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Research Article

A qualitative comparative study of public pharmaceutical procurement and distribution system in Tamil Nadu and Karnataka

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ABSTRACT

With the exploding rate of population increase, escalating health care costs and high expectations of the health care delivery system, the sustainability of the present public pharmaceutical procurement system has become untenable. The policy makers are struggling with the existing broader health care reforms. Clinical managers and clinical leaders are striving hard to recognize the delivery of health care and promote evidence-guided decision making to initiate a culture of inter-professional collaboration with quality improvement; Pharmaceutical procurement for government run health institutions is a complex process. It involves many procedures, agencies, ministries and pharmaceutical manufacturers. The existing institutional infrastructure, health policies, rules and regulations are inadequate and hamper the overall efficiency in responding to the end users (common population). No matter what type of model is incorporated to build and manage the drug procurement and distribution system, introduction of efficient, systematic procedures like selection of cost-effective essential medicines, quantification of needs based on real-time requirements, pre-selection of potential suppliers, regular monitoring of the performance of various factors that affects the functionality of the procurement system. Botch in any of these factors is a catastrophe, leading to wastage of limited resources. Procurement cycle comprises of interlinked stages where any change occurring in one stage, its results are reflected in the other stages as shown in Figure 1; This paper demonstrates a comparative study conducted to analyze the origin and function of the public drug procurement system followed in Tamil Nadu and Karnataka. It's a qualitative study that highlights the success of Tamil Nadu Medical Corporation Services Ltd and how Karnataka State Drug and Logistics Warehousing Society is still striving to meet the needs of the people.

Keywords: Pharmaceutical Procurement System; TNMSC; KDLWS; Rural Public Healthcare

INTRODUCTION

Before we start the discussion on strategies to address the comparative study, it is vital to understand the environment in which public sector procurement functions, and what the areas are, which have the highest probability of bottle neck occurrences that hinder the normal functionalities of the system. This section presents an introduction about procurement cycle, procurement environment, an overview of the public sector procurement system functioning in Karnataka and Tamil Nadu.

What is a Procurement Cycle?

A procurement cycle originates with planning the supply of products that are required. It culminates with the delivery to the receiving point and the acceptance of the products. The primary objective of any type of procurement is getting the right good quality product

at the right place, at the right time. The cycle comprises of three interlinked stages, which are as shown in Figure1. Procurement proceedings are known for its vulnerability. It attracts possibilities of fraud, manipulation, collusion and corruption; thereby, decreasing the efficiency of the system. Estimation studies suggest that, about 20-30% of procurement value diminishes mainly because of corruption. On the other hand, procurement process itself contributes about 15% of the gross domestic product (GDP) in OCED countries and around 45% of the government spending (United Nations Office on Drugs and Crime, 2012). Public pharmaceutical procurement in India constitutes about 30% of the GDP (Sinha, 2009).

Public Drug Procurement Environment

The environment around the public sector drug procurement embraces both the core technical and supporting system constituents. The core components include personal, technical capacity, workforce resources and expertise in management; while the institutional infrastructures, policies and regulations, leadership from the government grant and other elements comprises the supporting components as shown in Figure 2. Over a period of time, external services and

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market issues were added to complete the environment (Dickens, 2008).

HealthCare Sector in India

Healthcare requirements in India are divergent and vast. Provision of healthcare in India, is a responsibility shared by both the federal and state governments. The general health services are targeted by the state government and provision of medical education, vital drugs like vaccinations and other lifesaving medications, population stabilization and disease control are taken care by the central government. The National Health Programs controlled by the state handles the reproductive and child health services and also regulates major communicable diseases like Tuberculosis, AIDS, and Malaria etc. These programs have significantly backed the state health programs.

Around 26% of the entire government health budget is utilized in procurement of drugs. With so much of the fund flowing in just for procurement proceedings, preventing and controlling corruption is a determining factor to project efficiency in the system (Ministry of Health and Family Welfare, GOI, 2011). Despite of this, as per the National Health Accounts, the Out Of Pocket (OOP) expenditure is very high. Almost 62% of OOP is accounted from rural households availing different health care services (National Health Accounts Cell, MoHFW, 2009).

