Republic of Sudan

Federal Ministry of Health

Directorate General of Pharmacy

Statistics unit

Contributing factors to "stock out" of life- saving medicines, in governmental health facilities in the Sudan 2015-2016.

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CONFLICT OF INTEREST STATEMENT

None of the research staff has any job or conflict of interest with pharmaceutical industry or in charge of the storage and distribution of medicines.

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LIST OF ABBREVIATIONS

NMSF	National Medical Supplies Fund
DGOP	Directorate General of Pharmacy
NEML	National Essential Medicines List
NMP	National Medicines Policy
RDF	Revolving Drug Fund
NMRA	National Medicines Regulatory Authority
NMBP	National Medicines &Poison Board
STG	Standard Treatment Guidelines
WHO	World Health Organization
SMOH	State Ministry of Health

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EXECUTIVE SUMMARY

This study aimed to describe the pattern of stock out of life -saving medicines in Sudan in 2016. In terms of determination of the availability, average stock out duration and most frequent out of stock items of selected lifesaving medicines. In addition to the determination of the factors affecting the stock of life saving medicines at health facility level.

It is a descriptive cross-sectional facility based study conducted in 30 health facilities and 5 state central stores, selected from 5 states using multistage cluster sampling according to the WHO Operational package for assessing, monitoring and evaluating country pharmaceutical situations 2007 specifications. The study indicators were tested using 52 life saving medicines selected from the national essential list based on The official morbidity and mortality data for adults and children, standard treatment guidelines, and those classified as emergency medicines.

Data were collected using standardized WHO data collection forms regarding Stock in the facility at a certain date, Stock out periods during the month and Storage conditions of medicines. Moreover, Structured Checklists modified from a Global Fund Assessment Tool of the procurement and supply management Systems for the determination of the underlining factors contributing in stock out were used to interview the responsible personnel in the stock area in facilities and central warehouses. Data were analyzed using an SPSS program version 13 and Microsoft office Excel 2007.

Data collected revealed that The average availability of the 52 selected basket of lifesaving medicines was found to be 72.6%. The average stock out duration of the 52 selected lifesaving medicines was found to be 69 days per year. The most frequent out of stock life saving medicines within the year 2015 where Metoprolol tartrate (365day/year), desmopressin (292 day/year), paracetamol

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infusion (274 days/year) .while at time of data collection desmopressin and paracetamol infusion were the most out of stock medicines.

The factors affecting the stock of life saving medicines were the lack of qualified selection personnel, the absence of a written selection policy, the limited documentation of quantification data, lack of a quantification plan ,limited financial coverage, poor information flow between the facility and the state central store, limited storage capacity ,poor storage conditions and irrational dispensing of medicines plays a role in the stock out of life saving medicines at facility levels. In addition at the supplier and distributer levels where the distribution responsibility was no outsources the main constrains to the supply chain flow is distracted through limited financial resources and limited distribution resources. Another main reason of stock outs of life saving medicines is their deficiency at the central stores of the NMSF. Delays in distribution may also be due to weather conditions or war in some states.

The study was not performed at the NMSF level for comparison ,this was regarded as a limitation of the study along with the small sample size used that limited the execution of further statistical correlations. Moreover, more detailed interviews with all the supply chain personnel were needed for more realistic data.

It is recommended that a prospective observational study is needed to be carried out to capture and intensify the findings of this study putting in mind all the limitations of the present study.

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Chapter 1

Introduction

1.1Background:

Sudan officially the Republic of the Sudan(Arab African) republic in the Nile Valley of North Africa, bordered by Egypt to the north, the Red Sea, Eritrea and Ethiopia to the east, South Sudan to the south, the Central African Republic to the southwest, Chad to the west and Libya to the northwest. The Nile River divides the country into eastern and western halves. Its predominant religion is Islam. Almost one-fifth of Sudan's population lives below the international poverty line which means living on less than US$1.25 per day [(1)].

Sudan was the largest country in Africa and the Arab world until 2011, when South Sudan separated into an independent country, following an independence referendum. Sudan is now the third largest country in Africa (after Algeria and the Democratic Republic of the Congo) and also the third largest country in the Arab world (after Algeria and Saudi Arabia).

Sudan is a member of the United Nations, the African Union, the Arab League, the Organization of Islamic Cooperation, and the Non-Aligned Movement; as well as an observer in the World Trade Organization. Its capital is Khartoum, the political, cultural and commercial centre of the nation. It is a federal presidential representative democratic republic.

Sudan suffers from several challenges, for much of Sudan's history the nation has suffered from rampant ethnic strife and has been plagued by internal conflicts including two civil wars and the War in the Darfur region.

The current country's structure for health system includes three levels: federal, state, and localities. The federal level is concerned with policy making, planning, supervision, coordination, international relations and partnership. The state level is also responsible for planning, policy making and implementation at it is level,

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while the localities are mostly concerned with policy implementation and service delivery, including health, education and development[2].

Table 1: Basic & general national health system indicators, information & characteristics:

Indicator	Value
Sudan land area	2530701710 Km^2
Population	30,057,950
Urban population%	33.2%
Population over 60 years %	5.4%
Under 5 mortality rate (1000 live birth)	83%
Maternal mortality rate/100,000 live birth	215.6

Source: Pharmaceutical Statistical report 2014

Table 2: Distribution of health facilities throughout the country

Type of HF	**Figure**
Public hospitals	464
Primary health care centers	1900
Private hospitals	201
General doctors clinics	961
Private clinic specialty	1146

Source: Pharmaceutical Statistical report 2014

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1.2 Pharmaceuticals System Components in Sudan:[3]

1.2.1.The National Medicines and poison Board (NMPB):

Has been established since 2001 to represent relevant parties in the government, private and other sectors those deal with medicines. It is has been considered as a National Medicines Regulatory Authority (NMRA)in the country that is responsible for putting into effect the medicines and poison law 2001(amended 2009)to include veterinary preparations. At state level there is the directorate general of pharmacy acts as regulatory body by delegation of authority of NMPB.
The medicines and poison law cover all regulatory related areas including marketing authorization of medicines, good manufacturing practices, control on promotion and advertisement of medicines, importation /exportation of medicines, and licensing of pharmaceuticals establishments.

1.2.2. The Directorate General of Pharmacy (DGOP):

Which is responsible for developing and monitoring pharmaceutical polices and plans that govern the pharmaceutical sector, capacity building, promotion of local pharmaceutical manufacturing, developing pharmaceutical services in Sudan as well as promotion of rational use of medicines. The DGOP has a national essential medicines program that includes national medicines policy, national essential medicines list, standard treatment guidelines, national medicines formulary and rational use.

1.2.3. The National Medical Supplies Fund (NMSF):

Its responsibility is to procure essential medicines, lifesaving medicines, medical devices, vaccines and other medical agents to the public hospitals in Sudan

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including the selection, procurement, storage and distribution of medicines.

1.3. National Medicines Policy (NMP)

Medicines are crucial health care products in the health care system. Beyond their therapeutic utility, they are often considered by the public as the most tangible representation of health care, and their availability is taken as an indicator of the quality and accessibility of health services.

The Federal Ministry of Health (FMoH) developed the first National Drug Policy in 1981. Up to the last NMP (2014) major changes and reforms have taken place. The objectives of the NMP are to improve access to essential medicines by making them available, affordable, to ensure safety, efficacy, and good quality of medicines, to promote medicines rational use, to develop pharmaceutical care services, to qualify pharmaceutical human resources, and to coordinate between main actors in pharmaceutical sector[4]

1.4. National Essential Medicines List (NEML):

In 1982; the ministry of health publish the first NLED, but was not officially adopted. NLED was revised and updated and levels of use allocated; but again it was not officially adopted. In 1987 NLED was revised and published. In 2004 NLED was updated and the title changed to National List of Essential Medicines as adopted by WHO.

In 2012 The National Committee formulated to update NEML. Up to the NEML 2014. [5]

1.5. National Standard Treatment Guidelines (STGs):

The Sudan Standard Treatment Guidelines STGs have been produced in 2014 to provide prescribers in public healthcare system with information on how to manage common illnesses and diseases. The diseases were chosen from the leading

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causes of hospital admission, referral and death. The STGs are intended for management of both adult and pediatric patients at primary healthcare level. The target groups to use the STGs was identified according to the WHO recommendations , those were prescribers in the public health system, prescribers with limited training or limited access to information sources, and areas of care where prescribing shows variability.[6]

The Revolving Drug Fund Concept (RDF):

In an RDF concept, a sum of money (contributed by the government, donors or community) is used to purchase an initial stock of essential medicines and commonly used medicines to be sold, ideally at a price sufficient to replace the stock of medicines and ensure a continuous supply [10]

An evaluation of the RDF in Khartoum state Showed that the RDF facilities had a high level of medicines availability 97% compared with controls 86%. [11]

The National Medical Supplies Fund quantify and forecast the medicines consumption of the public sectors for to insure the maintenance of strategic two years stocks of medicinal products within the country at all times. Transit time in the supply chain should be minimal to ensure timely delivery. The medicine supply system should ensure that every medicine will arrive and delivered without effect on quality.[4]

Availability of essential medicines:

Essential Medicines are those that satisfy the priority health care need of the population. Essential are selected regard to disease prevalence, evidence on efficacy and safety and comparative cost effectiveness. Literature stated that 40 million deaths in developing countries one third among children under five age ten million was due to acute respiratory infections, diarrheal disease, tuberculosis and malaria all condition for which safe, in expensive essential drug can be lifesaving . Essential medicine to treat common disease should be available in functioning

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health facilities at all times in adequate amounts, in the appropriate dosage forms, with assured quality and adequate information, and at a price the individual and the community can afford [7].

Availability is a key component in equitable access to essential medicine. Data about medicine availability is a prerequisite for monitoring the performance of national pharmaceutical procurement system in any country [8].

Lifesaving medicines are derived from essential medicine list, which are emergency drugs that require immediate administration in medical emergency, medicine which have the potential to sustain life and prevent further complication.

In Sudan Problems regarding availability of medicines at public health facilities are common in terms of frequent out of stock. According to assessment of national pharmaceutical sector 2014 , Key essential medicines are fairly available in public health facilities; (85%) in warehouses that supply the public system, (60%) in the National Medical Supplies Fund (NMSF) and (90%) in private pharmacies. The average length of stock-out duration in public health facilities was 17 days, whereas in the warehouse it was 24.6 days and very long in NMSF 114 days which indicate the access concern to essential list of medicines[3].

In Sudan data regarding availability of medicine in public and private, central or at state for essential medicine is now available for the previous recent years. However data adapted to describe current procurement practice and the availability of sustainable stocks of life saving medicines in this area is needed. This need is in order to propose corrective measure to avoid possible episode of stock out and its consequences.

To ensure the availability of life saving medicines a proper supply chain should be established. The main components of an ideal supply chain are the selection of medicines, finance and quantification of medicine, procurement, storage and distribution and use organized around management support system [9].

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Figure (1) demonstrate the problem contribute to system failure to maintain adequately steady supply of medicines these factors includes supplier related factors, facility, distributor factors, financial factors and consumer factors.

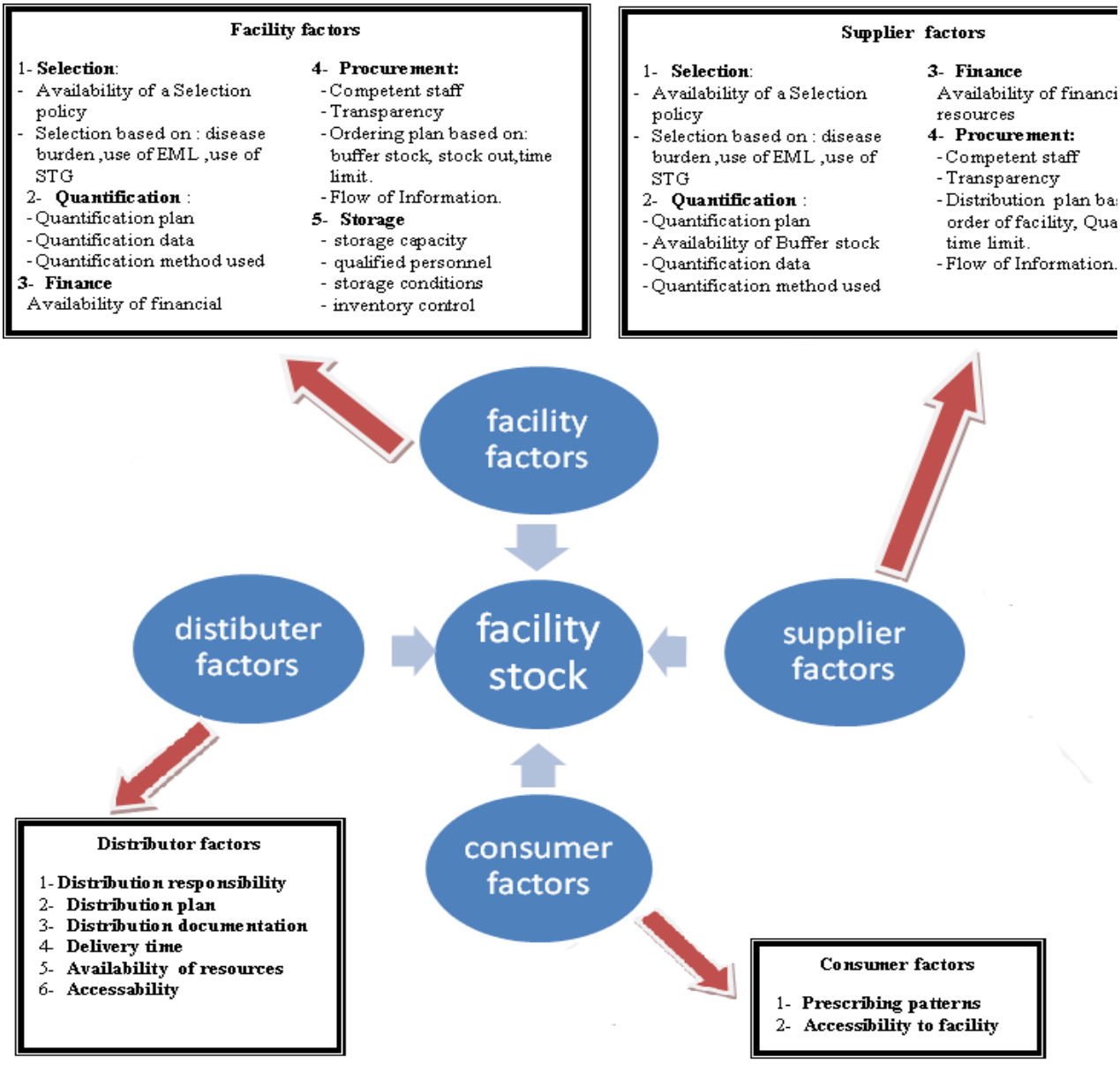

Figure 1: conceptual framework of the Contributing factors to "stock out" of life-saving medicines.

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Rationale

Lifesaving medicines must be available in sustainable stock all over the year. Shortage of their stocks is a serious problem that needs to be predicted and instantly managed through correcting possible defects contributing to this problem. In the Sudan problems regarding availability of medicines at public health facilities are common in terms of frequent out of stock durations according to the literature. Data regarding availability of essential medicines are available for the previous recent years; however, Data adapted to describe current procurement practices and the availability of sustainable stocks of life saving medicines is needed.

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Aim:

Is to describe the pattern of stock out of life -saving medicines in Sudan during the study period. In terms of determination of the availability, average stock out duration and most frequent out of stock items of selected lifesaving medicines. In addition to the determination of the factors affecting the stock of life saving medicines in the selected facilities.

Objectives:

3.1 General objective:

To describe the pattern of stock out of life -saving medicines in Sudan 2015-2016.

3.2 Specific objectives:

1. To determine the availability of selected lifesaving medicines.
2. To determine the average stock out duration of selected lifesaving medicines.
3. To determine the most frequent out of stock items of selected life saving medicines.
4. To identify the factors affecting the stock of life saving medicines in the selected facilities

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Chapter 2

Methodology

2.1. Study design

Descriptive cross-sectional facility based study.

2.2. Study area:

According to the WHO Operational package for assessing, monitoring and evaluating country pharmaceutical situations 2007 specifications, five geographical areas (states) in the republic of Sudan were selected, these Khartoum state, Northern state, Red sea state, White Nile state, North Darfur state from each six public health facilities and one central warehouse was sampled.

2.3. Study population

The study populations were:

- The 52 selected Life saving medicines, This list was chosen from the national essential list and selected based on The official morbidity and mortality data for adults and children, standard treatment guidelines, and those classified as emergency drugs (Annex 1).
- The responsible personnel of the stock area in the Public health facilities and central warehouses, within the selected states of the republic of the Sudan: Khartoum state, Northern state, Red sea state, White Nile state, North Darfur state.

2.4. Sample size

From the five geographical areas (states) in the republic of Sudan were selected: Khartoum state, Northern state, Red sea state, White Nile state, North Darfur

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state each six public health facilities and one central warehouse were sampled. Data of 52 selected lifesaving medicines were collected from 35 public health facilities, and 35 responsible personnel of stock areas in the selected facilities were interviewed.

