

Original article:

Special and Aid Pharmaceuticals ABC-VEN Matrix Analysis of Tikur Anbessa Specialized Hospital for the Years 2009 to 2013, Addis Ababa, Ethiopia

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Abstract

Effective drug supply management ensures uninterrupted availability of quality approved, safe and effective pharmaceuticals which could be achieved through developing a system like ABC-VEN matrix analysis. The main objective of the present study was to assess Tikur Anbessa Specialized Hospital (TASH) pharmaceutical inventory usage and management system by using ABC-VEN matrix analysis. It was a facility-based cross sectional study. The list of drugs with corresponding prices was retrieved from goods receiving vouchers as a secondary data documented in hospital drug store for the past five years. Pharmaceuticals were classified as Budget, Special and Aid items. For each of these three categories; ABC, VEN and ABC-VEN matrix analysis was done separately. From 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 safety and availability. The study findings indicated that there are huge pharmaceuticals in TASH, which need proper management and supervision. The hospital DTC and other concerned bodies are invited to use this ABC-VEN matrix work and try to adopt its principle.

Key words: Special pharmacy, Aid Pharmacy, ABC analysis, VEN analysis, ABC-VEN matrix

Introduction

Tikur Anbessa Specialized Hospital (TASH) is a tertiary teaching hospital of the Addis Ababa University, College of Health Sciences which has more than 700 beds. The hospital serves more than 818 patients per day/per the data on outpatient pharmacy service/. Majority of these patients receive a prescription containing one or more drugs [Tikur Anbessa Hospital Pharmaceutical List, 2012]. Many studies indicate that medicines consume significant proportion of the hospital's budget. The total pharmaceutical bill across Organization for Economic Cooperation and Development countries was around 800 billion USD in 2011 [OECD, 2013].

The hospital pharmacy is expected to make sure that medicines needed by the majority of clients are available at all times in sufficient quantities [Abiyeet *al*, 2013]. Improving the

availability and accessibility of essential drugs as well as alternative drugs with information particularly in pharmacy profession are found to be crucial for optimal and rational pharmacotherapy [Abulaet *al*, 2003]. This could possibly be achieved through developing analyses conducted periodically, like ABC/VEN matrix analysis methods.

For improvement of therapeutic outcome of hospital activity, availability of pharmaceuticals has a great role [Ferrettiet *al*, 2014]. But in real situation, pharmaceutical supplies interruption is very common even in developed countries. Delays in chemotherapy administration or changes in treatment regimens due to drug shortages were reported by 93% of survey participants and 10% reported reimbursement challenges related to drug shortages [Holleet *al*, 2013].

All diagnosis trials and inventions are depending on these pharmaceutical supplies. If there is no proper availability of the items, drug resistance, treatment failure and disruptions in patient safety and quality of health care will be increased [Anna *et al.*, 2011, Kassie *et al.*, 2014].

The inventory control is one of the important elements in materials management and an effective measure for containing cost of materials [Sarbjee *et al.*, 2013]. The inventory management can bring out significant improvement not only in patient care but also in the optimal use of resources [Ram *et al.*, 2012].

A study done in India on ABC-VEN analysis states; about one-third of the annual hospital budget in India hospitals is spent on buying materials and supplies, including medicines [Dwivedi *et al.*, 2012]. The drugs consume approximately 60% of total consumable budget [Anand *et al.*, 2013].

There are various methods involved for inventory management but commonly used are : Always, Better, and Control (ABC) and Vital, essential and Desirable/ Non essential (VED/N) and Stock card & Bin card [Thawani *et al.* 2004, Anand *et al.*, 2013, Kassie *et al.*, 2014].

ABC analysis is a method of classifying items according to their relative importance. It is also known as the V.Pareto principle [Dhoka *et al.*, 2013] “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 effects. The analysis classifies the items into three categories: the first 10-20% of the items account for approximately 70-80% of cumulative value (cost) (category A), 10-20% are category B items that account for a further 15-20% of the cumulative value and the remaining 60-80% are category C items, amounting for a mere 5-10% of the total value [Nigah *et al.*, 2000, Montone *et al.*, 2014].

