BM, Hashmi SJ, Doibale MK, Doifode SM. ABC-VED matrix analysis of Government Medical College, Aurangabad drug store. *Int J Community Med Public Heal.* 2016;3(2):469-72.
2. Singh V, Singh H, Singh S. Drug Inventory Management of a Pharmacy Store by Combined ABC-VED Analysis. *Int J Mech Eng Robot.* 2015;3(5):19-22.
3. Khurana S, Chhillar N, Kumar V, Gautam S. Inventory control techniques in medical stores of a tertiary care neuropsychiatry hospital in Delhi. *Health (Irvine Calif).* 2013;5(1):8-13.
4. Theses E, Citation R. Relationship between effective drug inventory control management and stock-outs in Kenya's public hospitals: a case study of Kenyatta National Hospital and Defence Forces Memorial Hospital; 2016.
5. Migbaru S, Yigeremu M, Woldegerima B, Shibeshi W. ABC-VEN matrix analysis of pharmaceutical inventory management in Tikur Anbessa Specialized Hospital for the years 2009 to 2013, Addis Ababa, Ethiopia. *Indian J Basic Appl Med Res.* 2016;5(2):734-43.
6. Pirankar SB, et al. Application of Abc-Ved Analysis in the Medical Stores of a Tertiary Care Hospital. *Int J Pharmacol Toxicol.* 2014;4(3):175-7.
7. Kaushik N, Anany M. Application of ABC and VED Analysis for a Pharmaceutical Distributor's Inventory in Kuwait. *Conf Inst Ind Eng Annu Conf Expo.* 2016.
8. Shah AG, Davda BK, Parikh SB, Bala DV. Always Better Control-Vital Essential Desirable analysis of the drugs used in health centres of Ahmedabad district. *Int J Basic Clin Pharmacol.* 2015;4(4):749-52.
9. Dwivedi, Surabhi, Kumar, Arun, Kothiyal P. Inventory Management: A Tool of Identifying Items That Need Greater Attention for Control. *Pharma Innov.* 2012;1(7):125-9.
10. RN, Devnani M, Gupta AK. ABC and VED Analysis of the Pharmacy Store of a Tertiary Care Teaching, Research and Referral Healthcare Institute of India. *J Young Pharm.* 2010;2(2):201-5.
11. Kokonya DM. Analysis of Medicines Expenditure for Fiscal Year 2014/2015 at Lodwar County Referral hospital 2016.
12. Embrey M. Managing Access to Medicines and Health Technologies.

13. Singh S, Gupta AK, L, Devnani M. ABC and VED Analysis of the Pharmacy Store of a Tertiary Care, Academic Institute of the Northern India. *J Young Pharm.* 2015;7(2):76-80.
14. Kivoto P. Drug consumption patterns with clinical and financial implications at KNH 2016.
15. Mousnad MA, Ibrahim MIM, Palaian S, Shafie AA. Medicine expenditures in Sudan National Health Insurance Fund: an ABC-VEN analysis of 5-year medicine consumption. *J Pharm Heal Serv Res.* 2016;7(3):165-71.
16. Yigit V. Medical Materials Inventory Control Analysis at University Hospital in Turkey. *Int J Heal Sci Res.* 2017;4(1):227-31.

Cite this article as: Woldeyohanins AE, Jemal A. Always, better control-vital, essential and non-essential matrix analysis of pharmaceuticals inventory management at selected public health facilities of jimma zone southwest Ethiopia: facility based cross sectional study design. *Int J Sci Rep* 2020;6(3):95-100.