2.5 Sampling method

Multi-stage cluster sampling.

According to the WHO Operational package for assessing, monitoring and evaluating country pharmaceutical situations 2007:

- A list of all states with their geographical distribution was provided and cluster sampling was performed. One state was the largest or capital city, one among the lowest income-generating areas, and the other three were selected according accessible geographical regions (North, East and West) .using systemic random sampling .A contingency plan was followed if any of the selected areas became inaccessible; the selection was made using systemic random sampling within the cluster of the inaccessible area.
- A list of all public health facilities with their geographical distribution was provided, and systemic random selection was done.
- The six facilities within a selected state were chosen as one to be the largest public hospital in the site, one to be a primary health facility, and other four health facilities to be selected within one day travel from the main administrative area using systemic random sampling.
- The selected central warehouse was the largest warehouse supplying public health facilities.

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2.7 Data collection

The data collection at the selected states was carried by a team of area supervisor and data collectors (5teams for the whole survey each of 2 data collectors). All personnel involved in data collection, supervision and data entry were trained to ensure reliable and accurate data collection, completion of the data collection form and transfer of data to the workbook. A one day training workshop for survey personnel was held as part of survey preparation. Data management plan was designed and implemented during data collection.

Data was collected using standardized WHO data collection forms regarding Stock in the facility at a certain date, quantity purchased during the month and their quantities and expiration dates, Stock out periods during the month and Storage conditions of medicines. Moreover, Structured Checklists modified from a Global Fund Assessment Tool of the procurement and supply management Systems for the determination of the underlining factors contributing in stock out were used to interview the responsible personnel in the stock area in facilities and central warehouses. A pilot study was carried to test for the appropriateness of data tools.

2.8 Data management

The collected data was entered into a computer using SPSS soft program version 13 and Microsoft office Excel 2007. Significance testing of difference between proportions was conducted using the Chi-square test when applicable. It was Adjusted by Pearson's or Fisher's exact test depending on the number of observations, with a value corresponding to p less than 0.05 for significance.

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2.9 Coordination, monitoring and quality control

Data collectors were trained to use the survey tools to insure proper data collection before data collection starts, a written schedule was prepared for each data collection team, indicating the date, time and location of each public health facility and the central warehouse, including the name of the contact person. A letter of introduction from the survey manager introducing area supervisors and later data collectors to staff in the public health facility and the central warehouse those surveyed. Data collected was reviewed by the end of the day insuring completion of data collection from the specified facility.

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Chapter 3

Results and Discussion

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INTRODUCTION

Medicines stock out are usually defined as occurring when a health facility temporarily does not have supplies of medicines it should have, according to national guidelines . Life saving medicines should be available in stock whenever needed . stock outs of life saving medicines in public health facilities affects the poor most severely than other levels of the community that may be able to purchase medicines from private sectors .

This study covered 30 health facility(general hospitals, rural hospitals and health facilities) and 5 central medicine stores within 5 states (RDF stores) in order to measure the percent availability and out of stock days of a selected list of 52 life saving medicine (Annex 1) within the country ,the most out of stock items and the most probable reasons of these stock outs through studying the steps of the supply chain in the country and the significance of its relationship with the stock out of the selected life saving medicines.

AVAILABILITY AND STOCK OUTS OF LIFE SAVING MEDICINES

Only two health centers of total 26 health facilities studied avoided stock outs of 6 items of the 52 selected basket of life saving medicines(Annex1) at time of data collection .The average % availability of life saving medicines of was found to be 72.6% (table 4). Discrepancies were observed in the availability of life saving medicines between health facilities, state and through the supply chain check points (table 3, table 4).

Percent availability data were stratified according to states showing that the white Nile state had the highest availability (84.4%) followed by the northern state with (79.7%) while Khartoum state was the one with the lowest availability of life saving medicines (52.6%) (table 5), this reflects that the distance from central stores may not be the reason of stock outs rather the high consumption of medicines due to population accumulation in the state .

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Results showed that the average % stock out of medicines is 20% and 27.4% at RDF level and facility level respectively detailed as 26% at general hospitals 24% at rural hospitals and 28.3% health centers (table 4).

Table 3 : Average % availability of selected life saving medicines at time of data collection per States and Facilities

Code Facility per state	Type of facility	% availability (in stock)	% (out of stock)
1-Khartoum state			
1	General hospital	38.5%	61.5%
2	General hospital	51.9%	48.1%
3	Rural hospital	-	-
4	Rural hospital	66.7%	33.3%
5	Health centre	66.7%	33.3%
6	Health centre	83.3%	16.7%
2-Northern state			
1	General hospital	73.1%	26.9%
2	General hospital	78.8%	21.2%
3	Rural hospital	86.1%	13.9%
4	Rural hospital	83.3%	16.7%
5	Health centre	83.3%	16.7%
6	Health centre	83.3%	16.7%
3-Red sea state			
1	General hospital	78.8%	21.2%
2	General hospital	80.8%	19.2%
3	Rural hospital	75%	25%
4	Rural hospital	77.8%	22.2%
5	Health centre	100%	0%
6	Health centre	50%	50%
White Nile			
1	General hospital	84.6%	15.4%
2	General hospital	84.6%	15.4%
3	Rural hospital	-	
4	Rural hospital	-	
5	Health centre	100%	0%
6	Health centre	66.7%	33.3%

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North Darfur			
1	General hospital	65.4%	34.6%
2	General hospital	76.9%	23.1%
3	Rural hospital	66.7%	33.3%
4	Rural hospital	-	
5	Health centre	83%	17%
6	Health centre	0%	100%
Total % of facilities with 100% availability	7.7%		
Total % states with 100% availability	0%		

Table 4: % availability and average % availability of selected life saving medicines at time of data collection at supply chain levels

Medicine	strength	% availability					% availability at facility level
		Central level (cms)	State store	General hospital	Rural hospital	Health centre	
Adrenaline hydrochloride	1mg/ml	-	100 %	100%	100%	-	-
Lyophilized anti scorpion venom	24mg/ml	-	100 %	90%	100%	-	-
Lyophilized anti snake polyvalent venom		-	100 %	90%	100%	-	-
Rabies vaccine	150 IU in vial	-	100 %	80%	83%	-	-
Anti tetanus	500 IU in vial	-	100 %	90%	100%	-	-

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Atropine sulphate	0.1mg/ml adult 0.05 mg/ml pediatric	-	100 %	70%	83%	-	-
Benzyl penicillin	1million IU powder for injection	-	40 %	70%	66.7%	70%	-
Dexamethasone	4mg/ml	-	80 %	100%	100%	-	-
Diazepam	10mg/2ml	-	100 %	90%	33%	-	-
Digoxin	0.5mg/2ml	-	100 %	70%	66.7%	-	-
Furosemide	20mg/2ml	-	100 %	90%	0%	-	-
Glyceryl trinitrate	500mg	-	60 %	50%	100%	-	-
Heparin	5000 IU/5ml	-	100 %	90%	-	-	-
Hydrocortisone	100mg powder for injection	-	100 %	90%	83.3%	-	-
Hyoscine n-butyl bromide	20mg/ml	-	40 %	50%	100%	60%	-
Soluble Insulin	100ml	-	100 %	100%	100%	-	-
Lidocaine	2%,5%	-	80 %	80%	83.3%	80%	-
Magnesium sulphate	50%in 10ml	-	100 %	90%	-	-	-
Metoprolol tartrate	1mg/1ml	-	20 %	20%	-	-	-
Metronidazole	500mg/100 ml	-	100 %	90%	-	-	-
Sodium chloride	0.9%/500 ml 1.8%,3%,	-	60 %	90%	16.7%	-	-

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O.R.S		-	60 %	60%	66.7%	50%	-
Oxytocin	10 unit/ml 5 unit/ml	-	100 %	50%	83.3%	-	-
Phenytion	50mg/ml,2 ml ampoule	-	100 %	80%	-	-	-
Potassium chloride	15%inj in10ml	-	100 %	100%	0%	-	-
Ranitidine	25mg/ml	-	40 %	50%	66.7%	-	--
Salbutamol	100microg ram	-	40 %	70%	100%	-	-
Salbutamol nebulizer solution	5mg/2.5 ml nebulizer	-	60 %	70%	66.7%	-	-
Streptokinase recombinant	750000 IU/vial	-	100 %	70%	-	-	-
Vitamin k	5,10,15 mg	-	80 %	80%	100%	-	-
Protamine suphate	10mg/ml in 5ml amp	-	60 %	40%	-	-	-
Chlorphenira mine	10mg	-	100 %	100%	-	-	-
Calcium gluconate	100mg	-	100 %	90%	-	-	--
Dopamine	200mg per 5ml	-	100 %	80%	-	-	-
Hydralazine	20mg-40mg	-	80 %	80%	-	-	-
Diclofenac	75mg	-	60 %	70%	66.7%	-	-
Ergomtrine	200-500mcg	-	80 %	40%	-	-	-
Quinine	150mg,300 mg	-	60 %	50%	83.3%	-	-
Metclopramid e	10mg	-	40 %	20%	66.6%	-	-

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Paracetamol infusion		-	20 %	0%	-	-	-
Desmopressin acetate	1-4mg	-	40 %	0%	-	-	-
Ringer lactate	250ml,500 ml	-	100 %	100%	-	-	-
Normal saline	0.9%	-	100 %	100%	66.7%	90%	-
Human albumin	20% to 25%	-	100 %	80%	50%	-	-
Pithidine HCL	15mg	-	100 %	70%	83.3%	-	-
Morphine	5mg/ml	-	100 %	60%	66.7%	-	-
Oxygen		-	60 %	60%	66.7%	-	-
Dextrose 10% with water	10% with water	-	100 %	100%	83.3%	-	-
Aminophylin e	25 mg/ml	-	100 %	80%	100%	-	-
Propofol	10 mg/ ml in 20-ml amp (emulsion)	-	60 %	60%	-	-	-
Dextrose 5% with water	5% with water	-	100 %	100%	100%	-	-
Promethazine hydrochloride	25mg/ml	-	40 %	40%	100%	80%	-
% availability At levels		**-**	**80 %**	**74%**	**76%**	**71.7 %**	**72.6%**

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Table 5: Average % availability of selected life saving medicines at supply chain per state levels

State	Average % availability of medicines (central level NMSF)	Average % availability of medicines (state store	Average % availability of medicines (general hospital)	Average % availability of medicines (rural hospital)	Average % availability of medicines (health centre)	Average % availability of medicines (state)
Khartoum State	-	73.1%	45%	66.7%	75%	52.6%
Northern State	-	75%	76%	84.7%	83.3%	79.7%
Red sea State	-	78.8%	79.8%	76.4%	66.7%	78.2%
White Nile State	-	98%	84.6%	-	83.3%	84.4%
North Darfur State	-	73.1%	71.2%	66.7%	41.7%	67.7%
Total	-	79.6%	71%	71.3%	70%	72.6%

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STOCK OUT DURATION IN DAYS PER YEAR

Percent availability at time of data collection doesn't alone reflect the stock outs of life saving medicines within the country along with there is the stock out duration of medicines that reflects estimated stock outs within a year life time. Data revealed that the average stock out duration of the selected life saving medicines in the year 2015 was found to be 69 days (table 6) with a record keeping percentage of 51%.

When analyzing data according to stock outs of selected life saving medicines it was found that there are considerable variation between stock outs at different supply levels highlighting the issue of lack of records reflecting the out of stock days. This finding presents a shortage point in information accessibility that helps in information based ordering or planning and inventory control whether based on a push or a pull system.

The most medicines that had experienced stock outs within the year 2015 where Metoprolol tartrate (365day), desmopressin (292 day), paracetamol infusion (274 days) .while at time of data collection desmopressin ang paracetamol infusion were the most out of stock medicines (table 6).

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Table 6: Average stock out duration per year (days) of selected life saving medicines at the facility level

Medicine	strength	Average out of stock days/year
Adrenaline hydrochloride	1mg/ml	23
Lyophilized anti scorpion venom	24mg/ml	32
Lyophilized anti snake polyvalent venom		0
Rabies vaccine	150 IU in vial	9
Anti tetanus	500 IU in vial	41
Atropine sulphate	0.1mg/ml adult 0.05 mg/ml pediatric	0
Benzyl penicillin	1million IU powder for injection	70
Dexamethasone	4mg/ml	8
Diazepam	10mg/2ml	18
Digoxin	0.5mg/2ml	100
Furosemide	20mg/2ml	59
Glyceryl trinitrate	500mg	184
Heparin	5000 IU/5ml	66
Hydrocortisone	100mg powder for injection	20
Hyoscine n- butyl bromide	20mg/ml	30
Soluble Insulin	100ml	20
Lidocaine	2%,5%	9
Magnesium sulphate	50%in 10ml	0
Metoprolol tartrate	1mg/1ml	365
Metronidazole	500mg/100ml	5
Sodium chloride	0.9%/500ml 1.8%,3%,	12
O.R.S		176
Oxytocin	10 unit/ml 5 unit/ml	122
Phenytion	50mg/ml,2ml ampoule	0
Potassium chloride	15%inj in10ml	0
Ranitidine	25mg/ml	218

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Salbutamol	100microgram	181
Salbutamol nebulizer solution	5mg/2.5 ml nebulizer	0
Streptokinase recombinant	750000 IU/vial	0
Vitamin k	5,10,15 mg	122
Protamine suphate	10mg/ml in 5ml amp	146
Chlorpheniramine	10mg	25
Calcium gluconate	100mg	0
Dopamine	200mg per 5ml	0
Hydralazine	20mg-40mg	20
Diclofenac	75mg	185
Ergomtrine	200-500mcg	71
Quinine	150mg,300mg	77
Metclopramide	10mg	43
Paracetamol infusion		274
Desmopressin acetate	1-4mg	292
Ringer lactate	250ml,500ml	0
Normal saline	0.9%	81
Human albumin	20% to 25%	132
Pithidine HCL	15mg	61
Morphine	5mg/ml	15
Oxygen		0
Dextrose 10% with water	10% with water	30
Aminophyline	25 mg/ml	0
Propofol	10 mg/ ml in 20-ml amp (emulsion)	46
Dextrose 5% with water	5% with water	12

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Promethazine hydrochloride	25mg/ml	57
Average out of stock days (facility LEVEL)		**69 day**

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CONTRIBUTING FACTORS TO STOCK OUTS OF SELECTED LIFE SAVING MEDICINES

Life saving medicines are part of the emergency agreement of the government of the Sudan, where every state is allocated with a specific amount of fund that meets their emergency situations (table 29). Every state is allowed to order their needs of life saving medication within a list of 193 items predetermined by the NMSF. An order is placed on line by the state on the NMSF website, this order will be revised by the later in order to assure that it meets the state quota allocated by the ministry of finance per year. Reordering takes place until the seal is reached. The NMSF is obligated to deliver the medications to the central store of the state. Then it is the state responsibility to deliver medications to its heath facilities according to each facility share of the quota.

Stock outs might be due to the direct factors described by the personnel in charge in the health facility or more deep due to disruption in the supply chain.

Disruption of supply chain could result due to number of Factors (facility factors, supplier factors distributor factors and consumer factors.

DIRECT FACTORS :

The major reason of out of stocks at facility levels and RDF levels is that the life saving medicine is out of stock at the supplier level (NMSF) , this reflects that NMSF doesn't keep buffer stocks to prevent shortages in life saving medicines quantities or they don't use a proper method of quantity forecasting (table 7, table 8).a non significant correlation between the factors and the average % availability within facilities. However, this result might be an effect of the study sample size rather than what it shows. this is considered to be a limitation factor to this study.

For the assessment of the supply chain 26 health facilities were surveyed ,4 facilities were invalid due to the absence of dispensing areas in the randomly selected health facilities in addition to the 5 central RDF stores .

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Table 7: leading Factors of stock outs according to personnel responsible of stock at health facilities

	Health facilities		
Factors	General hospital	Rural hospital	Health centre
Lack of fund	2%	3.8%	36.8%
Out of stock in the supplier	59%	65%	47.4%
Not commonly used	35%	27%	10.5%
Unexpected prescribing pattern	1%	2%	5.3%
Small storage capacity	5%	2%	0%

Table 8: leading Factors of stock outs according to personnel responsible of stock at health facilities

	Factors				
State	Lack of fund	Out of stock in the supplier	Not commonly used	Unexpected prescribing pattern	Small storage capacity
Khartoum State	0%	71.4%	14.3%	14.3%	0%
Northern State	0%	100%	0%	0%	0%
Red sea State	0%	90.9%	9.1%	0%	0%
White Nile State	0%	100%	0%	0%	0%
Darfur State	0%	78.6%	14.3%	0%	0%

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FACILITY FACTORS

Selection :

Although 84% of life saving medicines selection is done by the pharmacy department in health facilities (figure 2), but still the challenge remains if these personnel are qualified enough to perform their jobs, 7.7% responded that the personnel are medical assistants and 7.7% are non medicals.

Only 15% of the facilities use a selection policy that they depend on when selecting their need of life saving medicines (figure 3), while none had their policy written and available on hand. In general 42.3% of those perform their life saving medicines selection depend on the national medicine list in their selection (figure 4).