With this backdrop, government intervention is critically essential in achieving health care accessibility, affordability and availability of universal coverage. In order to achieve this, timely supply of drugs and other medical supplies are of great importance in the healthcare delivery system. Important foundation is laid down by legal, policies and regulatory environment for a robust infrastructure for public procurement in the Indian health care sector. In India, federal and state government follows one or more of these following arrangements for public pharmaceutical procurement (S.Sakthivel, 2007)-

- Rate Contract System
- Pooled procurement system (autonomous or government set-up)
- Decentralized purchasing
- Local purchasing

In the present global scenario, India has risen as a leading supplier of generic medicines. By volume, it is the third largest manufacturer of medical and ranks 14th in terms of value. In spite of which the present population's demand is out bursting and it is not able to meet the plea due to lack of accessibility to the essential medicine (World Health Organization, 2004). More than meticulous follow up of all the principles of Good Manufacturing Practice (GMP) throughout the manufacturing and production of medicines, it is essential that the produced medicines are aptly stored and distributed to the respective destination for their utiliza-

tion in a professional and scientific manner. The proficiency of the purchasing agency defines the development of an efficient and optimized procurement system. It ensures purchasing of the right item from the correct source at the right time possessing the accurate quality at a reasonable cost and in the right quantity. This requires possessing of both pharmaceutical and managerial skills to maneuver the processes of purchasing and distribution.



Figure 1: Interlinked Stages of Procurement Cycle

India is the second largest populated country, it is an established truth that the availability of drugs in the Indian Public Healthcare sector has always been an escalating problem. There are various factors like shortage or blockage of funds, inefficient indenting procedures, disorganized inventory and material handling management, non-rational use of resources and so on which adds up to the problem. By identifying the root cause for shortage of drugs in the public healthcare providers, many Indian state governments have introduced their own establishment for purchasing and distribution of drugs and other medical supplies required for them. In the initial stages, procurement of drugs was initiated through centralized pooled methods. This type of procurement commenced in the 1990s (R Veena, 2010).

In March 1994, Drug policy for Delhi was introduced by the Delhi Government. In the same year, the Tamil Nadu government came up with Tamil Nadu Medical Services Corporation Limited (TNMSC) and the revised Central Purchase Committee (CPC) was established in Kerala known as Kerala Medical Services Corporation Limited (KMSCL). These were the trend setters in the country, affirming scientific and organized pooled procurement of drugs. Over a period of time, the other state governments like Karnataka, Maharashtra, Punjab, Orissa, Rajasthan and others have started centralizing drug procurement systems (PrabalVikram Singh, 2012).

In this comparative study, we study and compare the origin, functionalities, management and the success

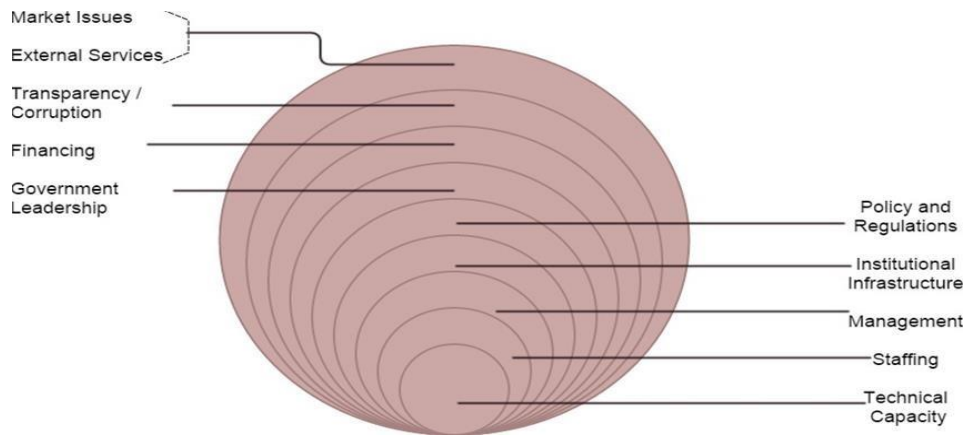


Figure 2: Components of Procurement Environment



Figure 3: 25 Drug warehouses located in various Districts of Tamil Nadu



Figure 4: 14 Drug warehouses located in various Districts in Karnataka

rates of the public drug procurement system followed in the states of Tamil Nadu and Karnataka.

Tamil Nadu Medical Services Corporation Ltd.

With the insight and strong involvement of the government leaders in the state of Tamil Nadu, there is a significant impact on the health gains of the state. Despite the ever changing political government, the approach of improving the public health system has always been the primary consistent priority, since the early 1980s. The funds allocated by the government and the policies emphasize on improving the primary health care services, especially targeting the rural, poor and deprived population.

During the beginning of 1990s, the Tamil Nadu health service sector was plagued with a plethora of problems related to shortage of drug and inaccessibility to the essential medicines. This issue alarmed the Tamil Nadu government to take charge and initiate new strategies over the old not so productive model. Under the leadership of R. Poornalingam, Health Secretary to Government of Tamil Nadu, a team of technocrats and bureaucrats made tremendous changes over the existing system and paved way for setting up a robust structure for purchasing, storage and distribution of drugs, called "Tamil Nadu Medical Services Corporation. The system was integrated under the Companies Act 1956 with the main intention of undertaking and monitoring

all the activities related to the procurement and distribution of drugs for the entire government hospitals and also to the public health setups around the state. The system was initiated in the year 1994 1st July and it started functioning on full scale by the year 1995 January (K G Revikumar, 2013).