ABC analysis categorizes products based on importance. Importance may come from cash flows, lead time, stock outs, sales volume, or profitability. Once the ranking factor is chosen, break points are chosen for classes A,B,C and so on [Gupta *et al.*, 2007, MSH 2012].

The limitation of ABC analysis is that it is based only on monetary value and the rate of consumption of the item. VED analysis is based on critical values and shortage cost of the item could be classified into three categories: vital, essential and desirable [Devnani *et al.*, 2010]. The categories in the original system are vital (V), essential (E), and nonessential (N) (sometimes called VED—vital, essential, and desirable). Some health systems find a two-category system more useful than the three-tiered VEN; [Kant *et al.*, 1989; Dwivedi *et al.*, 2012].

Objectives of this study was to assess pharmaceuticals inventory management system of TASH, from 2009 - 2013 using ABC-VEN matrix analysis while Specific Objectives to assess five years pharmaceuticals consumption trend and to identify the categories of pharmaceuticals requiring stringent management control by using ABC – VEN analysis

Methods

The study was carried out at TASH, Addis Ababa, Ethiopia. TASH is a university hospital of Addis Ababa University. This research was a facility based cross sectional study in which ABC, VEN and ABC-VEN matrix analysis techniques were utilized to assess the 5 year pharmaceutical inventory management system at TASH by using hospital's secondary GRV data. The study was conducted from January –May 2014.

Operational Definition

Budget Pharmacy: a unit in TASH which gives free or no profit service for patient and annual

pharmaceutical budget is planned to be invested for purchase items for this unit.

Special Pharmacy: it is special pharmacy unit in hospital which is established to give serves for all patients with low profit margin/ up to 20%.

Aid Pharmaceuticals: are pharmaceuticals supplied to hospital by donation from different local and international organizations.

Result and Discussion

Aid Pharmaceuticals ABC Analysis

Even if ABC analysis had its own principle how to categorize items, aid pharmaceuticals especially

anti-cancer drugs were out of ABC budget range. Obviously, Class A item's budget expected 70 to 80%, but these aid pharmaceuticals started above 80.5% (Shown in table 1 & figure 1). Only percentage of item was tried to preserve and budget percentage was considered as an extra ordinary money value. This is due all pharmaceuticals delivered to hospital by donation which are expensive. Their money value in ETB were calculated from their own money value like Dollar and Euro.

Table 1: Aid Pharmaceuticals ABC Category 2009-2013

Years	Percentage of Aid pharmaceuticals in ABC category		
	A	B	C
2009	94.3%(3,376,941.75 birr)	4.25%(124127.4 birr)	1.45%(69597.63 birr)
2010	97.57%(58103131.4 birr)	1.26%(746838.8 birr)	1.17% (700151.00 birr)
2011	99.6%(208859679.7 birr)	0.27%(570095.47 birr)	0.13%(267678.14 birr)
2012	96.1%(45893819 birr)	1.97%(939485.75 birr)	1.93%(919270.25 birr)
2013	99.64%(141682866.45 birr)	0.16%(238621.27 birr)	0.18%(268574.88 birr)

Out of the many aid pharmaceuticals in 2009, only 62 items are analyzed. Out of these, Class A items were 6 (9.67%) which accounts 94.3% (3,376,941.75 birr) of the total consumed budget even if it is from donation source. But class B and class C pharmaceuticals cover only 4.25% (124127.4 birr) and 1.45% (69597.63 birr) of budget, respectively. But in item value, class C items cover 87.25% and class B was 11.3%.

In the same way, the 2010 result showed a significant difference in budget assignment between class A items and rest classes. However, class A items accounted only 25 (10%) of total 250

items and they covered 97.57% (58103131.4 birr) of the budget. 80.2% of these items were occupied by class C items but it takes only 1.17% (700151.00 birr) budget, the rest taken by class B pharmaceuticals.

In 2011 TASH got pharmaceuticals which cover 209697453.29 birr. 99.6% of this money covered by Class A items which were 12 (10.52%) in number. Class B and Class C items showed very small portion of the budget, only 0.27% and 0.13% respectively, and in quantity, class C took 78.95% and class B 10.5%.