Among the 77% that don't use a policy in the selection of their life saving medicines some commented on that their medicines are predetermined by the MOH, others only provide the medications prescribed by the heath prescriber in the facility .

knowing that the selection range of life saving medicines is limited within 193 life saving medication previously determined by the NMSF, any item selected or needed as far from that list will not be provided and delivered by the NMSF.

Quantification

Quantification forecasting is entirely done by the pharmacy department, but 50% commented on the absence of quantification data at the facility level (figure 5).

Among the 38.5% having data available for quantification, of which 46.2% assure that the data are reliable (table 10).93% used the consumption method of quantification (table 9), none used the morbidity method of quantification. Quantification according to 75% of facilities is done depending on quantities (i.e. ordering quantities without going back to what is available in the store or what has

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been consumed.) (Figure 6) .Only 25% reported that they quantify their needs using a report and request method (i.e. reporting what has been consumed and what is left in the store and accordingly the y quantify their need) (figure 6). Only 65%of facilities plans to keep buffer stock in their systems while 23% never plan to have buffer stocks of their life saving medicines, this could represent an underlying factor of having stock outs of life saving medicine in facilities(figure 7).

Forecasts are managed mainly manually using inventory books (27%),while only 15% use computerized methods, the reminder 58% did not perform actual forecasting but they do depend on what is remaining in their quota at RDF to reorder whether based on the computerized system in the RDF stores or not (figure 8).

Finance

Only 31% of health facilities had full financial coverage for their need of life saving medicines, while 42% had partial coverage and 27% had no any financial coverage for their needs this might reflect an underlying cause of stock outs of vital medicines (figure 9, table 29).

Procurement

The department responsible of procurement is the pharmacy department (61.5%) where partial or no financial coverage of life saving medication is available (table 11) , otherwise facilities presents their orders to the state RDF, that in turn orders the whole state needs of life saving medicines from NMSF online through a very simple process. All funded and non funded life saving medicines are purchased from one single source which is the NMSF with reduced prices for all facilities in the general sector .ordering plan is done by one of two ways one is by buffer stock limits and the other is by time limit which represents 23.1% and 76.9% respectively of the ordering plan of life saving medicines (table 12).

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Storage

Storage of life saving medicines is the responsibility of the pharmacy department at health facilities (table 13), although only 76.9% of the facilities had trained staff to handle the supplies procured (figure 10), some facilities referred that to the limited range of items that don't need qualified personnel to handle.

Regarding the storage area only 19.5% had no enough storage area for their pharmaceuticals (figure 11),but the problem is that only 46.2% had the storage areas well equipped for the storage of medications (figure 12) .in 19.2% of the facilities the storage conditions are non appropriate for medicines storage (figure 13) .for those that don't have enough storage area some commented that they don't need to store their pharmaceuticals in the facility due to the small range of pharmaceutical and demand others are planning to increase the storage are in the future .

Inventory control in facilities is done using different methods and mechanisms among them are using bin cards (30.8%), ledgers (38.5%), and computer programs (15.4%) (Figure 14). But only 57.7% guarantee the reliability of the data produced, this is due to poor adherence to data recording. An average stock turnover is 30 days, inventory is controlled using the first in-first out in 84.6% of the facilities. Expired products are dealt with in 92.3% of facilities, where 79.2% returns expired pharmaceuticals to the supplier the deals with and 8.3% incinerate pharmaceuticals in the facility. A physical inventory check of all products is done annually in 88.5% of health facilities. Anti theft measures are kept in 84.6% of the facilities.

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CONSUMER FACTORS

Doctors and medical assistants are the personnel responsible with the prescribing of medicines (table 14), where 61.5% prescribe according to STGs (figure 15). Only 15.4% facility has a pharmacy and therapeutic committee (figure 16), that governs medicine prescribing to insure rational prescribing of medicines that can reduce unnecessary consumption of medicines on the other hand 42.3% of the facilities dispenses medicines without prescription that may lead to unplanned shortage or stock out of medications (figure 17) .

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A. Product selection

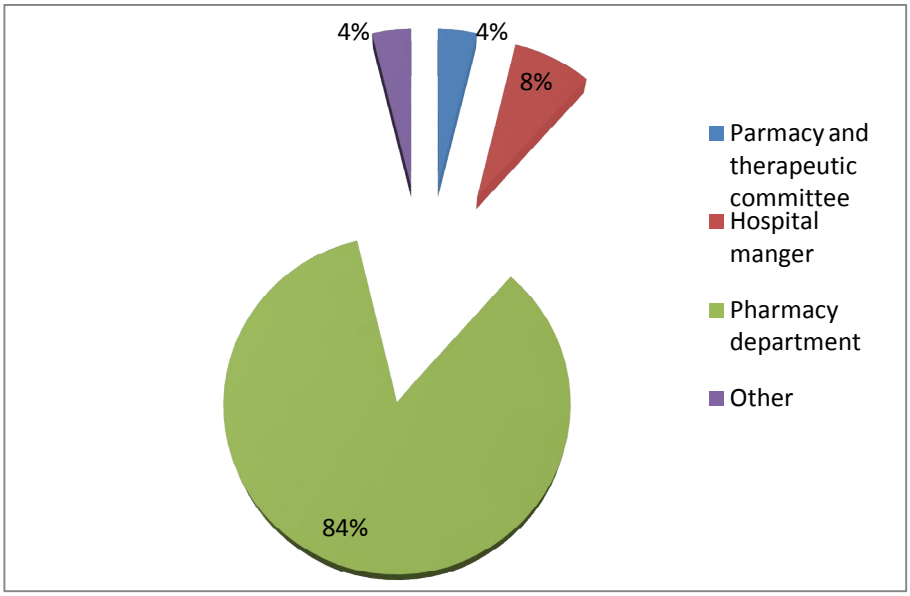

Figure 2: Departments responsible for life saving medicine selection at health facilities

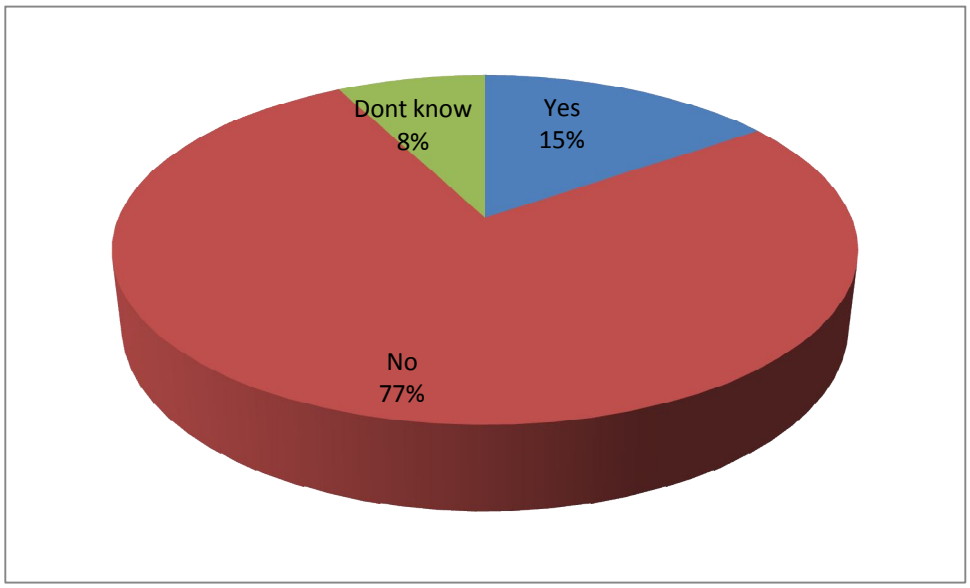

Figure 3: Availability of a selection policy at health facilities

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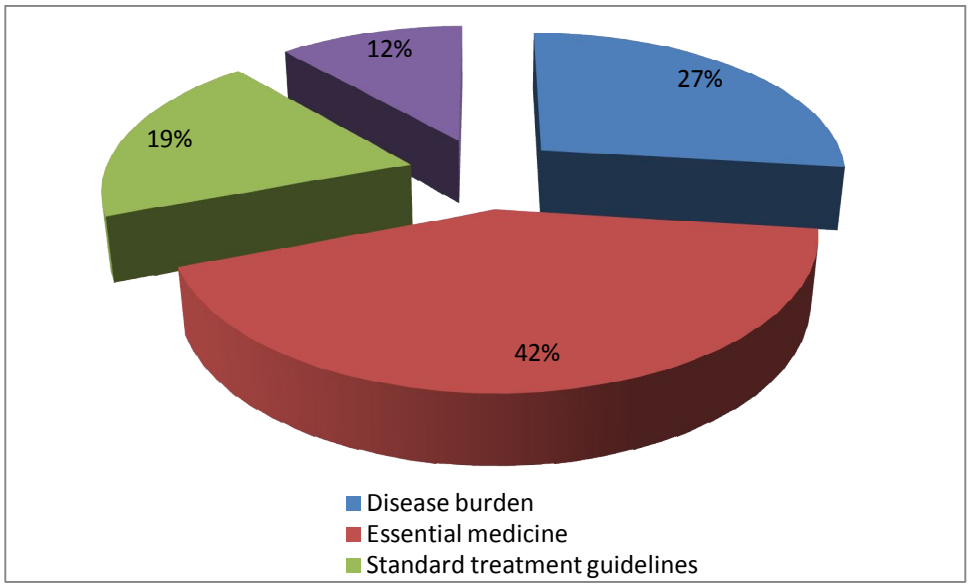

Figure 4: Bases of selection life saving medicines at health facilities

B. Quantification

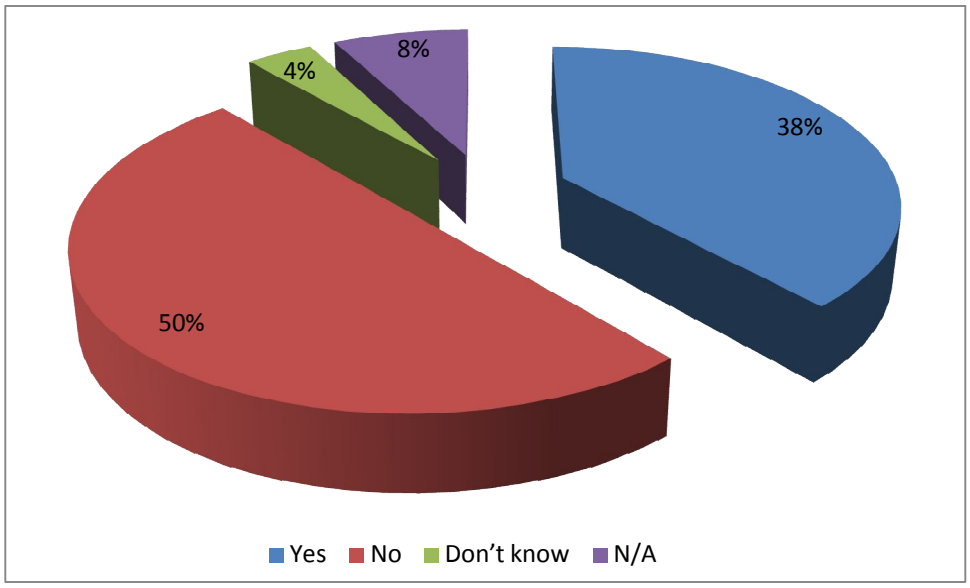

Figure 5 : Availability of quantification data at health facilities

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Table 9: Forecasts developed by consumption method at health facilities

Forecasting by consumption method	Percent
Yes	92.3
Don't know	3.8
N/A	3.8
Total	100.0

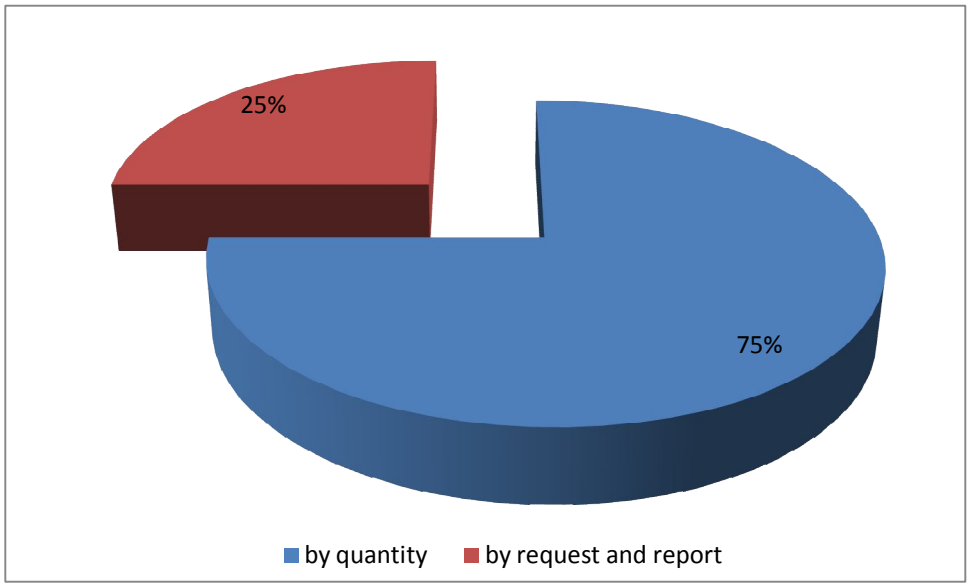

Figure 6: type of consumption method used in quantification at health facilities

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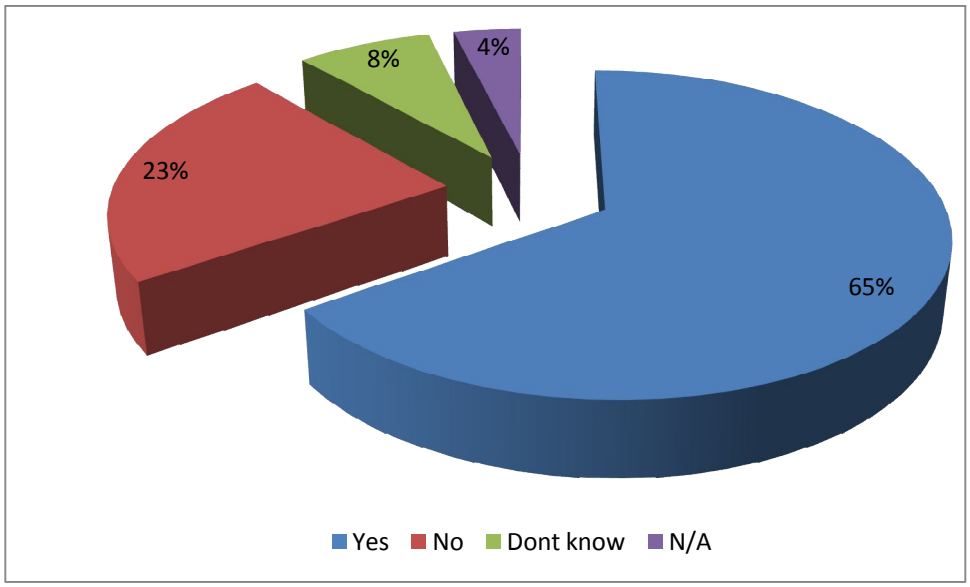

Figure 7: Planning of buffer stocks at health facilities

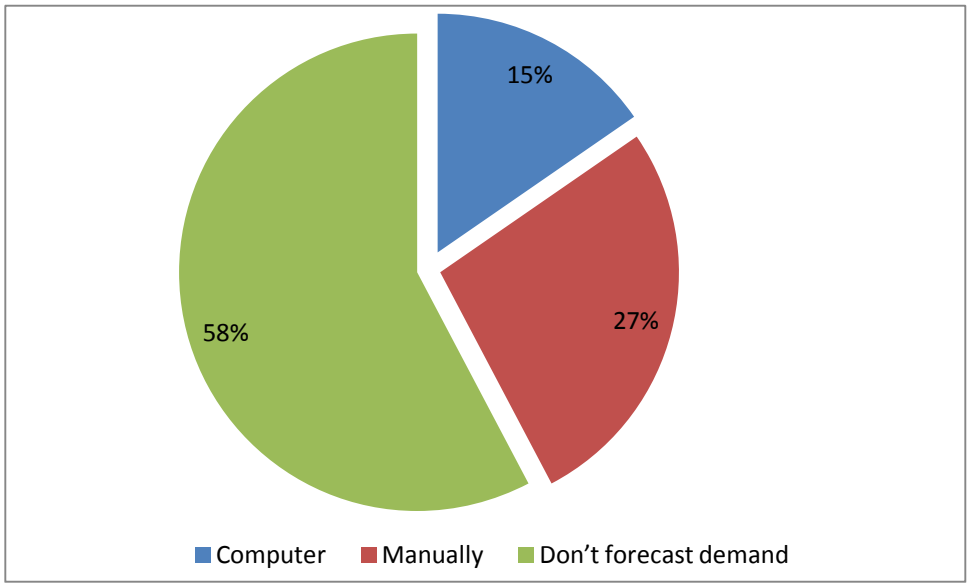

Figure 8: Management of forecasting data at health facilities

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Table 10: quantification forecasts presented on reliable data at health facilities

Quantification based on reliable data	Percent
Yes	46.2
No	19.2
Don't know	15.4
N/A	19.2
Total	100.0

C. Finance

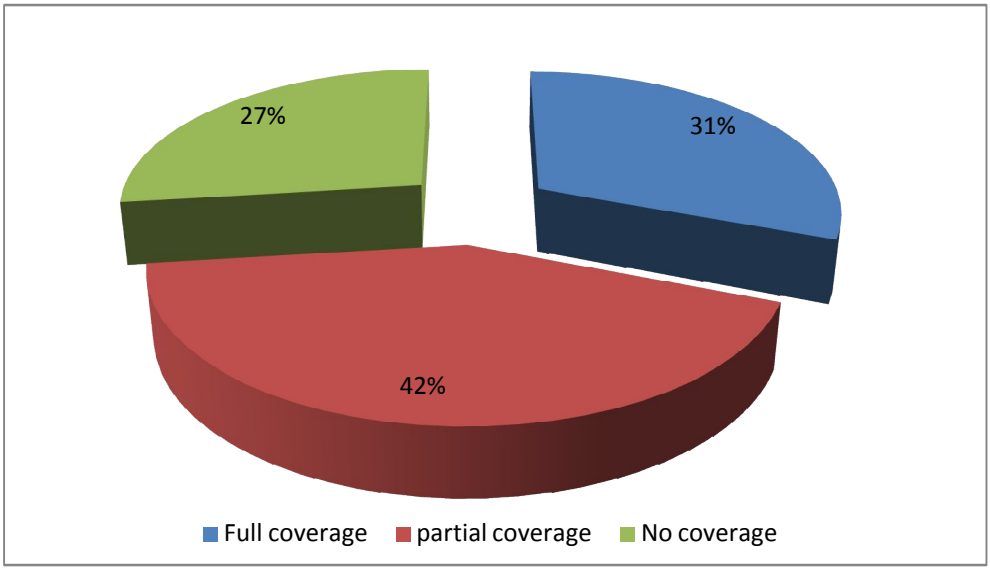

Figure 9: Availability of financial resources coverage at health facilities

D. Procurement systems

Table 11: Responsibility for procurement at health facilities

Department	Percent
Pharmacy department	61.5
Other	38.5
Total	100.0

❖ In others NMSF was responsible for procurement.