Tamil Nadu trail blazed in providing universal health coverage by introducing an effective drug procurement and distribution mechanism. The model is endorsed to other states by various organizations like the World Bank, the Department for International development and the World Health Organization. The system was also constituted to the Universal Health Care by the High Level Expert Group (HLEG) (High Level Expert Group, 2011). The entire system is built on an IT foundation that enables better visibility and tracking of medicines assuring the delivery of the same to the needy patients. The system drastically helps in eliminating the usage of counterfeit drugs (Dr. RumkiBasu, 2013). TNMSC has adopted a well-planned scientific streamlined process of drug procurement and distribution, assuring availability of drugs throughout the year. Bold and drastic decisions were made by the system to deviate from the traditional procedures and functionality. The model incorporates centralized tendering and procurement to improvise accessibility to drugs and decrease the financial burden on the state government and the individuals. A decentralized distribution system

is followed, where the drugs are delivered to 25 district drug warehouses located across the state by the suppliers in stipulated quantities as depicted in Figure 3. The TNMSC is an autonomous body, where all vital decisions regarding procurement are done by the board without any involvement of the ministry or the health department. The ministry is responsible for structuring the procurement policy and administration. The health department and the Ministry decides the list of essential drugs and supplies (DrT.Sundaraman, 2011).

Karnataka State Drugs Logistics and Warehousing Society

Initially the drugs and other supplies required for utilization of public health services in the state of Karnataka were procured Government Medical Stores. Only in the year 2002, a society was established with the main aim of establishing a cost effective, efficient and decentralized drug logistics and warehousing structure in the state. It was called the Karnataka State Drugs Logistics and Warehousing society (KSDLWS) which was initiated with the assistance of the European Union and was registered in 2003 under the Karnataka Registration Act 2003. The system was initiated to adhere to the modern warehousing techniques to stringent quality control and also to provide information technology empowered functionalities to serve the patients free of cost. Drugs, chemicals and other sundry items are procured through the society for the usage in government owned hospitals and other healthcare services. The procurement in the state is done under the State Sector, District Sector and the Directorate of Medical Education. The society also takes care of the drug requirements of various other programs like National Rural Health Mission (NRHM), Karnataka State Aids Prevention Society (KSAPS) and AksharaDasoha of Education Department (Comptroller and Auditor General of India, Supreme Audit Institution of India, 2013).

The KDLWS operates from its headquarters in Bengaluru, which comprises of 6 departments covering administration, procurement, logistics, quality control, accounts and finance and Information Technology. It was established on the similar lines with the TNMSC. Even though they function under similar objectives, there are significant variances between the two organizations. The KSDLWS is not an autonomous body, it is a complete government system where the Chairman of KSDLWS is the state health minister and the Additional Director is a member of the Karnataka State Administrative Department (SudhaBhat, 2011).

Currently, the society manages about 14 district drug warehouses (approximately one warehouse for every two districts) and the state government is taking an initiative to set up drug warehouses for every district as shown in Figure 4. The warehouse is staffed by 1 in-charge, 1 chief pharmacist, 2 junior pharmacists, 1 data operator and 2 attendees. An electronic based Drug

Management Information System operates in the headquarters and at the district drug warehouses, but does not extend up to the level of healthcare facilities. With the advent of NRHM programs that were implemented in 2005 and e-procurement and electronic drug management information access to essential medicines at the public health facilities have improved drastically, although there are reports of stock outs and increased out of pocket expenditure from the patient side. Hence, the electronic based drug supply chain system in Karnataka is still in its nascent stage, where major functionalities and transactions are manually done with cumbersome paper based proceedings (National Rural Health Mission, 2011).



Figure 5: Geographical location of Karnataka and Tamil Nadu

METHODOLOGY

The study is confined to equate the public drug procurement structures of the two states namely Karnataka and Tamil Nadu geographically located as shown in the Figure 5. It is descriptive cum empirical in nature. The parameters reveal the objectives of comparison study to highlight the demographic, socioeconomic and health indices, the organization of the state drug procurement society, the structure of the procurement model, financial budgeting, drug distribution mechanism, quality level of the drugs and services, timely availability of drugs, the low financial burden on the state, transparency and wastage elimination.