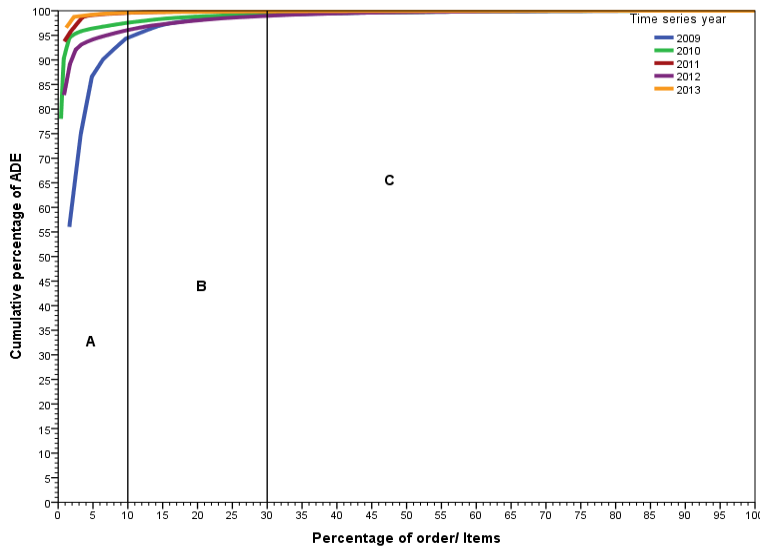
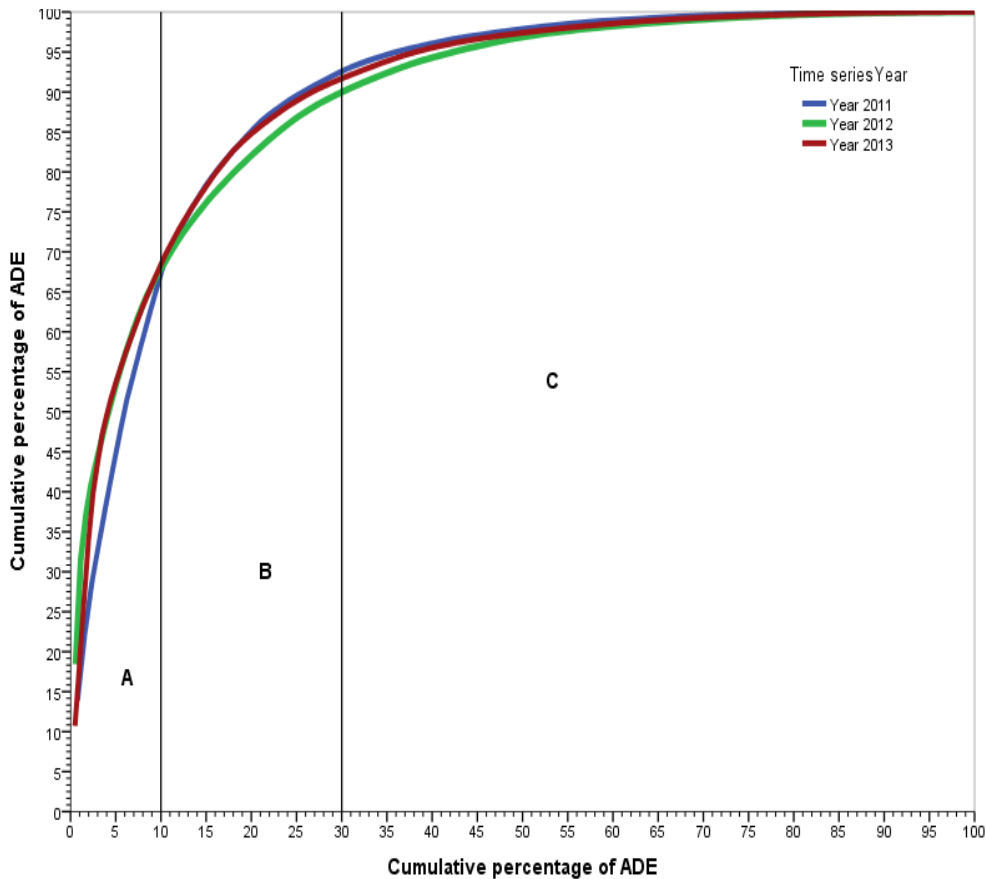


Figure 1: Aid Pharmaceuticals ABC analysis Cumulative percentage curve
Special Pharmaceuticals ABC Analysis

As seen from operational definition, Special pharmaceuticals run by their own 20% profit and giving service for public at an affordable cost than private pharmacy. Only three year data had been analyzed (seen on figure 1) since there were some loss of data on 2009 and 2010.