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Table 12: Methods for making order plans at health facilities

Method	Percent
buffer stock	23.1
time limit	76.9
Total	100.0

E. Storage

Table 13: Responsibility for procurement at health facilities

Department	Percent
Pharmacy department	100.0

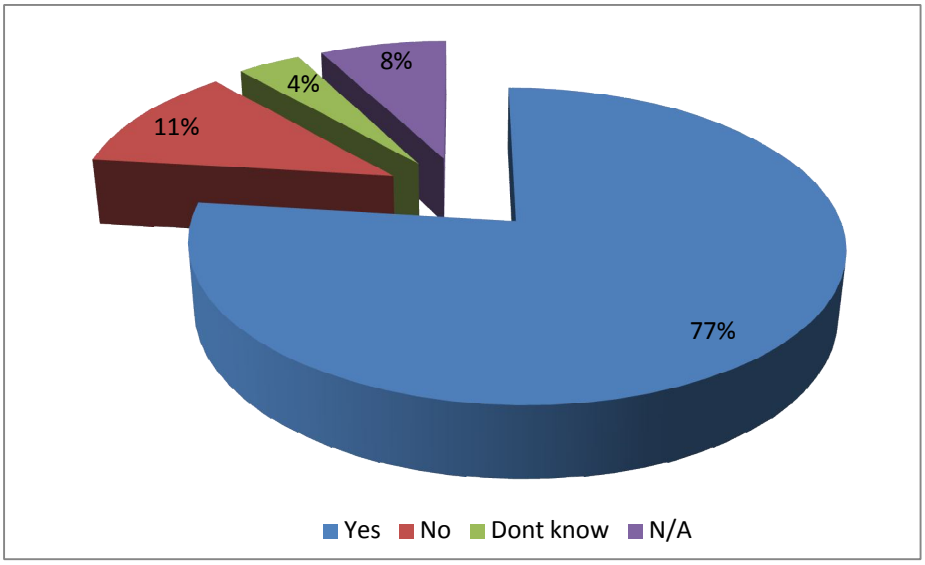

Figure 10: adequately trained storage staff at health facilities

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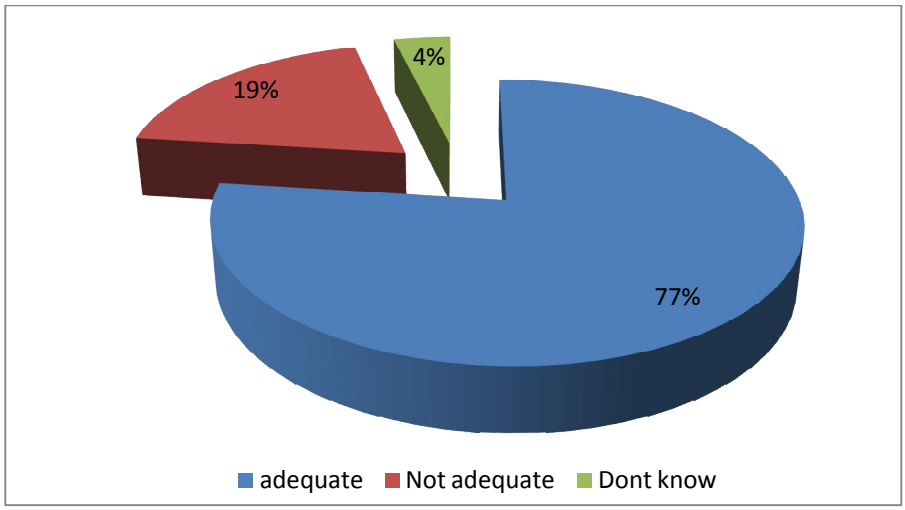

Figure 11: storage capacity at health facilities

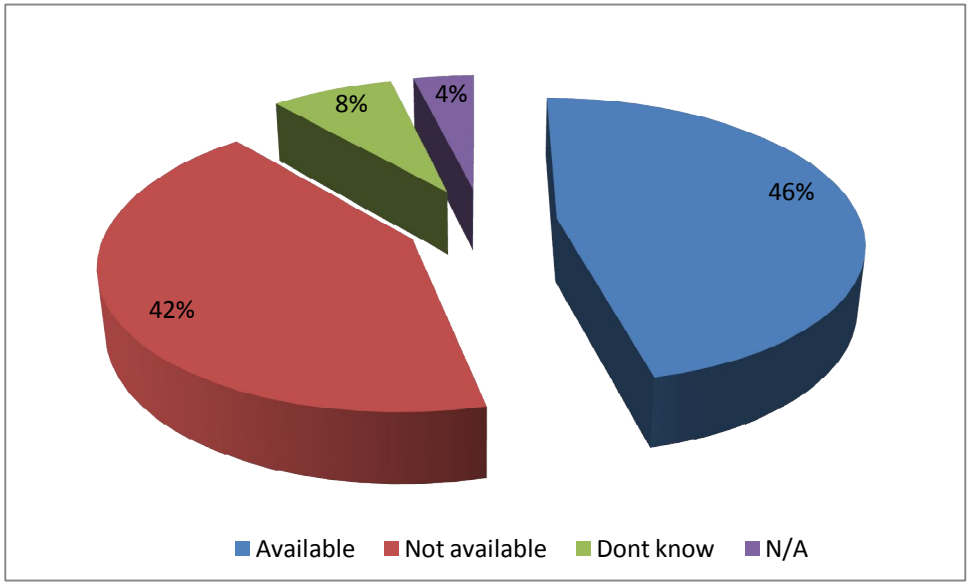

Figure12: Storage equipments at health facilities

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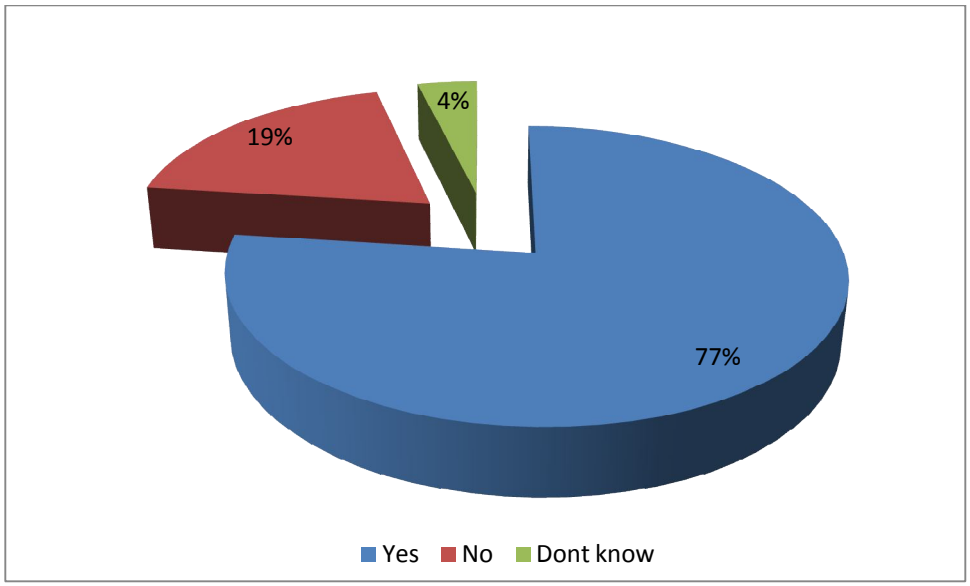

Figure 13: Appropriate Storage conditions at health facilities

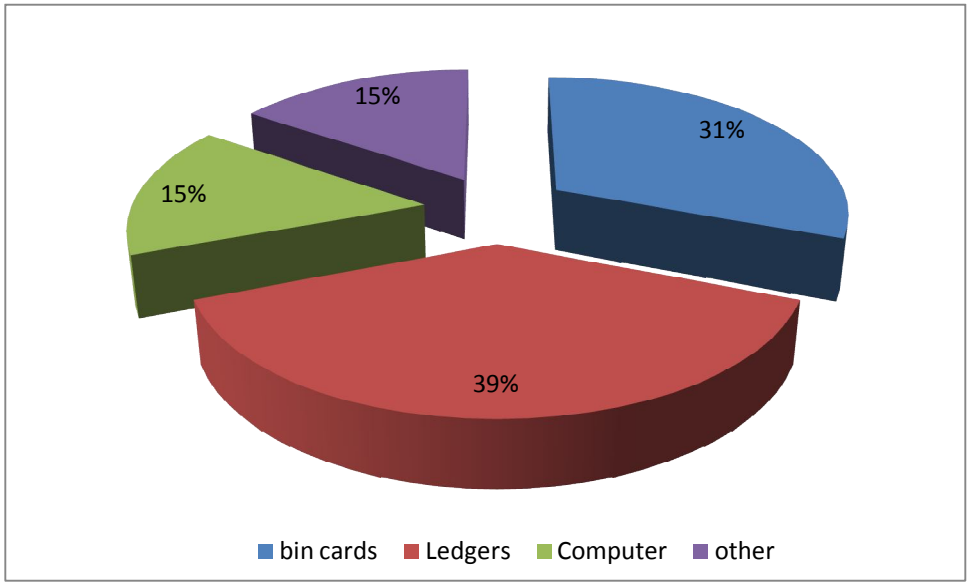

Figure 14: Inventory control mechanism at health facilities

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CONSUMER FACTORS

Table 14: medicines prescribing responsibility at health facilities

Responsible personnel	Percent
Doctors and Medical assistants	100.0

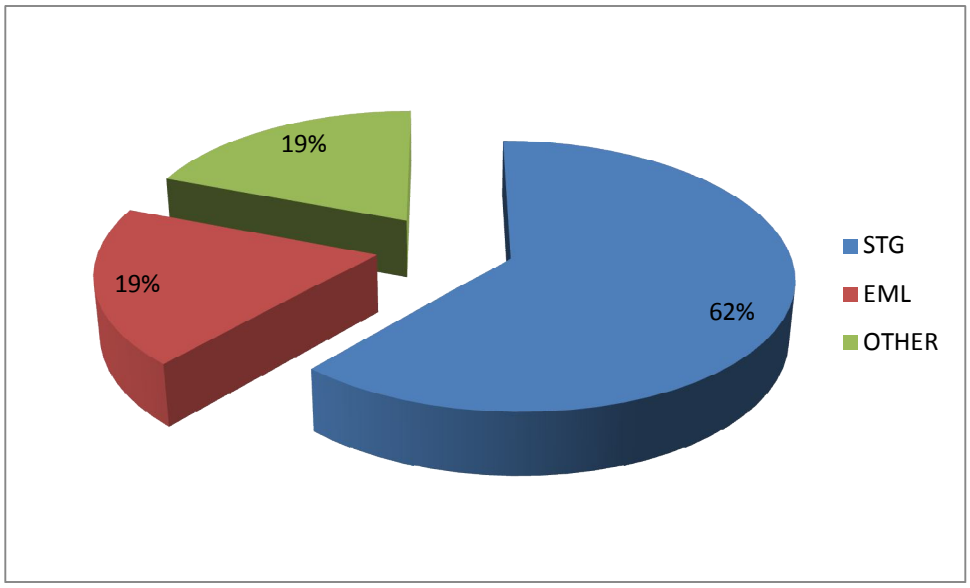

Figure 15: prescribing basis at health facilities

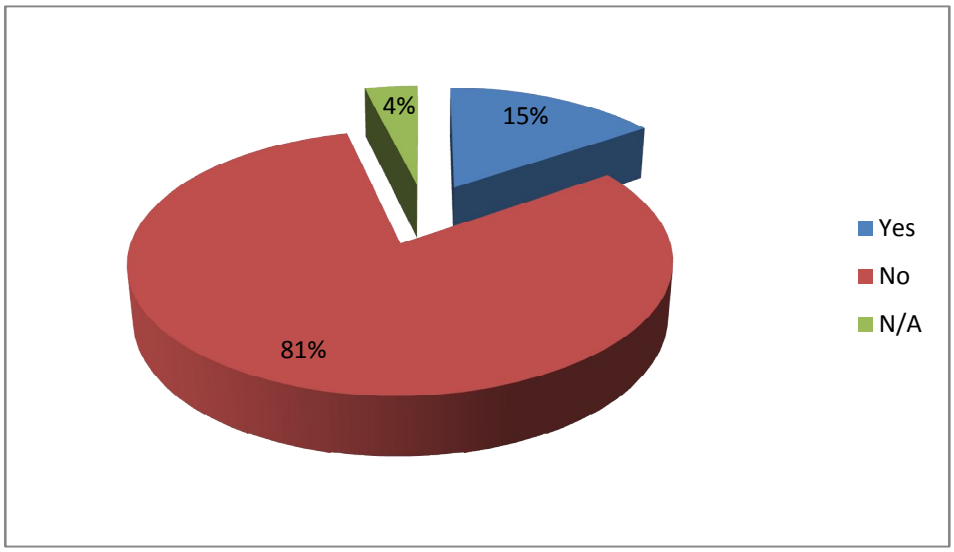

Figure 16: Availability of an active pharmacy and therapeutic committee at health facilities

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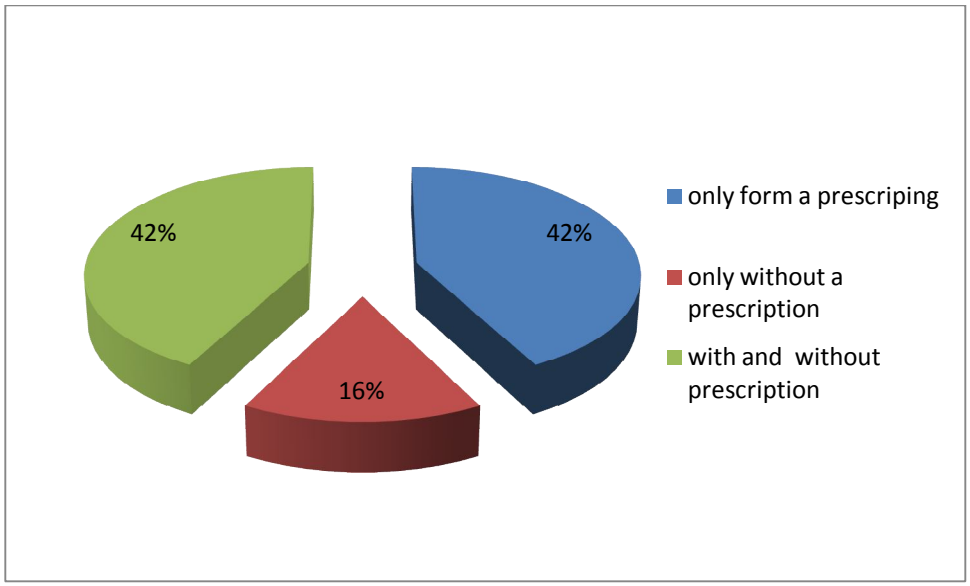

Figure 17: Dispensing pattern at health facilities

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SUPPLIER FACTORS

- The results showed that the responsible departments for life saving medicines selection were the medicines supply department at the NMSF at the state level, and the medicine supply department in the RDF in Khartoum state (figure 18).
- Selection of life saving medicines based on EML, and disease burden (figure 19).
- Forecasting is the responsibility of the procurement departments in the NMSF and RDF (figure 20).
- Quantification data was available (table 16).
- Forecasts developed for required quantities of life saving medicine selection by using consumption method (table 17).
- Validation was done by the WHO check lists in the NMSF (table 18).
- Buffer stocks were planned at relevant level by 80%, due to the lack of budget buffer stock for one month was maintained (table 19).
- Forecasting data were managed manually and by computer system (figure 22).
- Forecasts were presented depending on reliable data and method (table 20).
- 80% is the availability of financial resources (figure 23).
- Suppliers had detailed distribution arrangements all over the SUDAN (table 21).
- The distribution plan was done according to facility order or time limit through receiving medicines quarterly from NMSF (figure 24).
- A documented product distribution plan was done at all level of the system monthly (figure 25).
- Resources for product distribution were available, but not enough (figure

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26). This lead to out sourcing distribution responsibilities (i.e. to the facilities) in rare cases (figure 27).

