

# Inventory Analysis in a Private Dental Hospital in Bangalore, India

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## ABSTRACT

**Introduction:** There are various approaches for inventory management. Of all the inventory control systems, ABC (Always, Better, Control) and VED (Vital, Essential, Desirable) matrix is most suitable for dental stores. We could not find any literature pertaining to inventory analysis in a private dental hospital. So, we conducted a study in a private dental hospital in Bangalore, Karnataka, India.

**Aim:** The present study aimed at evolving an inventory control plan for a private dental institution by categorizing the materials utilizing an ABC-VED coupling matrix.

**Materials and Methods:** The study analysed the annual consumption, the expenditure incurred for the dental consumables and developed a matrix based on ABC and VED analysis to narrow down the group of consumables for managerial monitoring.

**Results:** Of the 215 consumables used 13.5% (A category) consumed 70% of total annual expenditure. About 21% of the consumables (Category B) consumed 20% and 65.5% (C category) accounted for 10% of the annual expenditure. The VED analysis found 47% consumables as vital, 37.6% as essential and 15.4% as desirable category. ABC-VED matrix analysis categorized 51.6%, 33.5% and 14.8% of consumables as category I, II and III, respectively.

**Conclusion:** Categorization by the ABC-VED coupling matrix model helps to narrow down on fewer consumables. The management of Category I consumables was monitored by top management resulting in better control on the annual expenses and at the same time making available the vital consumables. Category II was monitored by middle and Category III at lower managerial level.

**Keywords:** Always better control, Dental consumables, Vital essential desirable

## INTRODUCTION

A hospital supply system should ensure adequate stock of required items to maintain an uninterrupted supply of all essential items to provide optimal care [1]. The advent of advanced medical technology has resulted in a disproportionate increase in the expenditure on health care. Therefore, a hospital spends about one-third of its budget on purchasing various materials and supplies [2]. Various scientific approaches to inventory management include ABC (Always, Better, Control), VED (Vital, Essential, Desirable), FSN (Fast-Moving, Slow-moving, Non-moving, SDE (Scarce, Difficult, Easy), HML (High, Medium, Low) and SOS (Season-Off-Season) [3].

ABC and VED are the most commonly used inventory control techniques. But as ABC analysis considers only cost while VED considers criticality, the coupling matrix is most suitable for inventory analysis in the hospital. ABC analysis, popularly known as "Always Better Control" is based on Pareto's principle of "Vital few and trivial many". Materials are categorized as A, B or C depending upon the annual consumption of the item. Group A includes 10% items which consume about 70% of budget. Group B includes the next 20% which consume 20% of financial resources and Group C includes the remaining 70% items which account for just 10%. "V" is for vital items without which a hospital cannot function, "E" for essential items without which a hospital can function but may affect the quality of the services and "D" stands for desirable items, unavailability of which will not interfere with functioning [4].

We could not find any literature pertaining to inventory analysis in a private dental hospital. So, we conducted a study in a private dental hospital in Bangalore. The present study aimed at evolving an inventory control plan for a private dental institution by categorizing the materials utilizing a ABC-VED coupling matrix.

## MATERIALS AND METHODS

The study was conducted in a private dental hospital in Bangalore. Permission was obtained from the Head of the Institution. The ethical clearance was waived off considering the objectives of the study.

For ABC analysis, information regarding the total cost and consumption of materials was obtained from the stores for the financial year 2011-2012 [Table/Fig-1]. The value of annual consumption of all the dental consumables was calculated after multiplying unit cost by annual consumption. Resulting figures were arranged in descending order of Rupee value based on which the dental consumables were then classified into A (70%), B (20%) and C (10%) categories.

For VED analysis, a list of all the dental consumables were distributed to a panel of nine dental personnel comprising of periodontist, endodontist, oral medicine, prosthodontist, orthodontist, oral pathologist, oral surgeon, public health dentist and pedodontist. The panel included a specialist from each department who had been appointed as the Department Administrative Officer (DAO) of the department who was responsible for procurement of the materials. The list was prepared by DAO of each department in consultation with all the faculty members and was approved by the Head of Department.

They were asked to classify the consumables as vital, essential or desirable. The consumables which were common to all departments were categorized based on 50% concurrence of the panel members. For consumable inventory only ABC analysis alone is not enough, as this might miss the desired managerial control of vital items from B and C categories. When only VED analysis is considered for control strategy, some desirable (D) category consumables will be included in the priority list, which might hamper efficient management mechanism. However, the ABC-VED coupling matrix model can overcome this problem of prioritization in control mechanism, particularly for deciding the rational approach for repeated order placement and effective vigilance. The data was coupled into an ABC and VED matrix resulting in consumable categorization as Category I, II, and III.

## RESULTS

Out of the total of 215 dental consumables, around 29(13.5%) accounted for 70 % of the annual expenditure and were classified

as A category. Another 45(21%) of the consumables consumed 20% of the budget (B category), while the remaining 141(65.5%) accounted for only 10% of the annual expenditure (C category) [Table/Fig-2]. With regards to VED analysis, our study showed that the clinicians classified 101(47%) of the consumables as Vital, 81(37.6%) as essential and 33(15.4%) as desirable [Table/Fig-3].

The ABC-VED matrix classification of the inventory depicted in [Table/Fig-4] revealed that 51.6% of the consumables constituted Category-I items. 21 items of Category-I items were both high cost and vital, 10 items were high cost and essential, none were high

Sr. No.	Material	Sr. No.	Material
1.	Implants	8.	Rotary Files
2.	Gloves	9.	Composites Syringe Kit
3.	X-Ray Film	10.	GuttaPercha
4.	Metal Brackets	11.	K-File
5.	Rubber Base Material	12.	Alginate
6.	Alloy-Amalgam	13.	Teeth Set
7.	Glass Ionomer Cement		

[Table/Fig-1]: List of some important materials in the dental hospital.