(Note :ADE = Annual Drug Expenditure in Ethiopian Birr)

Figure 2: ABC analysis of Special pharmaceuticals

Figure 2 shows the three years ABC analysis trend. As V.Parito explanation there was increment in budget from Class C to Class A and decrement in item percentage. There was symmetrical increment on budget utilization as well as items availability from 2011 to 2013 in Special pharmacy. Special pharmacy gives service by providing drugs for any patient with cost lower than private pharmacy. Since it runs by revolving budget, utilization of systematic pharmaceutical analyzing tools like ABC- VEN were mandatory for proper selection and purchase.

Generally the drugs belonging to category A requires strict managerial control, accurate data driven forecasting of demand, close check on budgetary control, minimum safety stock, frequent stock taking and judicious purchasing, stocking, issue and inspection policy. Category B drugs require moderate control by middle level managers whereas category C requires minimum control measures for order and purchase and such functions can be delegated to lower level managers.

Due to inflation, total expenditure for the drugs is increased each year, which supports the higher budgetary requirement for the forthcoming years. At the same time, forecasting of budget helps for better management of medical store. Hence, the analysis along with VEN and integrated economic analysis optimizes the costs of medicare services besides making materials available to the patients

which can increase the quality of healthcare services [Dwivedi *et al.*, 2012].

VEN Analysis

ABC analysis alone provides a managerial tool for selectively controlling inventory on annual usage value alone, neglecting the criticality factor which is not acceptable in medical practice. Thus, selective inventory control of medical stores integrates the dual concept of usage and criticality for better and more patient-centric control of drug inventory [Kumar *et al.*, 2014].

Some pharmaceuticals which were Vital in TASH may be essential in other Hospitals. So this may be difficult to make an association based on number of vital, essential and desirable items. DebreMarkos referral hospital was one of the related studies done in Ethiopia. Based on this hospital VEN result 67.4% V vital, 28.9% E essential and 5.02% N non essential [APTS, 2012]. VEN analysis study done in Goa Medical College Hospital of India, around 12.36 per cent drugs were classified as vital, 47.12 per cent as essential, and the remaining 40.50 per cent as desirable [Vaz *et al.*, 2008]. Sassoon Indian General Hospital also showed 148 (50.9%), 117(40.2%) and 26 (8.9%) items were found to be V, E and D category items, respectively [Poorwaet *et al.*, 2013].

Figure 3 shows that Special Pharmaceutical's Vital items had been increased within three years but Aid and Budget pharmaceuticals did not show regular trend.