For the study, the primary data were collected by conducting semi-structured interviews with public health officials, rural medical doctors, pharmacists in the district warehouses and also through key informant analysis, which was substantiated with the field staffs through interviews and questionnaires. Data was also gathered through qualitative observation during the drug warehouse visits and a pilot study was conducted to visit 25 primary health centers located in Udupi district to corroborate the analysis. Secondary data on budgets, expenditures, health indices, etc. are compiled from the datasets provided by Ministry Of Health and Family Welfare, National Sample Survey Office, Press Information Bureau and Census Commission of India. Since the study is qualitative in nature and is

Table 1: Overview of the sample states (Karnataka and Tamil Nadu)

Parameters	Karnataka	Tamil nadu
Number of Districts	30	32
Total population (million)	61	72
Urban population ratio (%)	38.67	48.40
Rural population ratio (%)	61.33	51.60
Urban Literacy Rate (%)	85.78	87.04
Rural Literacy Rate (%)	68.73	73.54
Annual per capita income (Rs)	77,015	98,550
Number of District Drug Warehouses	14	25
Number of Sub centers	8,871	8,706
Number of Primary health centers	2,310	1,277
Number of Community health centers	180	385
Number of District hospitals	31	31
Number of Sub-divisional Hospitals	146	230
Number of Mobile Medical Units	144	385
Birth rate (/1000 population)	18.8	15.9
Death rate (/1000 population)	7.1	7.4
Infant death rate (/1000 live-births)	35	22
Maternal death rate (per 100000 live-births)	178	97
Total fertility rate (children per woman)	1.9	1.7

Table 2: Comparison of the procurement processes followed in the two states

Categories	Parameter	Karnataka	Tamil Nadu
State Health budget and Drug procurement System	Name of the drug procurement and distribution system	Karnataka State Drugs Logistics and Warehousing society. (KDLWS)	Tamil Nadu Medical Services Corporation Ltd. (TNMSC)
	Legal status of procurement system	Government set-up.	Autonomous system.
	State budget allocation for Medical and Public Health(million)	878.2(2011-12)	3048.2 (2011-12)
		1598.7(2012-13)	2365.5 (2012-13)
		1832.3(2013-14)	3598.0(2013-14)
	Drug, chemicals and other miscellaneous items Procurement budget (INR)	96.63 crores(2011-2012)	185 crores (2011-2012)
Monthly per capita consumer expenditure (MMRP) over medical (institutional) (INR)	65.54	32.60	
Essential Medicine List (EML)	Customized state Essential Medicine List	Yes	Yes
	Composition of EML committee	Multi-stakeholder committee	Multi-stakeholder committee
	Frequency of state EML revision (years)	2-3	1
	Time for EML preparation/revision (months)	2-3	2-3
	EML categorization	yes (ailment based)	yes (product-based categories)
	Third party review of EML	No	No

Table 2: Comparison of the procurement processes followed in the two states (Continued)

	Inventory management	The inventory is sorted based on ABC method and follow first –in first out method in distribution.	The inventory is classified based on FSN method and more importance is given on fast moving inventory.
	Scientific consumption/inventory forecasting	Presence of inventory management software but up to warehouse level with absence of track and trace of acknowledging the movement of drugs till the health care center level.	Yes, inventory management software is available with track and trace technologies.
	Flexibility for Alteration in indent	No	Yes
	Acknowledgement for dispatched/delivered drugs	Passbook (value based)	passbook(value based)
	Distribution of inventory at the facility	Uses first in first out (FIFO) principle	Uses first in first out (FIFO) principle
Penalty	Penalty for supply schedule default	61-75 days : 3% penalty on the belated supply of the order 76-90 days: 5% penalty on the belated supply of the order >90 days: liable for cancellation, blacklisting and forfeiture of Security Deposit without notice	0.5% per day to maximum of 15% of the tender amount
	Penalty for quality failure	Supplier is blacklisted with forfeiture of the security deposit and will not be allowed to participate in any of the department tenders for subsequent 5 years.	Supplier black listed with forfeiture of security deposit
	Blacklisting criteria	Abnormal under quoting, submission of false document, corrupt practices, supply of sub-standard quality or if the supply is not done in stipulated time period.	Defaulting consecutively 3 purchasing orders with less than 50% supply or fail in quality or black-listed by other national and other state level agencies.
IT enablement processes	Demand estimation & forecasting	No	Yes
	Tendering process	Yes	Yes
	Quality Assurances	Yes	Yes
	Payment disbursement	Yes	Yes
	Inventory management (district warehouse level)	Yes	Yes
	Inventory management (district health facility level)	No	Yes

Table 2: Comparison of the procurement processes followed in the two states (Continued)