- There was no delay in the distribution in the last 12 months. Generally sometimes the causes of delay might be the stock out of some items at the central level or the weather changes (e.g.: rain) (figure 28).
- Accounting system was available in the financial department (table 22, figure 29).
- The shelf life of medicines was well managed throughout the supply chain (table 23).

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A. Product selection

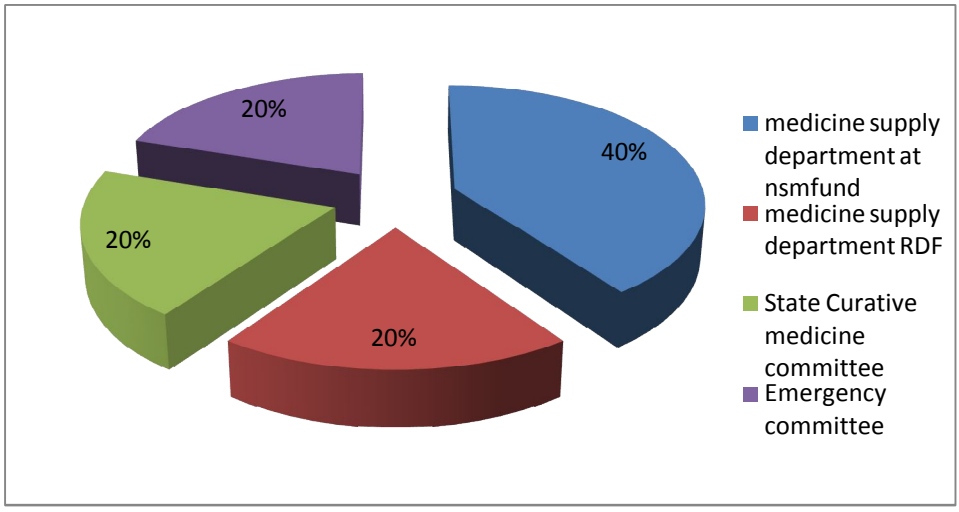

Figure 18: Departments responsible for life saving medicine selection at state RDF

Table 15: Availability of a selection policy at state RDF

Availability of selection policy	Percent
Yes	60.0
No	40.0
Total	100.0

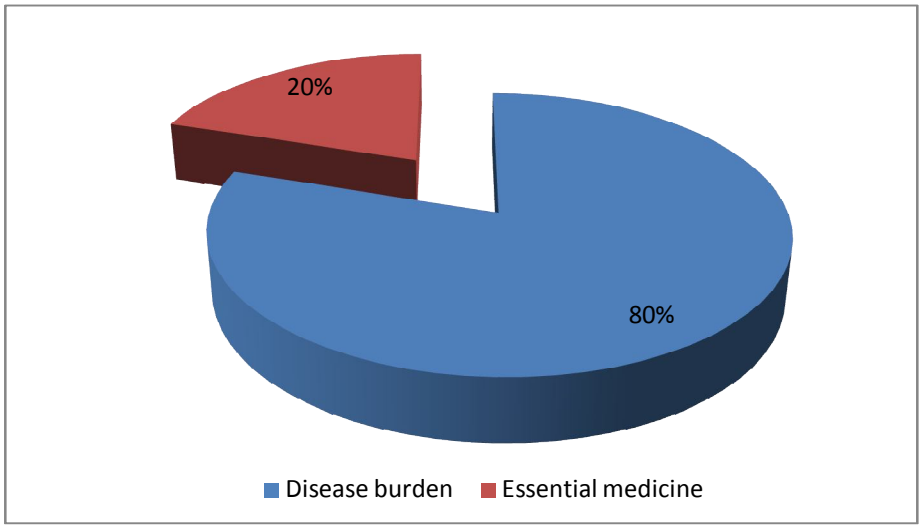

Figure 19: Bases of selection life saving medicines at state RDF

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B. Quantification

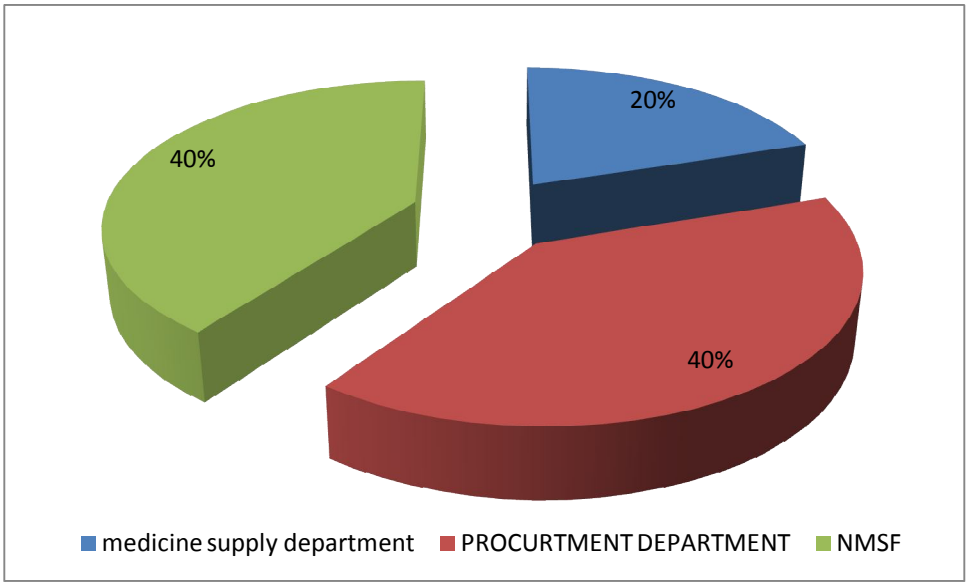

Figure 20: Forecasting responsibility at state RDF.

Table 16: Availability of quantification data at state RDF

Quantification data		Frequency	Percent
Valid	Yes	5	100.0

Table 17: Forecasts developed by consumption method at state RDF

Method		Frequency	Percent
Valid	Consumption by quantities	5	100.0

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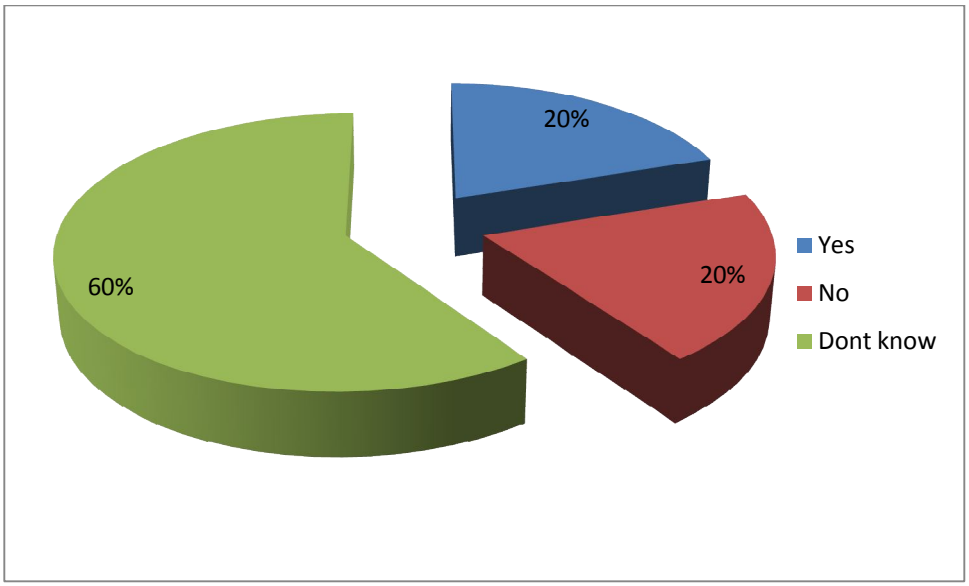

Figure 21: Forecasts developed by Morbidity method at state RDF

Table 18: forecasts validation at state RDF

Validation method	Frequency	Percent
By NMSF	2	40.0
No validation process in place	1	20.0
Past consumption	1	20.0
By check list in who site	1	20.0
Total	5	100.0

Table 19: Planning buffer stocks at state RDF

Planning	Frequency	Percent
Yes	4	80.0
No	1	20.0
Total	5	100.0

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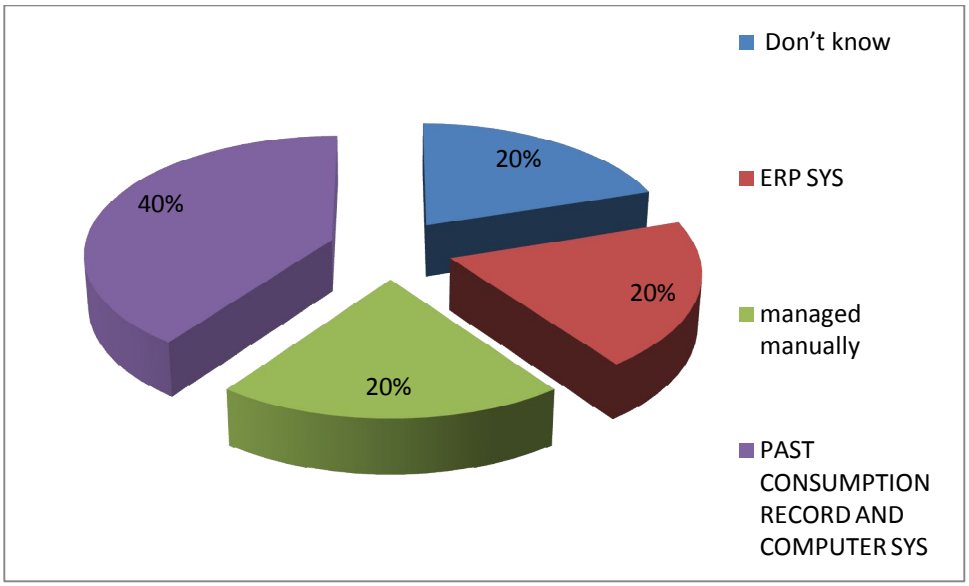

Figure 22: Management of forecasting data at state RDF

Table 20: quantification forecasts presented on reliable data at state RDF

Data reliability		Frequency	Percent
Valid	Yes	5	100.0

C. Finance

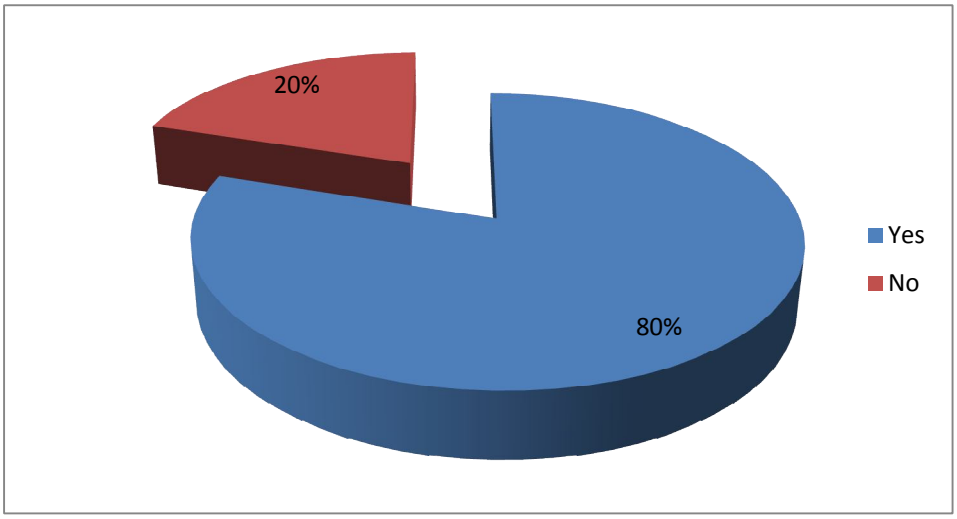

Figure 23: Availability of financial resources coverage at state RDF

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D. Distribution

Table 21: Agreement and distribution arrangements at state RDF

Arrangements availability		Frequency	Percent
Valid	Yes	5	100.0

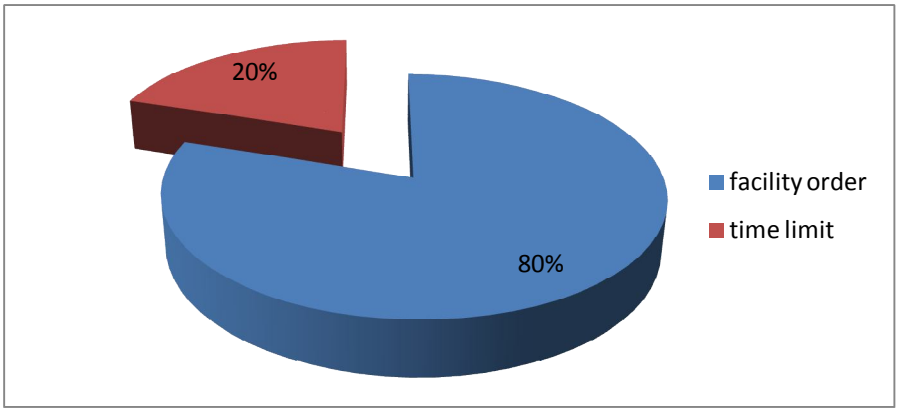

Figure 24: basis of a distribution plan at state RDF

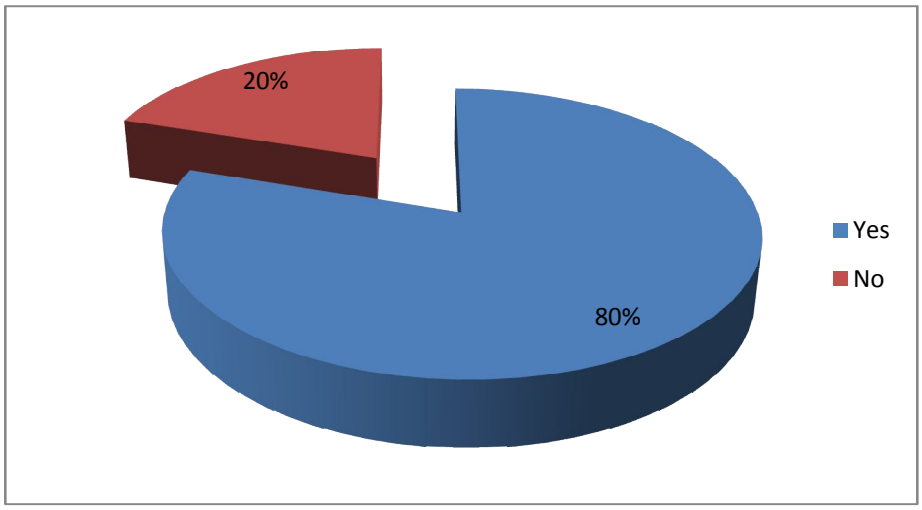

Figure 25: Availability of a documented product distribution schedule at state RDF

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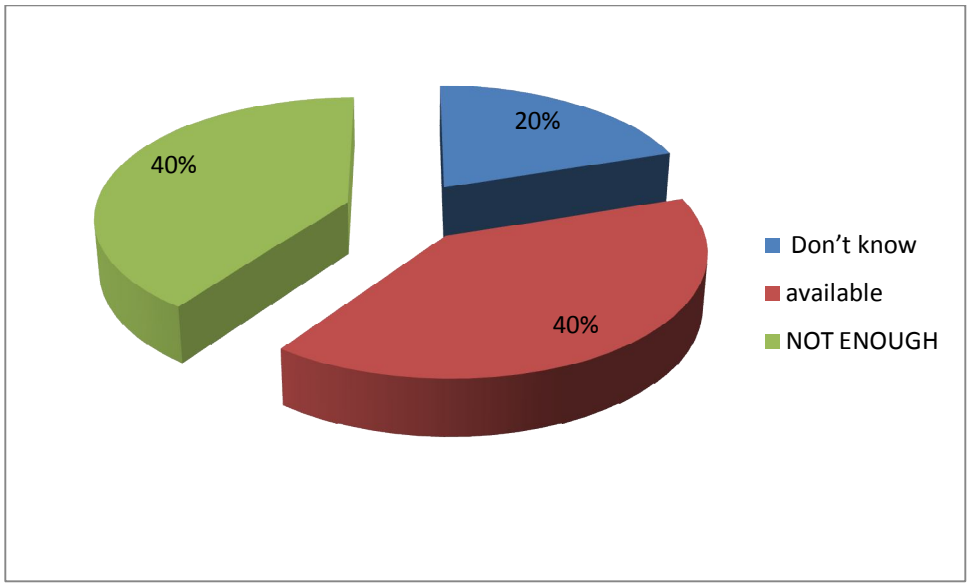