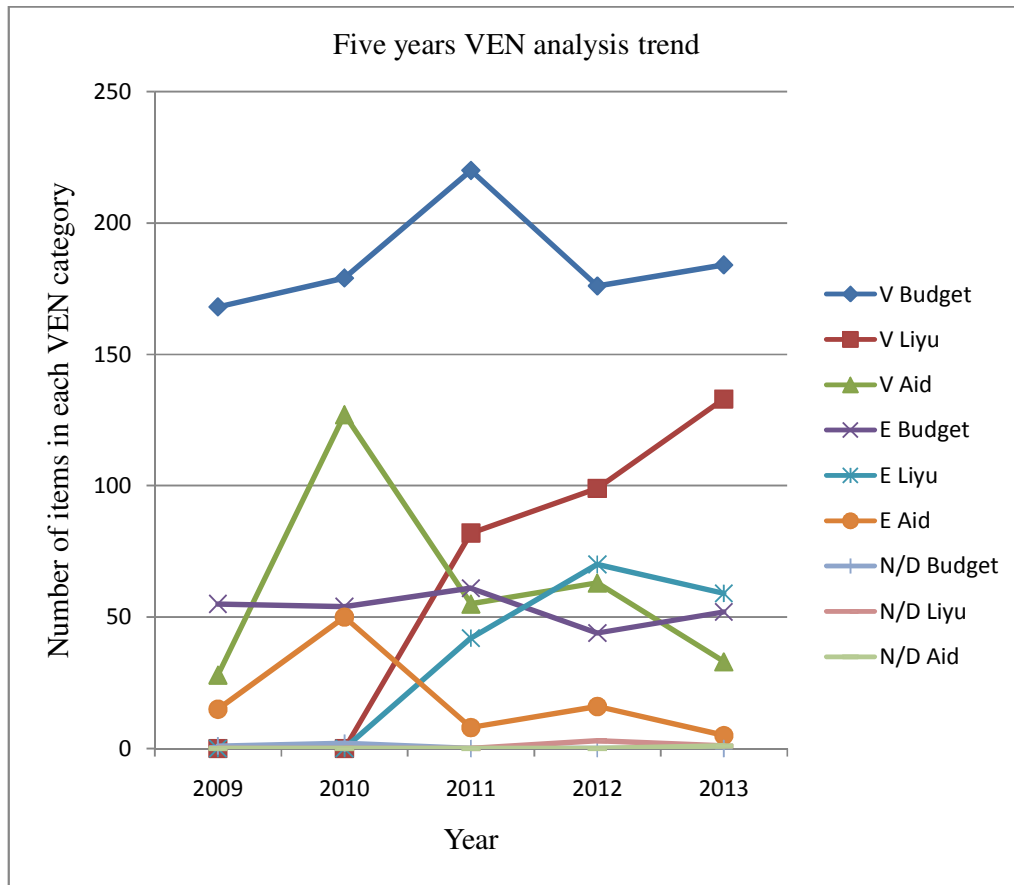


Figure 3: Five Years VEN Analysis Trend of Budget, Special and Aid Items

Unlike Special pharmaceuticals both Aid and Budget, items are dispensed to hospital patient cost free. So the hospital use these Aid pharmaceuticals as a crucial means of supporting Budget pharmaceutical service. But figure 3 shows both Aid and Budget items had lower Vital & Essential items on 2009 & 2013 simultaneously. This might have challenged the health service in those years. In case of Aid pharmaceuticals it is difficult to forecast since they highly depend on donors interest while some negotiation and recommendations also expected from hospital concerned body. Generally, Special items show progressive increment in the three years and this is

believed to be good to achieve the goal of delivering pharmaceuticals with lower cost by its own revolving fund.

As instant TASH express its own pharmaceutical list it is expected that majority of items are available in hospital's different unit based on the pharmaceuticals criticality range. For example when we say items are vital , it is crucial for the service or for life and its availability is mandatory within 24 hours of a day [APTS, 2012]. Table 2 shows that how many pharmaceuticals had been delivered to hospital after hospitalpublished its own drug list.

Table 2 :Number of Items on VEN Analysis of Budget, Aid and Special Pharmaceuticals

Years	V		E		N/D	
	Special	Aid	Special	Aid	Special	Aid
2009	-	28	-	15	-	0
2010	-	127	-	50	-	0
2011	82	55	42	8	0	0
2012	99	63	70	16	3	0
2013	133	33	59	5	1	1

There were more than 20 main pharmaceuticals categories in hospital Drug/VEN list based on hospital's diagnosis and treatment units. As seen on table 2, majority of pharmaceuticals were not deliver to each unit and these units only had an average of 20% of their need in 2013 as compared to the hospital drug list. Based on TASH drug list data 51.54%, 43.87% & 4.66% of pharmaceuticals which under inclusion was V, E & N respectively [TASH Pharmaceutical List, 2012]. Even though pharmaceuticals delivered in five years showed 59.7 to 73.5% items were vital, availability pharmaceuticals relative to the hospital drug list was very low.

From the total utilized items, more than 230 same pharmaceuticals had purchased every year. Generally, on 2011 there was someimprovement bysupplyingnewer items relative to the rest four years.