Forecasting and Demand estimation	Estimation of the demand rate	Accumulation of facility indents (consumption on the last 3 years)	Accumulation of facility indents
	Occurrence of demand estimation (years)	3	1
	Methodology for demand estimation (facility level)	No scientific method; performed by pharmacist and clerks. Estimation is based on rate of drug consumption, Annual Disease trends and Average patient attendance.	10% addition of the previous year consumption
Procurement process	Mechanism of procurement in the state	Centralized-pooled procurement with decentralized distribution to all the hospitals and other public health care services.	90% centralized; 10% decentralized
	Financing of drug procurement	State government budget allocation.	State government budget allocation
	Budget allocation for Emergency drug	No (procured from existing budget)	yes (additional budget released)
Tendering process	Bidding process	Two-bid system	Two-bid system
	Supply Schedule	Supply at least 50% of the ordered quantity with the first 30 days from the date of purchase order and remaining 50% before the next 30days.	Supply atleast 20% of the ordered quantity within 30 days from the date of the purchase order and to complete at least 70% supply before 60 days
Quality control	External quality testing of every consignment	Empanelled Government laboratories	Empanelled private and government laboratories.
	Testing before distribution	Mandatory	Mandatory
Payment mechanism	Payment department status	Government set-up (with e-payment).	Autonomous (managed by contractual staff)-IT enabled
	Lead time for payment (days)	Payment will be made only after the supplies are effected as per the supply order.	30
	Pre-requisites for payment disbursement	Warehouse material receipt, quality certificates from government empanelled laboratories.	warehouse material receipt, external quality certificate
Inventory management and distribution	Scientific warehousing practices	No	Yes
	In-house/outsourced supply chain management	In-house	In-house

envisioned to highlight gaps in structure for future research, no statistical techniques were utilized.

Findings

The findings of the study have been discussed below

Overview of the sample states

The state of Karnataka is situated in the southern part of India on the westside of the Deccan plateau with 30 districts, covering an area about 191,791 km². Karnataka is the 8th largest state in terms of area. It covers a population of 61,095,297 (male: 30,966,657 and female: 30,128,640), making the state the 9th most populated state in India. The literacy rate is about 75.36%. Out of the total population about 61.33 % comprises of rural dwellers (male: 18,929,354 and female: 18,539,981) (H K Jain, 2011; The Registrar General & Census Commissioner, India, 2011). Karnataka is one of the highest economic growth state in India and has recorded the highest growth rates in terms of Gross Domestic Product and per capita Gross Domestic Product compared to the other Indian states. Agriculture is one of the prime entities that contribute to the economy. Karnataka is the trailblazer in the field of Information Technology and houses up to 55% of Biotechnology associated companies in India (Indian Brand Equity Foundation, 2010).

On the other hand, the state of Tamil Nadu located is also located in the southern part of India on the eastern side of the Deccan plateau with 32 districts, covering an area about 130,058 km². Tamil Nadu is the 11th largest state in India in terms of area. It covers a population of 72,147,030 (male: 36,137,975 and female: 36,009,055) with a literacy rate of 80.09%. Out of the total population, 51.06% comprises the rural population (male: 18,679,065 and female: 18,550,525) (H K Jain, 2011). The state is the 6th most populated state in India. Tamil Nadu holds the second largest economy in the country. Even though it is traditionally an agrarian economy, it beholds a network of about 113 industrial parks. Tamil Nadu is a hub for major manufacturing industries, mainly automotive, software, leather and textiles. Tamil Nadu government is the major investor in the state comprising about 51% of the total investments and these incentives with good infrastructure has tremendously helped industrial and the ICT service sectors (The Associated Chambers of Commerce and Industries of India, 2012). For an overview of the context, brief information about both the states in terms of demography, socio-economic indices, public healthcare infrastructure and health indicators are presented in the Table 1 (Source - Census Report 2011. Government of India; Rural Health Statistics in India 2012; Ministry of Health and Family Welfare; SRS Bulletin 2010-11-Sample Registration System.)

Comparison of the Drug procurement and distribution process

The process of procurement and distribution of drugs, practiced in both the states is evaluated with respect to certain parameters. The parameters are as stated below-

- Overall Public Healthcare Infrastructure
- Generation of Essential Drug List
- Forecasting and Demand estimation of Drugs and other medical essentials
- Procurement Mechanism
- Prequalification criteria
- Quality maintenance
- Payment Procedure
- Inventory Management
- Distribution Mechanism
- Enforcement of penalties
- IT system Enablement

The in-depth comparison of the two procurement mechanisms and price of the drugs is described in Table 2. In various cases, the process practiced was different from the one planned in the manuals. The information captured, correlates to the practices that were followed in real time basis.

DISCUSSION

An ideal drug procurement and distribution system must guarantee the availability of the essential drugs and other medical, miscellaneous items in sufficient quantities that which is purchased at lowest reasonable price to safe guard therapeutic values to a large population of beneficiaries with additional and available resources.

The beneficiaries are normally referred to the government and the patients. In general, any government, which exists in a resource constraint situation, would rationally look forward for an effective procurement mechanism. A mechanism that pledges constant availability of required quality drugs throughout the year with optimized financial sustenance than ensures better outcomes. For the betterment of the government, it is vital that the system operates on a transparent basis to promote competition and efficiency. On the other hand, the patient's only expectation is availability of quality drugs any time of the year at free of cost or at a reasonable charge. Every state must take steps to intensify the usage of technical capabilities and Information technology to enhance the administrative strength of the government, driving it to become a better leader.