Figure 26: availability of resources for product distribution at state RDF

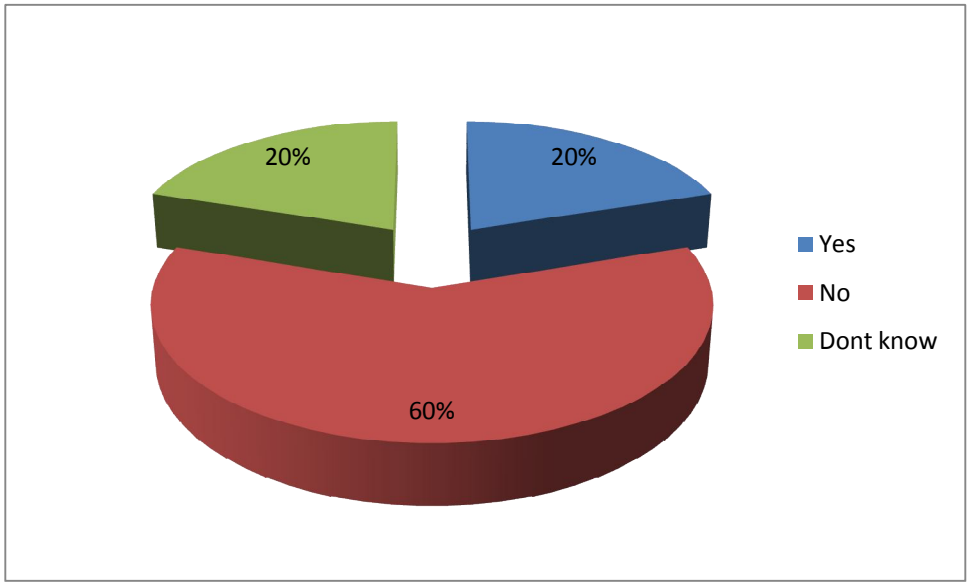

Figure 27: transportation responsibility outsourced at state RDF

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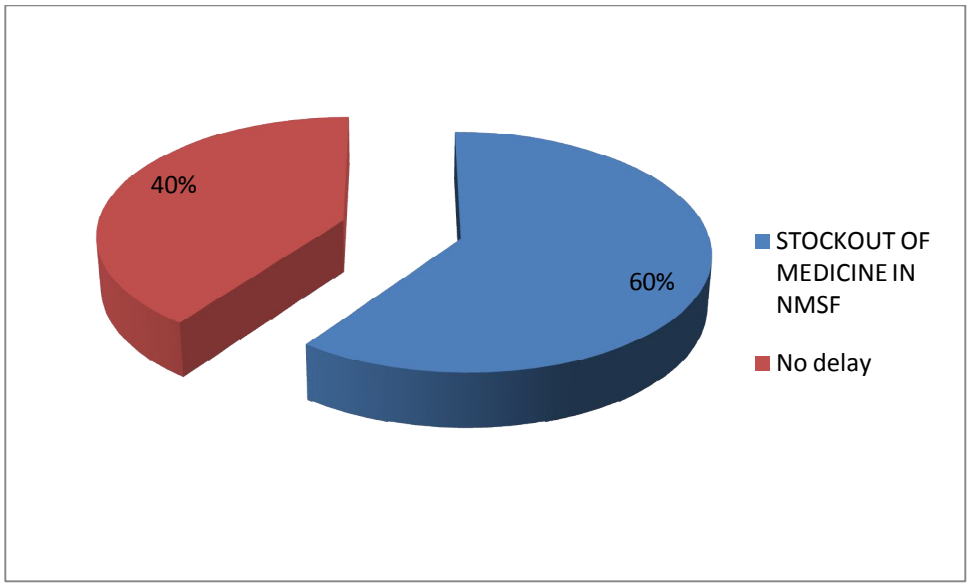

Figure 28: sources of transportation delay in the last 12 months at state RDF

Table 22: Availability of an accounting system at state RDF

Accounting system availability		Frequency	Percent
Valid	Yes	5	100.0

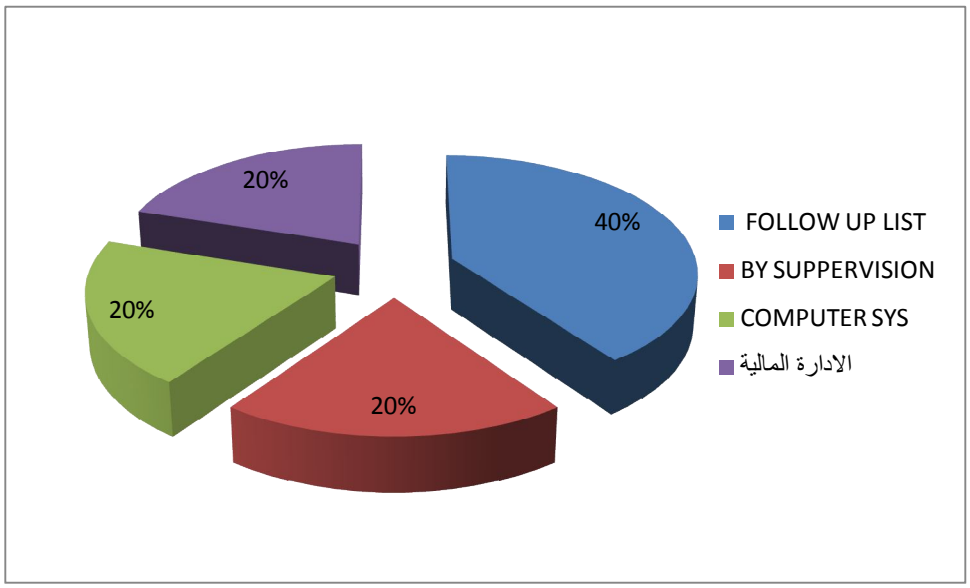

Figure 29:Types of accounting systems available at state RDF

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Table 23:Management of products shelf life throughout the supply chain at state RDF

Shelf life management		Frequency	Percent
Valid	Yes	5	100.0

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DISTRIBUTER FACTORS

The result showed:

- The distribution cost was 80% fully covered by the distributer (figure 30).
- The distribution responsibilities were 60% owned by the supplier (NMSF, RDF), while 40% owned by the facility (figure 31).
- Distribution arrangements planned monthly.
- Distribution schedule was documented and arranged regularly (daily, monthly, and quarterly) (table 25).
- There was lack of resources for product distribution, including number and storage capacity of vehicles as well as availability of petrol and drivers for the supply levels in the system (table 26).
- Transportation was not outsourced at any level of the supply chain management system (figure 32).
- Delays in distribution may be due to rain or war in some states (table 27).
- Accounting system was available (table 28).

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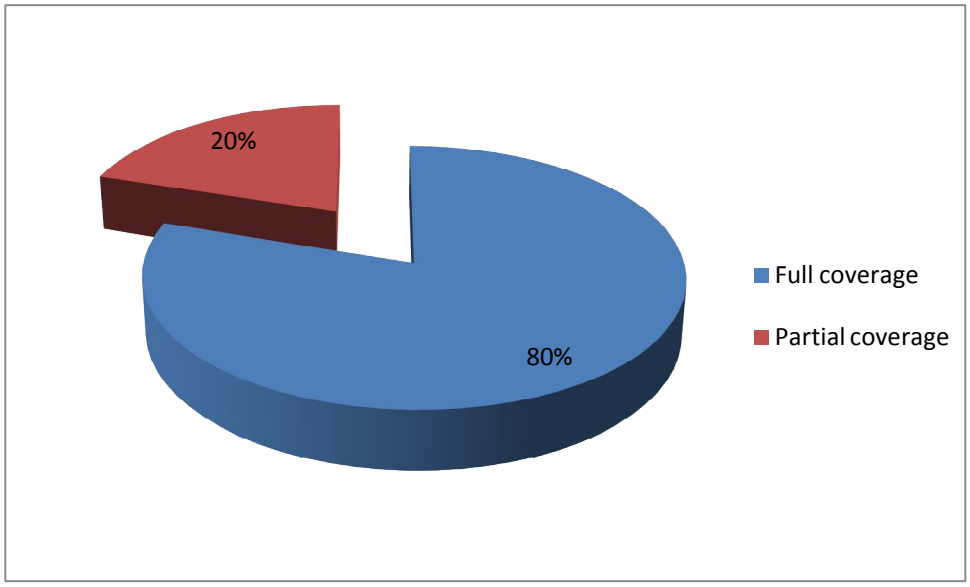

Figure 30: Distribution coverage by state RDF

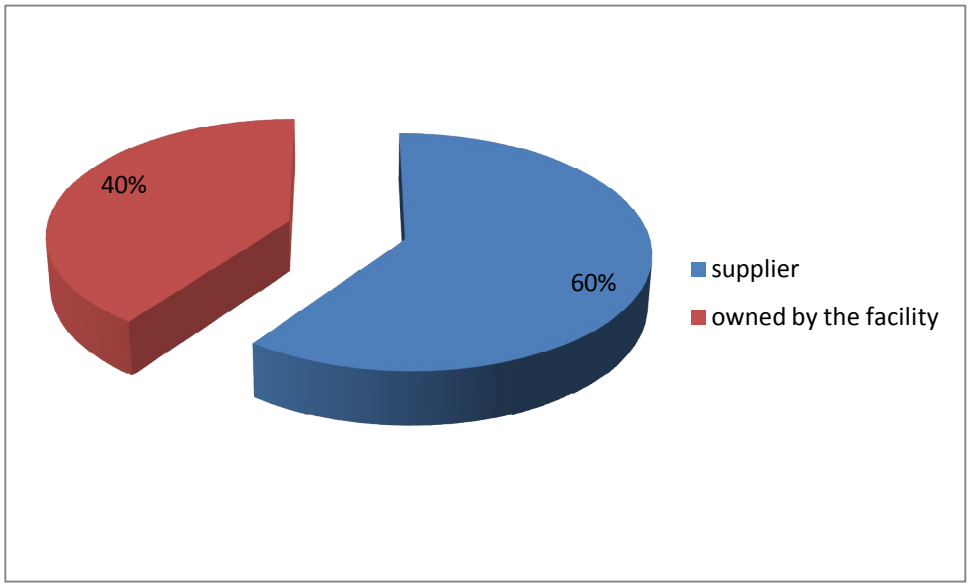

Figure 31: Distribution responsibility at state RDF

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Table 24: availability of a documented product distribution schedule at state RDF

Availability of a product distribution schedule		Frequency	Percent
Valid	Yes	5	100.0

Table 25 : product distribution schedule duration at state RDF

Schedule duration	Frequency	Percent
daily ,monthly, weekly and quarterly	1	20.0
monthly	3	40.0
Not used	1	20.0
	5	100.0

Table 26: availability of sufficient resources for product distribution at state RDF

Distribution resources availability	Frequency	Percent	Valid Percent	Cumulative Percent
Not available (facilities to distribute their need of medications)	1	20.0	20.0	20.0
Not sufficient	1	20.0	20.0	40.0
Available	3	60	20.0	60.0
Total	5	100.0	100.0	

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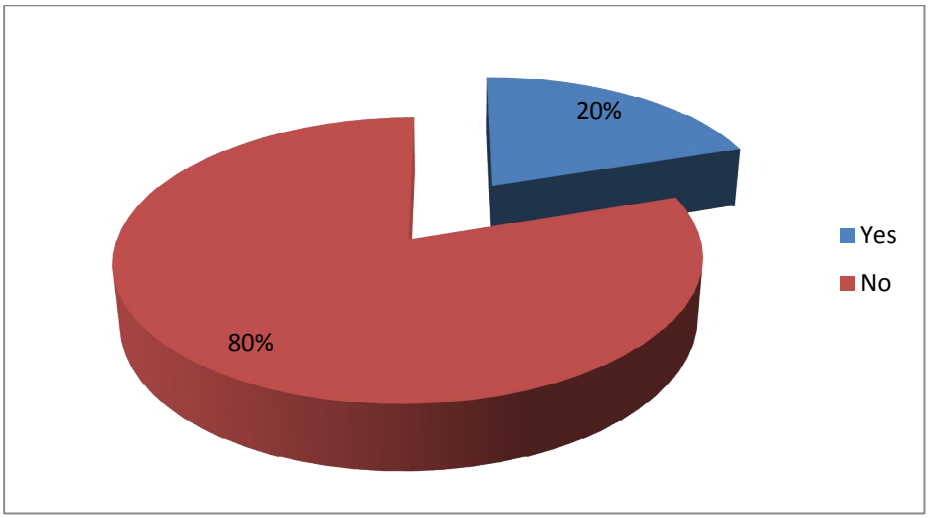

Figure 32: transportation responsibility outsourced at state RDF

Table 27: Sources of transportation delay in the last 12 months at state RDF

Sources of delay		Frequency	Percent
Valid	No delay	2	40.0
	for the war we have difficulty to distribute	1	20.0
	Rainy season	1	20.0
	Stock outs of imported medicines	1	20.0
	Total	5	100.0

Table 28: Availability of an accounting system at state RDF

Accounting system availability		Frequency	Percent
Valid	Yes	5	100.0

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Table 29 :Free Emergency medicines facility coverage per state 2014

No.	State	Hospitals per state	Hospitals covered	(%) coverage	Health centers per state	Health centers covered	Coverage (%)
1	Khartoum	48	48	100%	633	0	0
2	Aljazeera	85	85	100%	809	0	0
3	Red sea	21	12	57.1%	182	0	0
4	Gadarif	30	30	100%	296	0	0
5	Northern	30	27	90%	206	0	0
6	Kassala	25	9	36%	306	0	0
7	River Nile	40	29	72.5%	293	0	0
8	White Nile	35	13	37.1%	353	0	0
9	Blue Nile	14	12	85.7%	137	16	11.7%
10	Sinnar	29	22	75.9%	195	0	0
11	North kurdufan	24	21	87.5%	422	0	0
12	South kurdufan	13	11	84.6%	117	0	0
13	North Darfur	18	18	100%	248	0	0
14	South Darfur	17	16	94.1%	220	0	0
15	West Darfur	8	8	100%	91	5	5.5%
16	West kurdufan	16	16	100%	165	0	0
17	Central Darfur	7	3	42.9%	62	0	0
18	East Darfur	7	4	57.2%	77	0	0
	Sudan	467	384	82.2%	4862	21 (1%)	

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LIMITATIONS OF THE STUDY

- Small sample size
- More detailed interviews to with all the supply chain personnel were needed for more realistic data
- Health care providers and patients needed to be interviewed to reveal consumer factors
- The study was not performed at the NMSF level for comparison

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Chapter 4

Conclusion and recommendations

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CONCLUSION

- The average availability of the 52 selected basket of lifesaving medicines was found to be 72.6%
- The average stock out duration of the 52 selected lifesaving medicines was found to be 69 days per year.
- The most frequent out of stock life saving medicines within the year 2015 where Metoprolol tartrate (365day/year), desmopressin (292 day/year), paracetamol infusion (274 days/year) .while at time of data collection desmopressin and paracetamol infusion were the most out of stock medicines.
- By direct responding of the stock responsible personnel the main reasons of stock outs of life saving medicines was stock outs at the supplier level and the lack of funds.
- By the assessment of the supply chain at the facility level the main contributing factors to the stock out of life saving medicines were the lack of qualified selection personnel, the absence of a written selection policy, the limited documentation of quantification data lack of a quantification plan and limited financial coverage. Moreover, poor information flow between the facility and the state central store, the limited storage capacity and poor storage conditions plays a role a factors contributing in the stock out of life saving medicines. In addition irrational dispensing of medicines (dispensing of medicines without a prescription) played an important role in unplanned stocking out of facility stocks.
- At the supplier and distributer levels where the distribution responsibility was no outsources the main constrains to the supply chain flow is distracted

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through limited financial resources and limited distribution resources. Another main reason of stock outs of life saving medicines is their deficiency at the central stores of the NMSF. Delays in distribution may also be due to weather conditions or war in some states.

RECOMMENDATIONS :

- Relevant Training of personnel throughout the supply chain.
- Enforce the availability of all the supply documents at all the supply chain levels by the construction standard operating procedures.
- Enhancement of data recording and flow through the construction of computer based systems at the facility levels and to be connection with the center.
- To improve medicine storage area infrastructure at facility level
- To control irrational dispensing of medicines
- To improve the distribution resources at state central level
- To increase the governmental financial coverage of life saving medicines at state insuring that each health facility will have its need of life saving medicines
- To create alternative emergency measurements to insure accessibility to life saving medicines at special conditions.
- A prospective observational study needed to be performed to capture and intensify the findings of this study.