Even though some pharmaceutical supplies were provided by donation, majority of drugs are still on hand of Budget pharmaceuticals supply management. There is huge gap on lifesaving drugs availability implementation. The purchasing system might always follow similar ways of procurement since there were no more new drugs seen relative to hospital's drug list.

There could be serious functional dislocation of patient care when vital drugs are not available even for a short period. Therefore, these should always be stocked in sufficient quantity to ensure their

constant availability. This group of drugs must be controlled and monitored with the greatest care. The shortage of essential drugs can be tolerated for a short period. If these essential drugs (like antibiotics, antineoplastic) are not available beyond a few days or a week, the functioning of the hospital can be adversely affected. These drugs should also be controlled and monitored carefully. The shortage of desirable drugs would not adversely affect patient care or hospital functioning even if shortage is prolonged and there were no more non-essential items too.

ABC-VEN Matrix Analysis

To do ABC-VEN matrix analysis preparation of each detailed tables were mandatory. Then cross tabulation was done based on other research's trend. The ABC-VEN matrix was formulated by cross-tabulating the ABC and VEN analysis. From this combination, three categories were created (I, II and III). Category I was constituted by drugs belonging to AV, AE, AN, BV and CV subcategories. The BE, CE and BN subcategories constituted category II, and the remaining drugs in the CN subcategory constituted category III. In these subcategories the first alphabet took place the ABC analysis, while the second alphabet stands for its place in the VEN analysis [Vaz *et al.*, 2008]. This matrix yield nine different subcategories and further these subcategories were coupled into three main categories, categories I, II and III [Sarbjee *et al.*, 2013]. The cross tabulation

finally summarized as Class I = AV + BV + CV + AE + AN, Class II = BE + CE + BN, Class III = CN [Junita *et al.*, 2012; Anand *et al.*, 2013]. In the combination of ABC and VEN analysis, the category I (specially AV and BV) needs strict managerial control as these items are expensive and vital. To prevent locking up of capital due to these items, low buffer stock needs to be maintained while keeping a strict vigilance on the consumption level and the stock in hand. CV drugs are drugs that have low cost but of high criticality. Hence these items can be procured for a longer duration and stocked because of their low carrying cost. AN drugs are those which need careful study before order.

After classifying pharmaceuticals by using ABC-VEN matrix, implementation of prioritization is expected. Class I – Needs close monitoring & stringent control by top management, Class II - Moderate control by the middle level management and Class III- Control at the lower managerial level [Sarbjee *et al.*, 2013].

Even if there was some softcopy data bases for Model 19 registry it was impossible to use in this ABC-VEN study due to its incomplete information. This might be also difficult to use it for internal auditing service to Budget, Special and Aid independent pharmaceutical stores.

ABC-VEN Matrix analysis of Aid Pharmaceuticals

Aid pharmaceuticals total utilized money was greater than even from budget pharmacy especially in recent years, but as seen from the main ABC-VEN Aid appendix, the numbers of items were smaller than Budget items. Most items were expensive anticancer drugs supplied to hospital

patients freely through research projects. These were ; Imatinib (Gliveec) HGC 100mg tri 1 of 10*12, Anastrozol/Armidex 1mg tab white FC of 2*14's STR and Nolvadex'D (tamoxifen) 20 mg FC of 3*10 tablet. As shown from the main chart, unit price of one pack of Gliveec was 420 euro, 28 tablet of Anastrozol/Armidex 1mg and Tamoxifen 20 mg of 30 tab also 1262 and 400 ETB, respectively .

Three years ago TikurAnbessa Specialized hospital prepared ABC- VEN analysis. The analysis was done for the three years (2008, 2009, and 2010). But the matrix cross tabulation analysis was not done except ABC and VEN categorization. Other unique procedure which followed, it was done by mixing Aid pharmaceuticals and Budget pharmaceuticals together. Even though it was difficult to make comparison between current study with previous result, Imatinib(gliveec) took the lion share by budget [Abate, 2013].

For more than four years, these three drugs had been supplied for TASH by Glive International Patient Assistance Program (GIPAP) and AstraZeneca company. Numbers of patients got treatment by these branded drugs. The top managers are expected to keep the sustainability of donation programs or find other options if donation agreement may be at end.