The reduction of financial encumbrance to initiate drug affordability

For a developing nation like India with major constraints in research, lowering the monetary burden on the government exchequer is the main concern of the public drug procurement and distribution system. Areas like the establishment of a robust, transparent man-

agement system, procurement, pricing, storage and transportation facilities, and generation of reality based essential drug list that cater to the needs of state health burden can be molded in order to lower the financial hardship.

Procurement processes have grave repercussions on the allocated state budget that includes both capital and operational expenditure. Implementation of a centralized procurement system, results in possessing an optimum number of warehouses located at strategic points in order to make drugs available to the distant and remote regions. In addition to which, adequate transportation facilities are required; as it plays a vital role in making sure that the products reach the user healthcare institutions from the warehouses. Along with the implementation of the system, construction and maintenance of warehouses and transportation facilities, it is very important to enable an Information Technology management system for managing all the activities in the system. All these factors initiate the necessity for a considerable initial capital investment. In the financial year 2013-14, a budget of 3598.0 and 1832.3 million (INR) has been sanctioned for the states Tamil Nadu and Karnataka respectively, for Medical and Health Expenditure (Reserve Bank of India, 2014). The sanctioned fund is used for capital investments, procurement of drugs, maintenance of infrastructure and manpower, initiation of various health programs etc. In Tamil Nadu, with 32 districts and 25 drug warehouses, the state has implemented a fully autonomous, IT based, centralized drug procurement system with decentralized distribution network, which functions at most perfection complying with the scientific standards of inventory and material management. The system has gained its popularity in ensuring the availability of drugs and medical support throughout the state at all times and at a very meager price. Karnataka has also implemented a drug procurement system. The Karnataka state government has allocated drug budget to different kind of health facility. The budget allocation is based on the type of the health facility and the number of beds, not based on patient attendance, staffing capacity or the regional demography. The approximate budget allocation done by the state government is as represented in Table 3 .

The KDLWS is typical government set up which is akin to the Tamil Nadu model but not completely computerized. The state comprises of 30 districts, but only 14 drug warehouses and is unable to make necessary investments to fully grasp the benefits and advantages of a centralized pooled procurement model.

A well-structured and formulated essential drug list is important to make optimized utilization of available monetary resources. The state of Tamil Nadu procures up to 268 drugs, 84 suture items and 63 surgical items for distribution to various governments owned health care facilities at various levels. Along with this the system also procures 114 veterinary drugs for several vet-

erinary dispensaries. KDLWS procures about 295 drugs, 108 suture items, 80 surgical items and 85 other drugs, which fall under special category. It is a universal fact that drug price is the major expenditure component in health care system. The process of purchasing of drugs and other pharmaceutical items starts with outlining of purchasing policies, stocking and payment. Therefore, optimal and rational use of drugs by the medical professionals and health workers is vital. Hypothetically, the centralized procurement process does provide volume discounts, thereby reducing monetary burden. Drug rates have increased tremendously and the current pricing practice is based on cost-plus pricing. Since, it is a difficult task to obtain accurate cost data from pharmaceutical companies; they tend to project higher margins in base cost with, added to the margins charged by the wholesalers, manufacturers, retailers and stock lists. Implementation of an efficient centralized purchasing system for drugs fallout in competitive procurement practices at a lower rate is demonstrated in the state of Tamil Nadu. Table 4-represents the, the pricing followed in TNMCS is comparatively lower than the pricing under KDLWS. In a few cases, the rates of certain medicines are higher, which reveals that Tamil Nadu may not inevitably have lower pricing despite greater quality products. With these evidences, the only question that cannot be answered is that how other states are able to procure drugs at a comparatively lower price and still face problems in making it available to the population. The answer to this question may be the supplier location; where more than 50% of the suppliers are located in the state when compared to the supplier location in Karnataka.

Drug availability and accessibility

The mission of any drug procurement system is to ensure availability of quality drugs with accessibility for all. Implementation of a centralized drug procurement system has the following advantages-

1. Bulk quantities of drugs, chemicals and other miscellaneous items can be procured at a low price (with discounts) under advantageous purchasing terms
2. Strategically positioning of drug warehouses
3. Possibility of better systematic accounting of drugs
4. Reduction in transportation expenses
5. Avoidance of reckless procurement of drugs
6. Evades duplication of efforts and procurement
7. Maintenance of uniformity in procurement policies
8. Minimization of investment in inventory

The methodology used for distribution of the drugs to the healthcare services at various levels is a decentralized distribution network, ensuring the availability in the required time period. States like Maharashtra and Punjab follow a decentralized system of procurement, where the systems are at the mercy of suppliers and

this allows an irregular supply due to reasons like payment delay, improper planning etc. This has a major impact on the availability of drugs and eventually leads to wastage (PrabalVikram Singh, 2013).