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ANNEX 1

وزارة الصحة الإتحادية
الإدارة العامة للصيدلة الإتحادية

Contributing factors to "stock out" of life –saving medicines, in governmental health facilities in the Sudan 2015-2016

Selected life saving medicine list to be surveyed

No.	Drug	Case	strength	Dosage form	Level of use
1	Adrenaline hydrochloride	Cardiac arrest, cardio pulmonary edema, hypotension Anti arrhythmic	1mg/ml	Injection	B
2	Lyophilized anti scorpion venom	Anti scorpion venom	24mg/ml	Injection	B
3	Lyophilized anti snake polyvalent venom	anti snake polyvalent		Injection	B
4	Rabies vaccine	Anti- rabies vaccine	150 IU in vial	Injection	B
5	Anti tetanus	Anti- tetanus immunoglobulin 500 iu in vial	500 IU in vial	Injection	B
6	Atropine sulphate	Preoperative medication, cardio pulmonary odema,management of bradycardia(MI)	0.1mg/ml adult 0.05 mg/ml pediatric	Injection	B
7	Benzyl penicillin	Acute tonsillitis ,pneumonia	1million IU powder for injection	Injection	A.A
8	Dexamethasone	Severe allergic, asthma, chronic obstructive lung disease, brain swelling	4mg/ml	Injection	C
9	Diazepam	Epilepticus, tetanus, anxiety, seizure, sedative due to operation	10mg/2ml	Injection	B
10	Digoxin	C.H.F	0.5mg/2ml	injection	B
11	Furosemide	Fluid retention, C.H.F,COPD,	20mg/2ml	Injection	B
12	Glyceryl trinitrate	Angina. HF	500mg	Tablet	B
13	Heparin	DVT, Pulmonary embolism, prophylaxis	5000 IU/5ml	Injection	C
14	Hydrocortisone	Asthma, anaphylactic shock,, severe allergy, Inflammatory bowel disease.	100mg powder for injection	Injection	B
15	Hyoscine n- butyl	Anti spasmodic	20mg/ml	Injection	A

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	bromide				
16	Soluble Insulin	Diabetes	100ml	Injection	B
17	Lidocaine	Local anesthesia	2%,5%	Injection	A
18	Magnesium sulphate	Constipation, prevention of seizure due to eclampsia	50%in 10ml	Injection	C
19	Metoprolol tartrate	HTN, angina, arrhythmia	1mg/1ml	injection	C
20	Metronidazole	Anaerobic infection, surgical prophylaxis	500mg/100ml	infusion	C
21	Sodium chloride	Electrolyte Imbalance, wound irrigation	0.9%/500ml 1.8%,3%,	Infusion Infusion	B C
22	O.R.S	Fluid and electrolyte loss due to diarrhea		Powder for suspension	A
23	Oxytocin	Stimulation labour, monitoring of fetal HR .,Prevent post partrium hemorrhage after delivery of placenta	10 unit/ml 5 unit/ml	injection	B C
24	Phenytion	Seizure, trigeminal neuralgia	50mg/ml,2ml ampoule	injection	C
25	Potassium chloride	Electrolyte imbalance, hypokalemia	15%inj in10ml	injection	B
26	Ranitidine	Gastric acidity ,duodenal ulcer, prophylaxis of steroid and NSAID associated gastric or duodenal ulcer	25mg/ml	injection	B
27	Salbutamol	Asthma	100microgram	Inhaler	B
28	Salbutamol nebulizer solution	Asthma	5mg/2.5 ml nebulizer	solution	B
29	Streptokinase recombinant	Acute MI-acute arterial thromboembolism, D.V.T	750000 IU/vial	injection	C
30	Vitamin k	For bleeding, include intracranial bleeding	5,10,15 mg	injection	B
31	Protamine suphate	Heparin over dose	10mg/ml in 5ml amp	injection	C
32	Chlorpheniramine	Allergy ,hay fever, watery eye	10mg	injection	B
33	Calcium gluconate	Hypocalcaemia due to pregnancy, hyperkalemia ,osteomalacia	100mg	injection	C
34	Dopamine	Low blood pressure due to shock cause by heart attack trauma, H.F R.F	200mg per 5ml	injection	C
35	Hydralazine	HTN crises	20mg-40mg	injection	C
36	Diclofenac	Pain killer, anti inflammatory	75mg	injection	B
37	Ergomtrine	Prevent and treatment post partum and post abortion hemorrhage	200-500mcg	injection	C

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38	Quinine	Anti inflammatory, ant arrhythmic effect	150mg,300mg	injection	B
39	Metclopramide	Heart burn, nausea ,and vomiting	10mg	injection	B
40	Paracetamol infusion	Moderate pain killer		infusion	C
41	Desmopressin acetate	Hemophilia Maintain homeostasis, cranial diabetes insipidus	1-4mg	injection	C
42	Ringer lactate	Fluid resuscitation after blood loss due to trauma, electrolyte imbalance that occurs with acute fluid loss	250ml,500ml	Infusion	C
43	Normal saline	Water and electrolyte balance, sterile wound, hypotensive	0.9%	Infusion	A
44	Human albumin	Shock due to blood loss, low protein level increase plasma volume	20% to 25%	Infusion	B
45	Pithidine HCL	Pain killer after surgical operation	15mg	injection	B
46	Morphine	Moderate to severe pain ex .MI	5mg/ml	injection	B
47	Oxygen	For asthma ,trauma, C.V.D,		Inhaler	B
48	Dextrose 10% with water	Hypoglycemia and electrolyte balance	10% with water	infusion	B
49	Aminophyline	Blockage air way emphysema	25 mg/ml	injection	B
50	Propofol	General anesthesia	10 mg/ ml in 20-ml amp (emulsion)	Injection	C
51	Dextrose 5% with water	Electrolyte imbalance	5% with water	Infusion	B
52	Promethazine hydrochloride	Severe nausea-vomiting	25mg/ml	injection	A

Note: Level of use

A, AA= health centre

B= rural hospital + A, AA

C= general hospital+ A, AA and B

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ANNEX 2

وزارة الصحة الإتحادية
الإدارة العامة للصيدلة الإتحادية

Contributing factors to "stock out" of life- saving medicines, in governmental health facilities in the Sudan 2015.

Availability of medicines
General Hospital

Code				Date ……
D				

Investigator Name:……

investigator signature……..

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No	Medicine		In Stock Yes=1 No= 0 (B)	If No why?(check all that appropriate) a- Lack of fund b- Out of stock in the supplier c- Not commonly used d- Unexpected prescribing pattern e- Small storage capacity	Expired Medicines on Shelves Yes=1 No= 0 (C)
1	Adrenaline hydrochloride	1mg/ml		a ☐ b ☐ c ☐ d ☐ e ☐	
2	Lyophilized anti scorpion venom	24mg/ml		a ☐ b ☐ c ☐ d ☐ e ☐	
3	Lyophilized anti snake polyvalent venom			a ☐ b ☐ c ☐ d ☐ e ☐	
4	Rabies vaccine	150 IU in vial		a ☐ b ☐ c ☐ d ☐ e ☐	
5	Anti tetanus	500 iu in vial		a ☐ b ☐ c ☐ d ☐ e ☐	
6	Atropine sulphate	0.1mg/ml adult 0.05 mg/ml pediatric		a ☐ b ☐ c ☐ d ☐ e ☐	
7	Benzyl penicillin	1million Iu powder for injection		a ☐ b ☐ c ☐ d ☐ e ☐	
8	Dexamethasone	4mg/ml		a ☐ b ☐ c ☐ d ☐ e ☐	
9	Diazepam	10mg/2ml		a ☐ b ☐ c ☐ d ☐ e ☐	
10	Digoxin	0,5mg/2ml		a ☐ b ☐ c ☐ d ☐ e ☐	
11	Furosemide	20mg/2ml		a ☐ b ☐ c ☐ d ☐ e ☐	
12	Glyceryl trinitrate	500mg		a ☐ b ☐ c ☐ d ☐ e ☐	
13	Heparin	5000 IU/5ml		a ☐ b ☐ c ☐ d ☐ e ☐	
14	Hydrocortisone	100mg powder for inj		a ☐ b ☐ c ☐ d ☐ e ☐	
15	Hyoscine n- butyl bromide	20mg/ml		a ☐ b ☐ c ☐ d ☐ e ☐	
16	Soluble Insulin	100ml		a ☐ b ☐ c ☐ d ☐ e ☐	
17	Lidocaine	2%,5%		a ☐ b ☐ c ☐ d ☐ e ☐	
18	Magnesium sulphate	50%in 10ml		a ☐ b ☐ c ☐ d ☐ e ☐	
19	Metoprolol tartrate	1mg/1ml		a ☐ b ☐ c ☐ d ☐ e ☐	
20	Metronidazole	500mg/100ml		a ☐ b ☐ c ☐ d ☐ e ☐	
21	Sodium chloride	0.9%/500ml 1.8%,3%,		a ☐ b ☐ c ☐ d ☐ e ☐	
22	O.R.S			a ☐ b ☐ c ☐ d ☐ e ☐	
23	Oxytocin	10 unit/ml 5 unit/ml		a ☐ b ☐ c ☐ d ☐ e ☐	

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24	Phenytion	50mg/ml,2ml ampoule		a ☐ b ☐ c ☐ d ☐ e ☐	
25	Potassium chloride	15%inj in10ml		a ☐ b ☐ c ☐ d ☐ e ☐	
26	Rantidine	25mg/ml		a ☐ b ☐ c ☐ d ☐ e ☐	
27	Salbutamol	100microgram		a ☐ b ☐ c ☐ d ☐ e ☐	
28	Salbutamol nebulizer solution	5mg/2.5 ml nebulizer		a ☐ b ☐ c ☐ d ☐ e ☐	
29	Streptokinase recombinant	750000 IU/vail		a ☐ b ☐ c ☐ d ☐ e ☐	
30	Vitamin k	5,10,15 mg		a ☐ b ☐ c ☐ d ☐ e ☐	
31	Protamine suphate	10mg/ml in 5ml amp		a ☐ b ☐ c ☐ d ☐ e ☐	
32	chlorpheniramine	10mg		a ☐ b ☐ c ☐ d ☐ e ☐	
33	Calcium gluconate	100mg		a ☐ b ☐ c ☐ d ☐ e ☐	
34	Dopamine	200mg per 5ml		a ☐ b ☐ c ☐ d ☐ e ☐	
35	Hydralazine	20mg-40mg		a ☐ b ☐ c ☐ d ☐ e ☐	
36	Diclofenac	75mg		a ☐ b ☐ c ☐ d ☐ e ☐	
37	Ergomtrine	200-500mcg		a ☐ b ☐ c ☐ d ☐ e ☐	
38	Quinine	150mg,300mg		a ☐ b ☐ c ☐ d ☐ e ☐	
39	metclopramide	10mg		a ☐ b ☐ c ☐ d ☐ e ☐	
40	Paracetamol infusion			a ☐ b ☐ c ☐ d ☐ e ☐	
41	Desmopressin actate	1-4mg		a ☐ b ☐ c ☐ d ☐ e ☐	
42	Ringer lactate	250ml,500ml		a ☐ b ☐ c ☐ d ☐ e ☐	
43	Normal saline	0,9%,		a ☐ b ☐ c ☐ d ☐ e ☐	
44	Human albumin	20 to 25%		a ☐ b ☐ c ☐ d ☐ e ☐	
45	Pithidine HCL	15mg		a ☐ b ☐ c ☐ d ☐ e ☐	
46	Morphine	5mg/ml		a ☐ b ☐ c ☐ d ☐ e ☐	
47	Oxygen			a ☐ b ☐ c ☐ d ☐ e ☐	
48	Dextrose 10% with water	10% with water		a ☐ b ☐ c ☐ d ☐ e ☐	
49	Aminophyline	25 mg/ml		a ☐ b ☐ c ☐ d ☐ e ☐	
50	*Propofol*	*10 mg/ ml in 20-ml amp (emulsion)*		a ☐ b ☐ c ☐ d ☐ e ☐	
51	*Dextrose 5% with water*	*5% with water*		a ☐ b ☐ c ☐ d ☐ e ☐	
52	*Promethazine hydrochloride*	*25mg/ml*		a ☐ b ☐ c ☐ d ☐ e ☐	

(B1)= Sum of B

% in stock= $\frac{(B1)}{\text{No of medicines}} \times 100$

(C1) = Sum of (C)

% expired= $\frac{(C1)}{(B1)} \times 100$

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ANNEX 3

وزارة الصحة الإتحادية
الإدارة العامة للصيدلة الإتحادية

Contributing factors to "stock out" of life- saving medicines, in governmental health facilities in the Sudan 2015.

Availability of medicines
Rural hospital

Code				Date ……
D				

Investigator Name:……

investigator signature……..

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No	Medicine		In Stock Yes=1 No= 0 (B)	If No why?(check all that appropriate) f- Lack of fund g- Out of stock in the supplier h- Not commonly used i- Unexpected prescribing pattern j- Small storage capacity	Expired Medicines on Shelves Yes=1 No= 0 (C)
1	Adrenaline hydrochloride	1mg/ml		a☐ b☐ c☐ d☐ e☐	
2	Lyophilized anti scorpion venom	24mg/ml		a☐ b☐ c☐ d☐ e☐	
3	Lyophilized anti snake polyvalent venom			a☐ b☐ c☐ d☐ e☐	
4	Rabies vaccine	150 IU in vial		a☐ b☐ c☐ d☐ e☐	
5	Anti tetanus	500 IU in vial		a☐ b☐ c☐ d☐ e☐	
6	Atropine sulphate	0.1mg/ml adult 0.05 mg/ml pediatric		a☐ b☐ c☐ d☐ e☐	
7	Benzyl penicillin	1million IU powder for injection		a☐ b☐ c☐ d☐ e☐	
8	Diazepam	10mg/2ml		a☐ b☐ c☐ d☐ e☐	
9	Digoxin	0.5mg/2ml		a☐ b☐ c☐ d☐ e☐	
10	Furosemide	20mg/2ml		a☐ b☐ c☐ d☐ e☐	
11	Glyceryl trinitrate	500mg		a☐ b☐ c☐ d☐ e☐	
12	Hydrocortisone	100mg powder for injection		a☐ b☐ c☐ d☐ e☐	
13	Hyoscine n- butyl bromide	20mg/ml		a☐ b☐ c☐ d☐ e☐	
14	Soluble Insulin	100ml		a☐ b☐ c☐ d☐ e☐	
15	Lidocaine	2%,5%		a☐ b☐ c☐ d☐ e☐	
16	Sodium chloride	0.9%/500ml		a☐ b☐ c☐ d☐ e☐	
17	O.R.S			a☐ b☐ c☐ d☐ e☐	
18	Oxytocin	10 unit/ml		a☐ b☐ c☐ d☐ e☐	
19	Potassium chloride	15%inj in10ml		a☐ b☐ c☐ d☐ e☐	
20	Ranitidine	25mg/ml		a☐ b☐ c☐ d☐ e☐	
21	Salbutamol	100microgram		a☐ b☐ c☐ d☐ e☐	
22	Salbutamol nebulizer solution	5mg/2.5 ml nebulizer		a☐ b☐ c☐ d☐ e☐	
23	Vitamin k	5,10,15mg inj.		a☐ b☐ c☐ d☐ e☐	
24	Chlorpheniramine	10mg inj.		a☐ b☐ c☐ d☐ e☐	

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25	Diclofenac	75mg inj.		a ☐ b ☐ c ☐ d ☐ e ☐	
26	Quinine	150mg,300mg inj.		a ☐ b ☐ c ☐ d ☐ e☐	
27	Metclopramide	10mg inj.		a ☐ b ☐ c ☐ d ☐ e☐	
28	Normal saline	0.9%		a ☐ b ☐ c ☐ d ☐ e☐	
29	Human albumin	20 %, 25%		a ☐ b ☐ c ☐ d ☐ e☐	
30	Pithidine HCL	15mg		a ☐ b ☐ c ☐ d ☐ e☐	
31	Morphine	5mg/ml		a ☐ b ☐ c ☐ d ☐ e☐	
32	Oxygen			a ☐ b ☐ c ☐ d ☐ e☐	
33	Dextrose	10% /500ml infusion		a ☐ b ☐ c ☐ d ☐ e☐	
34	Aminophyline	25 mg/ml		a ☐ b ☐ c ☐ d ☐ e☐	
35	Dextrose 5%	5% /500ml infusion		a ☐ b ☐ c ☐ d ☐ e☐	
36	Promethazine hydrochloride	25mg/ml		a ☐ b ☐ c ☐ d ☐ e☐	

(B1)= Sum of B

% in stock= $\frac{(B1)}{\text{No of medicines}} \times 100$

(C1) = Sum of (C)

% expired= $\frac{(C1)}{(B1)} \times 100$

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ANNEX 4

وزارة الصحة الإتحادية
الإدارة العامة للصيدلة الإتحادية

Contributing factors to "stock out" of life- saving medicines, in governmental health facilities in the Sudan 2015.

Availability of medicines
Health centre

Code				Date ……
D				

Investigator Name:……

investigator signature……..