ABC-VEN Matrix analysis of Special Pharmaceuticals

In the same way Special pharmaceuticals show major percentage covered by Class I items.

This figure 3 and 4 showed that as budget and aid pharmaceuticals Class I Special items were higher in number. Class III pharmaceuticals were also very rare.

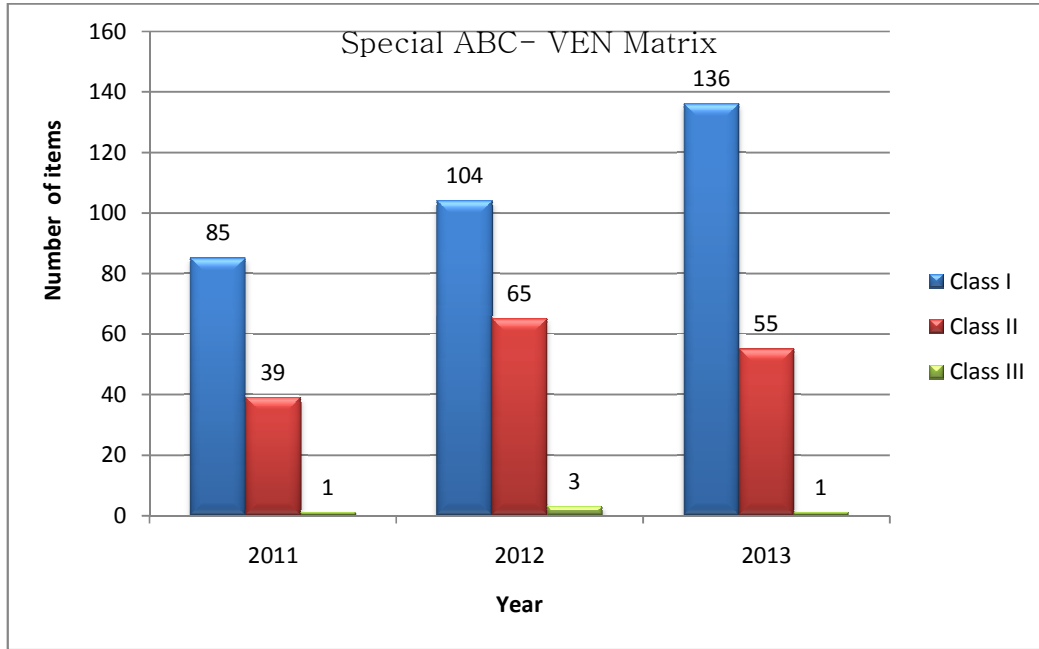


Figure 3: ABC- VEN matrix Special Items Class Value

As seen from all graphs, majority of the items in Budget, Special and Aid were classed under category I. There was some variations between Class I and Class III. In most years, Class III show almost non value while Class I took the lion share.