TNMSC has overcome the problem of stock outs at both the district drug warehouse level and health facility level. Incorporating a robust trace and tracking system along with scientific methodology of estimation and forecasting solved the problem. In Karnataka, a large number of community members and other stakeholders stated that stock-outs were the major problem. This is because the implemented drug distribution management system allows tracking of drug stock level till the district warehouse level, but does not extend to the health facility level like district hospitals, CHCs and PHCs. In addition to which, the staff working on such management platforms are not able to exploit its usage. The drug distribution management system only highlights the stock level for medicines that are in stock but not the drugs that are out of stock (zero stock). On the contrary, the KDLWS headquarters is only able to display the list of drugs that are out of stock in every warehouse (Holloway, 2014).

Optimal utilization of available resources

Elimination of wastage of drugs is the prime priority for a drug supply chain system. Wastage of drugs occurs due to mismanagement, improper forecasting, inadequate planning, depleting employee efficiency, unorganized warehousing facilities, lack of inventory tracking, etc. Wastage elimination is mandatory in order to optimize costs and ensure the availability of drugs. Level of elimination depends on the magnitude and efficiency of inventory management. With the proficient gathering of requirements, appropriate forecasting of demands, analysis of realistic consumption pattern and scientific management of warehouses, wastages can be reduced.

In Tamil Nadu, software tools are utilized to generate the list of required medications and supply, for constant monitoring of stock levels, forecasting and management of inventory and distribution. Ideally, the pharmacist needs to perform weekly, quarterly and annual consumption pattern analysis in order to estimate the demand for every year and this analyzed data is used for generation of the drug indent. But in reality, in most of the primary health centers in Karnataka, the pharmacist inflates about 10-15% of the previous year's data to provide the next year's drugs requirement. This is mostly due to less time given to the health centers to generate their earlier indent for drugs and also due to lack of software tools, trained personnel and computer operators to perform these tasks.

Furthermore, in most of the warehouses in Karnataka, even though there are software tools to manage the inventories in the warehouses, the stocks are manually managed by entering the data into ledger books for

future reference, thereby increasing the level of erroneous, wastage of material as well as the space utilization in the warehouse.

Quality of the procured drugs

Any procurement system comprises of two major criteria to qualify to ensure the quality of the goods procured. They are-

1. Pre-qualification Standards – this is for filtering incompetent suppliers
2. External Quality Testing Procedures – Testing the quality of the goods to be procured by a third party

When these two levers are answered, it ensures quality and maintains a lower price. States that comply with a rigorous external quality testing procedures can afford to maintain the low minimum turn over criterion of the pharmaceutical company bidders, thereby giving an opportunity to a wide range of companies to bid their prices. For example, the state of Tamil Nadu declares criteria of 35 lakhs (INR) as the minimum turnover for pharmaceutical companies and they are supposed to possess market standing of bided items for minimum 3 years. Bidding pharmaceuticals must hold the 'Good Manufacturing Practice' (GMP) certificate allotted by the state drug controller. A technical team is sent to pharmaceutical companies without prior intimation to corroborate the provided details and to estimate their production capability. Once the technical team is satisfied, upon their recommendation, the inspection team will collect random samples and subject them to quality testing before the process of bidding. A quality check is again performed before distribution where random samples are collected from every batch of supply and are subjected to testing under the empanelled laboratories. In Karnataka, the pre-qualification minimum turnover criterion is set to around 25 lakhs (INR) for pharmaceutical companies with GMP certification and KDLWS has the right to test the batch or batches selected randomly from the consignment receives either at the time of receiving goods or at any time during the self-life of the product. Testing of the products can be done at any laboratory approved under the Drugs and Cosmetic Acts and Rules. Two testing procedures are done, one prior to the bidding process by the Drug Control and Regulatory authorities\ Laboratories empanelled by KDLWS indicated by the Additional Director, KDLWS, Bangalore and other before the distribution of the supply (Karnataka State Drugs Logistics & Warehousing Society, 2014).

Drug Supply Chain Visibility in the system

A procurement system owned by the government is answerable to various multiple stakeholders; since there is a major need for better visibility and transparency in the system. Introducing the ideology of visibility and transparency drives the system to become more proactive and systematic in their supply chain

Table 3: Approximate Budget Allocation by the State Government for various Healthcare Facilities

Type of public health facility	KDLWS (in Lakhs)	NRHM** (ARS – ArogyaRakshaSamitee) (in Lakhs)
District Hospital	79-90	5
Taluk Hospital	25-30	5
Community Health Center	4- 6	2.5
Primary Health Center	2	1.75

(** NRHM budget partially used for drug procurements).