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No	Medicine		In Stock Yes=1 No= 0 (B)	If No why?(check all that appropriate) k- Lack of fund l- Out of stock in the supplier m-Not commonly used n- Unexpected prescribing pattern o- Small storage capacity	Expired Medicines on Shelves Yes=1 No= 0 (C)
1	Benzyl penicillin	1million IU powder for injection		a☐ b☐ c☐ d☐ e ☐	
2	Hyoscine n- butyl bromide	20mg/ml		a☐ b☐ c☐ d☐ e ☐	
3	Lidocaine	2%,5% inj.		a☐ b☐ c☐ d☐ e ☐	
4	O.R.S			a☐ b☐ c☐ d☐ e ☐	
5	Normal saline	9%/500ml infusion		a☐ b☐ c☐ d☐ e ☐	
6	Promethazine hydrochloride	25mg/ml inj.		a☐ b☐ c☐ d☐ e ☐	

(B1)= Sum of B

% in stock= $\frac{(B1)}{\text{No of medicines}} \times 100$

(C1) = Sum of (C)

% expired= $\frac{(C1)}{(B1)} \times 100$

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ANNEX 5

وزارة الصحة الإتحادية
الإدارة العامة للصيدلة الإتحادية

Contributing factors to "stock out" of life- saving medicines, in governmental health facilities in the Sudan 2015.

Average Stock out Duration
General Hospitals

Code				Date ……
E				

Investigator Name:……

investigator signature……..

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No	Medicine		Records at least 6 month Yes=1 No=0 (B)	No of Days out stock (C)	No of Days covered (at least 6 month) (D)	Equivalent No of Days per year (E) (E)=(C)×365÷(D)
1	Adrenaline hydrochloride	1mg/ml				
2	Lyophilized anti scorpion venom	24mg/ml				
3	Lyophilized anti snake polyvalent venom					
4	Rabies vaccine	150 IU in vial				
5	Anti tetanus	500 iu in vial				
6	Atropine sulphate	0.1mg/ml adult 0.05 mg/ml pediatric				
7	Benzyl penicillin	1million Iu powder for injection				
8	Dexamethasone	4mg/ml				
9	Diazepam	10mg/2ml				
10	Digoxin	0,5mg/2ml				
11	Furosemide	20mg/2ml				
12	Glyceryl trinitrate	500mg				
13	Heparin	5000 IU/5ml				
14	Hydrocortisone	100mg powder for inj				
15	Hyoscine n- butyl bromide	20mg/ml				
16	Soluble Insulin	100ml				
17	Lidocaine	2%,5%				
18	Magnesium sulphate	50%in 10ml				
19	Metoprolol tartrate	1mg/1ml				
20	Metronidazole	500mg/100ml				
21	Sodium chloride	0.9%/500ml 1.8%,3%,				
22	O.R.S					
23	Oxytocin	10 unit/ml 5 unit/ml				
24	Phenytion	50mg/ml,2ml ampoule				

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25	Potassium chloride	15%inj in10ml				
26	Rantidine	25mg/ml				
27	Salbutamol	100microgram				
28	Salbutamol nebulizer solution	5mg/2.5 ml nebulizer				
29	Streptokinase recombinant	750000 IU/vail				
30	Vitamin k	5,10,15 mg				
31	Protamine suphate	10mg/ml in 5ml amp				
32	chlorpheniramine	10mg				
33	Calcium gluconate	100mg				
34	Dopamine	200mg per 5ml				
35	Hydralazine	20mg-40mg				
36	Diclofenac	75mg				
37	Ergomtrine	200-500mcg				
38	Quinine	150mg,300mg				
39	metclopramide	10mg				
40	Paracetamol infusion					
41	Desmopressin actate	1-4mg				
42	Ringer lactate	250ml,500ml				
43	Normal saline	0,9%,				
44	Human albumin	20 to 25%				
45	Pithidine HCL	15mg				
46	Morphine	5mg/ml				
47	Oxygen					
48	Dextrose 10% with water	10% with water				
49	Aminophyline	25 mg/ml				
50	*Propofol*	*10 mg/ ml in 20-ml amp (emulsion)*				
51	*Dextrose 5% with water*	*5% with water*				
52	*Promethazine hydrochloride*	*25mg/ml*				

Note:

(B1)= Sum of (B) ,(E1) = Sum of (E) ,(F)= Average No of Stock out days= (E1)÷(B1)

(B2)=Percentage of adequate records=$\frac{(B1)}{\text{No of medicines}}\times 100$

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ANNEX 6

وزارة الصحة الإتحادية
الإدارة العامة للصيدلة الإتحادية

Contributing factors to "stock out" of life- saving medicines, in governmental health facilities in the Sudan 2015.

Average Stock out Duration
Rural hospital

Code				Date ……
E				

Investigator Name:……

investigator signature……..

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No	Medicine		Records at least 6 month Yes=1 No=0 (B)	No of Days out stock (C)	No of Days covered (at least 6 month) (D)	Equivalent No of Days per year (E) (E)=(C)×365÷(D)
1	Adrenaline hydrochloride	1mg/ml				
2	Lyophilized anti scorpion venom	24mg/ml				
3	Lyophilized anti snake polyvalent venom					
4	Rabies vaccine	150 IU in vial				
5	Anti tetanus	500 IU in vial				
6	Atropine sulphate	0.1mg/ml adult 0.05 mg/ml pediatric				
7	Benzyl penicillin	1million IU powder for injection				
8	Diazepam	10mg/2ml				
9	Digoxin	0.5mg/2ml				
10	Furosemide	20mg/2ml				
11	Glyceryl trinitrate	500mg				
12	Hydrocortisone	100mg powder for injection				
13	Hyoscine n- butyl bromide	20mg/ml				
14	Soluble Insulin	100ml				
15	Lidocaine	2%,5%				
16	Sodium chloride	0.9%/500ml				
17	O.R.S					
18	Oxytocin	10 unit/ml				
19	Potassium chloride	15%inj in10ml				
20	Ranitidine	25mg/ml				
21	Salbutamol	100microgram				
22	Salbutamol nebulizer solution	5mg/2.5 ml nebulizer				
23	Vitamin k	5,10,15mg				

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		inj.				
24	Chlorpheniramine	10mg inj.				
25	Diclofenac	75mg inj.				
26	Quinine	150mg,300 mg inj.				
27	Metclopramide	10mg inj.				
28	Normal saline	0.9%				
29	Human albumin	20 %, 25%				
30	Pithidine HCL	15mg				
31	Morphine	5mg/ml				
32	Oxygen					
33	Dextrose	10% /500ml infusion				
34	Aminophyline	25 mg/ml				
35	Dextrose 5%	5% /500ml infusion				
36	Promethazine hydrochloride	25mg/ml				

Note:
(B1)= Sum of (B)
(E1) = Sum of (E)
(B2)=Percentage of adequate records=$\frac{(B1)}{\text{No of medicines}} \times 100$

(F)= Average No of Stock out days= (E1) ÷ (B1)

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ANNEX 7

وزارة الصحة الإتحادية
الإدارة العامة للصيدلة الإتحادية

Contributing factors to "stock out" of life- saving medicines, in governmental health facilities in the Sudan 2015.

Average Stock out Duration
Health centre

Code				Date ……
E				

Investigator Name:……

investigator signature……..

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No	Medicine		Records at least 6 month Yes=1 No=0 (B)	No of Days out stock (C)	No of Days covered (at least 6 month) (D)	Equivalent No of Days per year (E) (E)=(C)×365÷(D)
1	Benzyl penicillin	1million IU powder for injection				
2	Hyoscine n- butyl bromide	20mg/ml				
3	Lidocaine	2%,5% inj.				
4	O.R.S					
5	Normal saline	9%/500ml infusion				
6	Promethazine hydrochloride	25mg/ml inj.				

Note:

(B1)= Sum of (B)

(E1) = Sum of (E)

(B2)=Percentage of adequate records=$\frac{(B1)}{\text{No of medicines}}\times 100$

(F)= Average No of Stock out days= (E1) ÷ (B1)

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ANNEX 8

وزارة الصحة الإتحادية
الإدارة العامة للصيدلة الإتحادية

Contributing factors to "stock out" of life- saving medicines, in governmental health facilities in the Sudan 2015.

Facility Assessment check list

Code | | | | |	**Date …….**

Investigator Name:…….

investigator signature……..

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TICK ALL THAT IS APPLICABLE

A. Product selection	
Tick all that apply	
A.1	**Who/which department is responsible for life saving medicine selection?** pharmacy and therapeutic committee ☐ Hospital manager ☐ Pharmacy department ☐ Others ☐ Specify……
	Comments:
A.2	**Is any policy regarding life saving medicine selection is used as a reference?** YES ☐ No ☐ Don't know ☐ N/A ☐
	If yes How was it developed? Comment
	Comment on Adherence to policy contents
A.3	Is the selection based on Disease burden ☐ Essential medicines ☐ Standard treatment guidelines ☐ Others ☐ Specify……..
	Comment

B. Quantification	
B.1	**Who/which department is responsible for forecasting (including forecasting of buffer stocks)?** **pharmacy department** ☐ **Others** ☐ **Specify……**

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	Comments:
B.2	**Availability of quantification data** YES ☐ No ☐ Don't know ☐ N/A ☐
B.3	**How were forecasts developed for required quantities of life saving medicine selection?**
a)	**Consumption method** YES ☐ No ☐ Don't know ☐ N/A ☐
	If yes what type of consumption data By quantities ☐ by report and request ☐ others ☐ specify ……
	Comments:
b)	**Morbidity method, using population, case detection rate, and patient segmentation?** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
c)	**Other:** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
B.4	**How are forecasts validated?**
	Comments:
B.5	**Are adequate volumes of buffer stocks planned at relevant levels?** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
B.6	**How is forecasting data managed (e.g. use of Information Systems)**

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	Comments:
B.7	**Are forecast presented based on reliable data and methods?** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:

C. Finance	
C.1	Availability of financial resources
	Full coverage ☐ partial coverage ☐ No covarage ☐

D. Procurement systems	
D.1	**Who is/are responsible for procurement?** **pharmacy department** ☐ **Others** ☐ **Specify……**
	Comments:
D.2	**Reference Procurement manual or document** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
D.3	**Is competent procurement staff available** YES ☐ No ☐ Don't know ☐ N/A ☐
	if yes , is it adequately equipped? YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:

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D.4	**Is the actual procurement process efficient and transparent?** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
D.5	**What is the anticipated duration of the procurement cycle calculated in months from "product selection" until "arrival of goods"?**
	Comments:
D.6	**Does an adequate and functional supplier tracking system exist? (if not, indicate when such as system will be implemented)** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
D.7	**Ordering plan of medicines made according to** buffer stock ☐ Stock out ☐ Time limit ☐

E. Storage	
E.1	**Who/which department is responsible for receipt and storage of procurements?** **pharmacy department** ☐ **Others** ☐ **Specify……**
	Comments:
E.2	**Is the storage capacity adequate and appropriate for the expected products? If not, describe plans to which plans exist to improve and/or expand storage capacity.** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
E.3	**Is sufficient and adequately trained staff available to handle the supplies procured?** YES ☐ No ☐ Don't know ☐ N/A ☐

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	Comments:
E.4	**Is adequate storage equipment available at critical levels (e.g. pallet racks, trolleys, forklifts, refrigerators etc.) to handle products procured?** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
E.5	**Are storage conditions (e.g. temperature, humidity, cleanliness) appropriate?** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
E.6	**Which inventory control mechanism is used** bin cards ☐ ledgers ☐ computers ☐ Others ☐ Specify……
	is this system reliable? YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
E.7	**Is a physical inventory check of all products carried out at least annually?** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
E.8	**What is the average stock turnover time?**
	Comments:

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E.9	**Are adequate security measures in place to prevent theft of stored products?** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
E.10	**Is there a policy and practice of storing and issuing stock according to first expiry/first out inventory control procedures at all levels?** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
E.11	**Are there any systems in place to deal with expired products at either the nominated PR or sub-recipient sites?** YES ☐ No ☐ Don't know ☐ N/A ☐
	If yes are they incinarated in the facility ☐ returned back to the supplier ☐ Others Specify ……. ☐ Don't know ☐
	Comments:

F. CONSUMER	
F.1	**Who/which Responsible for prescribing medicines?**
	Comments:
F.2	**Prescribing according to** STG ☐ EML ☐ others ☐
F.3	**Availability of an active pharmacy and thraputic committee** YES ☐ No ☐ Don't know ☐ N/A ☐
F.4	**Dispensing pattern** only from a prescription ☐ only without a prescription ☐ with and without a prescription ☐

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ANNEX 9

وزارة الصحة الإتحادية
الإدارة العامة للصيدلة الإتحادية

Contributing factors to "stock out" of life- saving medicines, in governmental health facilities in the Sudan 2015.

Supplier Assessment check list

Code	Date ……

Investigator Name:……

investigator signature……..

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TICK ALL THAT IS APPLICABLE

A. Product selection	
A.1	**Who/which department is responsible for life saving medicine selection.**
	Comments:
A.2	**Is any policy regarding life saving medicine selection is used as a reference?** YES ☐ No ☐ Don't know ☐ N/A ☐
	If yes How was it developed? Comment
	Comment on Adherence to policy contents
A.3	**Is the selection based on** Disease burden ☐ Essential medicines ☐ Standard treatment guidelines ☐ Others ☐ Specify……..
	comment

B. Quantification	
B.1	**Who/which department is responsible for forecasting (including forecasting of buffer stocks)?**
	Comments:
B.2	**Availability of quantification data** YES ☐ No ☐ Don't know ☐ N/A ☐

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	Comment
B.3	**How were forecasts developed for required quantities of life saving medicine selection?**
a)	**Consumption method, using quantities of life saving medicine ? distributed and dispensed to patients?** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
b)	**Morbidity method, using population, case detection rate, and patient segmentation?** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
c)	**Other:** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
B.4	**How are forecasts validated?**
	Comments:
B.5	**Are adequate volumes of buffer stocks planned at relevant levels?** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
B.6	**How is forecasting data managed (e.g. use of Information Systems)**
	Comments:
B.7	**Are forecast presented based on reliable data and methods?** YES ☐ No ☐ Don't know ☐ N/A ☐

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	Comments:

C. Finance	
C.1	Availability of financial resources
	Full coverage ☐ partial coverage ☐

D. Distribution	
D.1	**Have detailed distribution arrangements been described and agreed upon? Please specify.**
	YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
D.2	**Is the distribution plan according to**
	facility order ☐ **Time limit** ☐ **Buffer stock** ☐ **Others** ☐
	Specify……
	Comment
D.3	**Is there a documented product distribution schedule for all levels of the system (e.g. monthly, quarterly etc.)?**
	YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
D.4	**Are resources available for product distribution, including number and storage capacity of vehicles as well as availability of petrol and drivers, sufficient for the supply levels in the system? Explain.**
	Comments:

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D.5	**Is transportation outsourced at any level of the supply chain management system?** YES ☐ No ☐ Don't know ☐ N/A ☐ **If yes, to whom is the responsibility outsourced and how effective has it been?**
	Comments:
D.6	**Describe the sources of significant delays to the distribution of the key selected medicines in the last 12 months (if any) and the actions taken/recommended to prevent such delays.**
	Comments:
D.7	**What material accounting systems and processes are in place to ensure that the exact amount and type of products dispatched from the central level reached the service sites?**
	Availability of accounting system YES ☐ No ☐ Don't know ☐ N/A ☐
	If yes what type of methods are used
	What are its components
D.8	**Does the shelf life of products appear to be well-managed throughout the supply chain?** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:

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ANNEX 10

وزارة الصحة الإتحادية
الإدارة العامة للصيدلة الإتحادية

Contributing factors to "stock out" of life- saving medicines, in governmental health facilities in the Sudan 2015.

Distributor Assessment check list

Code | | | | |	**Date …….**

Investigator Name:…….

investigator signature……..

Note: to be filled by distributers other than the conventional ones

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TICK ALL THAT IS APPLICABLE

A. Finance	
A.1	Availability of financial resources Full coverage ☐ partial coverage ☐

B. Distribution	
B.1	**Distribution responsibility** Supplier ☐ Owned by the facility ☐ Third party ☐
B.2	**Have detailed distribution arrangements been described and agreed upon? Please specify.** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
B.3	**Is there a documented product distribution schedule for all levels of the system (e.g. monthly, quarterly etc.)?** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:
B.4	**Are resources available for product distribution, including number and storage capacity of vehicles as well as availability of petrol and drivers, sufficient for the supply levels in the system? Explain.**
	Comments:
B.5	**Is transportation outsourced at any level of the supply chain management system?** YES ☐ No ☐ Don't know ☐ N/A ☐ **If yes, to whom is the responsibility outsourced and how effective has it been?**
	Comments:

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B.6	**Describe the sources of significant delays to the distribution of the key selected medicines in the last 12 months (if any) and the actions taken/recommended to prevent such delays.**
	Comments:
B.7	**What material accounting systems and processes are in place to ensure that the exact amount and type of products dispatched from the central level reached the service sites?**
	Availability of accounting system YES ☐ No ☐ Don't know ☐ N/A ☐
	If yes what type of methods are used
	What are its components
B.8	**Does the shelf life of products appear to be well-managed throughout the supply chain?** YES ☐ No ☐ Don't know ☐ N/A ☐
	Comments:

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