Dental consumables analysis	Category			Total
	A	B	C	Total
Total annual consumption (%)	70	20	10	100
Value of annual consumption (Rupees)	3730263	1043478	517886	5291627
Number of items	29	45	141	215
Number as percentage	13.5	21	65.5	100

[Table/Fig-2]: ABC analysis of dental consumables.

Category	Number	Percentage
Vital	101	47
Essential	81	37.6
Desirable	33	15.4

[Table/Fig-3]: Distribution of dental consumables into VED classification.

Category	V	E	D	Matrix classification
A	AV (21)	AE (10)	AD (0)	Category I (51.6%)
B	BV (26)	BE (18)	BD (1)	Category II (33.5%)
C	CV (54)	CE (53)	CD (32)	Category III (14.8%)

[Table/Fig-4]: ABC-VED matrix.

Category I	Category II	Category III
Glass ionomer cement Gloves Impression paste X-ray film	RC prep Pit and fissure sealant Paper points Diamond burs	Crowns Wedges Base plate APF gel

[Table/Fig-5]: Categorisation of materials according to ABC-VED matrix.

Category	Vaz et al., [2]	Gupta et al., [4]	Thawani et al., [7]	Devnani et al., [8]	Singh et al., [9]	Wandalkar et al., [10]	Anand et al., [11]	Mahatme et al., [12]	Khurana et al., [13]	Mani et al., [14]
A	12.93	14.46	10.76	13.78	11.08	13.4	18.6	14.5	3.45	17.9
B	19.54	22.46	20.63	21.85	22.16	16.5	24.0	18.2	6.9	20.2
C	67.53	63.08	68.61	64.37	66.75	70.1	57.4	67.3	89.65	61.9
V	12.36	7.39	23.76	12.11	12.40	50.9	13.2	24.2	32.41	29.8
E	47.12	49.23	38.12	59.38	60.16	40.2	38.8	68.5	61.38	36.9
D	40.52	43.38	38.12	28.51	27.44	8.9	48.0	7.3	6.2	33.3
I	22.99	20.92	29.15	22.09	19.80	57	28.7	31.5	33.8	42.8
II	41.67	48.92	41.2	54.63	57.54	35	41.1	68.5	60	36.9
III	35.34	30.16	29.59	23.28	22.7	8	30.2	0	6.2	20.2

[Table/Fig-6]: Comparison of ABC, VED and ABC-VED matrix analysis of different studies [2,4,7-14].

cost and desirable. Category- II items (33.5%) was constituted by intermediate cost and essential items numbering 18, intermediate cost and desirable items numbering 1 while 53 items were low cost and essential. 14.8% of the items fell into Category III which consisted of the low cost and desirable items [Table/Fig-5].

## DISCUSSION

Out of a total of 215 dental consumables, around 29(13.5%) accounted for 70 % of the annual expenditure and were classified as A category. Another 45(21%) of the consumables consumed 20% of the budget (B category), while the remaining 141(65%) accounted for only 10% of the annual expenditure (C category). These results are similar to the study conducted by Gupta et al., in Armed Forces Medical Services (AFMS) where out of 325 drugs, 47 (14.6%) drugs consume 70% of ADE (Group A), 73 (22.46 %) consume 19.99 % of ADE (Group B) and the rest 205(63%) drugs consume just 9.99 % of the total budget [4].

With regards to VED analysis, our study showed that the clinicians classified 101(47%) of the consumables as Vital, 81(37.6%) as Essential and 33(15.4%) as Desirable. These results are in concurrence with those obtained by Mannas et al., which revealed that out of 156 items, 50.9% were considered 'Vital' by the constituted medical panel; 40.2% were 'Essential' and the rest 8.9% were considered 'Desirable' [5].

The ABC-VED matrix classification of the inventory depicted in [Table/Fig-4] reveals that 51.6% of the consumables constituted Category-I items. Twenty one items of Category-I items were both, high cost and vital, 10 items were high cost and essential, none were high cost and desirable. Category- II items (33.5%) were constituted by intermediate cost and essential items numbering 18, intermediate cost and desirable items numbering 1 while 53 items were low cost and essential. Category III(14.8%) consisted of low cost and desirable items.

Based on ABC-VED matrix analysis a study by Roy RN et al., revealed that, around 42.42% of drugs were classified as category I, accounting for 75.12% of the total drug expenditure. Category II drugs constituted 43.94% of drugs which consumed 21.68% of the total drugs budget, while the remaining 13.64% drugs (category III) accounted for only 2.79% of the total drug expenditure [6].

A comprehensive view of the studies involving inventory control analysis using ABC-VED matrix is provided in [Table/Fig-6] [7-14].

Economics of materials control is a matter of self- presentation in today's competitive environment. Materials control is a matter of rupee control; it is axiomatic that stringent controls must be placed on higher value items. The management of inventory pares the avenues for optimizing the costs of services besides making materials available to the patients which increase the quality of health care services. Thus, the management of class I vital items would help in keeping a check on the annual budget and their availability. The management of class II items could help in providing all the essential items. Class III items can be managed by low level management.

## LIMITATION

The fact that this particular study was undertaken in one private dental college could be a possible limitation. The consumption might differ from other institutions based on the patient flow and work load. The findings could not be compared as we could not find any published literature regarding inventory control in a dental college.

## CONCLUSION

The results of this study will facilitate the management in controlling the cost and ensure the availability of vital and essential items in the hospital which will be in the interest of patients and the administration. It is concluded that the use of inventory control techniques need to be made a routine practice in the present health care institution.

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