Table 4: Price comparison of 30 randomly selected drugs from the essential drug list of Tamil Nadu and Karnataka

Drugs	Medium	Strength	TNMSC (2013-14) (INR)	KDLWS (2013-14) (INR)
Albendazole	TAB	400mg	65.23	119
Amoxicillin	TAB	250mg	67.32	91.02
Atenolol	TAB	50mg	14.92	16.39
Atorvastatin	TAB	10mg	20.97	31.79
Cephalexin	CAPS	250mg	102.4	150
Cetirizine	TAB	10mg	8.1	23.5
Clotrimazole	CREAM	2% w/w	4.02	7.11
Dextrose	INJ IP	25%	7.96	7.43
Diclofenac Sodium	TAB	50mg	11.79	18
Erythromycin	TAB IP	250mg	112.46	162.59
Folic Acid	TAB IP	5mg	5.94	8.32
Gamma Benzene Hexachloride	LOTION	1% w/v	10.1	7.74
Glimepiride	TAB	1mg	11.88	15.89
Ibuprofen	TAB	200mg	22.06	25.46
Insulin Human (intermediate)	INJ IP	40 IU / ML	42.57	52.13
Insulin Human (rapid action)	INJ IP	40 IU / ML	52.13	42.57
Mannitol	INJ IP	20% w/v	39.78	14.8
Metformin	TAB	500mg	19.44	26.4
Methyldopa	TAB IP	250mg	161.57	152.1
Misoprostal	TAB	200mcg	179.11	86.98
Nebuliser Solution Salbutamol	SOLUTION	5mg/ml	5.24	5.46
Omeprazole	TAB	20mg	29.01	59
Pantoprazole Sodium	TAB	40mg	42.12	46.39
Paracetamol	TAB	500mg	21.71	21.06
Povidone Iodine	OINTMENT	5% w/w	5.51	43.36
Propofol	INJ	(1%) BP 10 MG / ML	28.56	30.35
Rantitidine	TAB	150mg	19.99	48.5
Silver Sulphadiazine	CREAM	1% w/v	21.96	54.73
Thyroxine Sodium	TAB IP	0.1mg	14.79	44.1
Tinidazole	TAB	500mg	80.58	87.39

operations, track and trace of drugs and other products throughout the supply chain; starting from cradle to grave, proactive alert on the availability of drugs, on-time delivery etc. TNMSC being an autonomous body headed by a director (may be a civil service officer) who has both administrative and technical exposure, enables the system to perform more transparently by evading probable delays and also for better decision making. On the other hand, in Karnataka, the procurement system is under the Directorate of Health Services in the state. When the administrative efficiency of a government set-up and an autonomous body is compared, there is a clear difference – differences can be identified under areas like latency for payment, usage and implementation of IT infrastructure, automation of processes and quality control. In TNMSC, most of the employees or staff members are contractually based on their technical ability, and this is not the same in state-run procurement system.

Maintaining a multi-stakeholder governance model in the procurement system helps in maintaining better coordination and transparency. Starting from preparation of the essential drug list (EDL) to the provision of tenders, a multi-stakeholder ship provides a better decision making system and initiates visibility into the transactions and functionalities. Multi-stakeholder governance is maintained in both the states under study.

Maintenance of a different team exclusively for payment procedure is a good practice and more convenient as the transactions and payment processing is more clear and transparent. The payments are normally made based on the acknowledgement of stock supplied and the quality certificate. In Karnataka, the payment procedure is dealt under the supervision of the government sector and, thereby, there is a lead time in the payment process. But in Tamil Nadu there is a separate, autonomous department to administer the payments and other financial proceedings.

CONCLUSION

In conclusion, it can be stated that the success of any public procurement system depends on an in-depth analysis and their validity in state contexts. It is vital for policy makers to comprehend both the tangible and intangible facets that are involved in running the system efficiently before replicating the same. Even though, the existing systems serve the purpose to an extent, there are several aspects that need to be revamped to make it more efficient. Structuring a model from scrap and discarding the present system is a herculean task. Hence, incorporation of certain following factors in the existing system can make it more efficient and reliable. They are-

- Strong Government leadership and support
- Preference of an autonomous procurement system over a government set-up

- Participation of multi-stakeholders in state buy-in
- Extension of electronic drug distribution management system to level all types of healthcare facilities
- Allocation of sufficient budget to meet the real-time demand
- Stringent quality testing
- Initiation for regular inspection of the supplier premises
- Prompt system of payment to the suppliers
- Generation of Essential Drug list that is localized and based on the real-time requirements. Producing annual reports on the regional drug consumption rate
- Incorporation more scientific methods in demand forecasting and estimation
- Reviewing system of quantification by introducing standard methods based on past consumption, adjusted for stock-out period (maintaining buffer stock minus stock balance)
- Regular annual revision of Essential medicine list (EML) in a transparent method with categorization of drugs based on the level of health facilities
- Monitoring the usage of drugs in order to promote rational use of limited resources
- Scientific warehousing facilities with efficient inventory management
- A robust IT foundation to monitor the system of drug supply as a whole for controlling its functionalities and movement of vital information

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