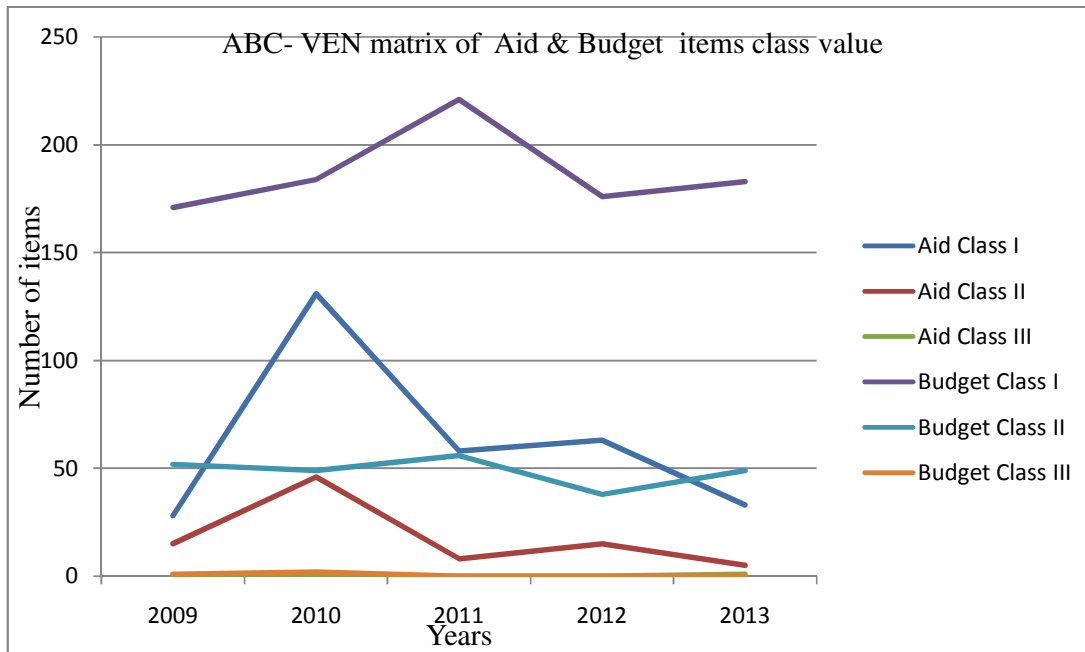


Figure 4: ABC-VEN Matrix of Aid & Budget Items Class Value

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Number of items in class I were higher than the other categories which indicates that most budget was utilized for Class I items. Most of Category I pharmaceuticals were also Class A and V items which need great attention for their safety and availability. From Category I some pharmaceuticals had lower unit cost like Examination glove but existed, in the top ten list in all five years. So this items must not be consider as cheap and need attention on their use as well.

Limitation of Study

There were some limitations of study; Even though some model 19 files contain some crucial items, they may not be used for this ABC-VEN analysis due to poor hand writing and there was difficulty to read from hard copy. There was also incomplete information on assigning of 'Unit' for items when they filled in model 19. In the first two years, there was some loss of model 19 files especially in special Pharmacy unit and unable to do five years analysis for special pharmacy unit. There was difficulty to analyze Aid pharmaceuticals by V.parito ABC categorization. The study also can't measure the lead time and order fill rate since it needs more time, sufficient budget and appropriate requisition letter of pharmaceuticals for entire five years i.e. There was no organized and well-documented pharmaceuticals requisition letter record.

CONCLUSION

The study finding indicated that there are huge pharmaceuticals in TASH, which need proper management and supervision. Budget utilization shows increment from 2009 to 2013 but there is an asymmetric trend on pharmaceutical availability for both Special and Budget units. Majority of Budget, Special and Aid pharmaceuticals are vital items. Relative to TASH drug list there is a gap on pharmaceuticals availability.

Category I pharmaceuticals took higher proportion than Category II and III. Most of Category I pharmaceuticals were also Class A and V items that need great attention for their safety and availability. There was symmetrical increment on budget utilization as well as items availability from 2011 to 2013 in Special pharmacy.

Aid pharmaceuticals ABC analysis result does not fit into the ABC Analysis principles.

Recommendation

Based on this study findings, the following recommendations can be given:

This ABC-VEN matrix analysis, can be used by TASH for inventory management application for effective and efficient management of the medical stores for implementing close supervision on the hospital pharmaceutical management.

Hospital top management shall monitor Class I items for its effective management. For AV & BV Class I items need strict managerial control as these items are expensive and vital, for CV items since they have low cost with high criticality can order for long duration, for AN items those need careful study before order. They are also expected to delegate concerned manager for Class II and class III pharmaceuticals.

Implementing

Auditable Pharmaceutical Transactions and Services (APTS) will ease the hospital pharmaceuticals management. The EHRIG Recommendation on the Yearly ABC-VEN matrix analysis and revision of the hospital drug list has to be implemented by the hospital DTC. TASH shall further survey on patient and staff level of satisfaction in terms of drug availability. Hospital's concerned body expected do more on pharmaceuticals availability relative to their own drug list.

The hospital should apply this inventory tool to all budget categories of pharmaceuticals for better safety and availability of pharmaceuticals.

Acknowledgments

First, I want to give my heartfelt gratitude to the Almighty God and to his mother, St. Virgin Mary, since they have been with me throughout the execution of this research and in all my life to save me from harsh.

I owe special thanks to my beloved mom Lielt Belay who takes every challenge and pray to see my success.

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