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Medicine Expenditure and Trends in National Health Insurance Funds Sudan

Mohamed Awad Mousnad[1], Subish Palaian[2], Asrul Akmal Shafie[3], Mohamed Izham Mohamed Ibrahim[4*]

[1]Department of Pharmacy Practice, Faculty of Pharmacy, International University of Africa, Khartoum, SUDAN.

[2]Department of Pharmacy Practice, Gulf Medical University, Ajman, UNITED ARAB EMIRATES.

[3]Social and Administrative Pharmacy Discipline, School of Pharmaceutical Sciences, Universiti Sains Malaysia- 11800, Penang, MALAYSIA.

[4]Social and Administrative Pharmacy, Clinical Pharmacy and Practice Section, College of Pharmacy, Qatar University, Doha, QATAR.

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***Correspondence to:**

Professor Mohamed Ibrahim MI, PhD,
Social and Administrative Pharmacy, Clinical Pharmacy and Practice Section, College of Pharmacy, Qatar University, Doha, QATAR.
Phone no: +974-55615789
Email: mohamedizham@qu.edu.qa

Abstract

Objectives: To assess the National Health Insurance Fund Sudan (NHIF-Sudan) medicine expenditure trends over the period between 2006 and 2010. **Methods:** The NHIF-Sudan medicine lists for 2006 and 2007 were classified according to the Anatomical Therapeutic Chemical (ATC) system. Tools for analysing aggregate medicine data were used. The medicine consumption in terms of cost was analysed using therapeutic category analysis. **Results:** Total medicine expenditure was SDG 232.03 million which approximates to USD 86.90 million. The overall medicine expenditure increased by 391.95 %. The medicine classes that accounted for the highest expenditure were: first level (anatomical main group) - general anti-infectives for systemic use (40.37%); alimentary tract and metabolism (14.11%); cardiovascular system (9.79%); and anti-parasitic products, insecticides and repellents (8.62%). These classes were responsible for approximately two-thirds of the medicine expenditure (72.89%). ATC main groups that account for the highest contribution to the increase in total medicine expenditure: first level (anatomical main group) - general anti-infectives for systemic use (48.59%); alimentary tract and metabolism (16.16%); blood and blood-forming organs (8.77%); and cardiovascular system (7.74%). These four classes were responsible for most of the total increase in medicine expenditures (81.26%). **Conclusion:** The results clearly show that medicine expenditure has significantly increased and confirmed that policy-makers in NHIF-Sudan are in need of better understanding of medicine expenditure and related issues.

Key words: ATC system, Medicine expenditure, Sudan National Health Insurance Fund, Therapeutic category analysis, Anti-bacterials for systemic use.

INTRODUCTION

Pharmaceuticals (medicines and non- medicines) were determined as one of the fastest-used health-care components representing a one of the single largest component of health expenditure, accounting for more than 15.2% of the total health expenditure in the world in 2000.[1] The trend of per capita spending on pharmaceuticals as reported has increased approximately 50% over the period 1995–2006. Unfortunately, the largest increases were in poor countries, which have a greater total medicine expenditure than high-income countries.[1] Pharmaceuticals have been one of the growing components of the total health expenditure in Sudan. The total pharmaceutical expenditure in Sudan in 2010 was SDG 2,833 million (US$1,349 million). The total pharmaceutical expenditure per capita was SDG72.3 (US$34.45). The pharmaceutical expenditure accounts for 2.2% of the GDP and makes up 36% of the total health expenditure.[2] There has been a growing trend of medicine expenditure in the NHIF-Sudan. Through the group purchasing system, the expenditure grew from SDG22.83 million in 2006 to SDG77.59 million in 2010, yielding an average annual growth rate of 35.78%.[3]

Pharmaceutical services and procurement policies

Prior to 2001, medicines were purchased directly from suppliers by each state separately (decentralization strategy). A limited bidding system has been implemented to purchase medicines for all states (centralization strategy) by the Directorate of Pharmaceutical Services headquarters, which was established in 2001 for this issue. In 2004, the limited tender system was adopted and it contributed to reducing the medicines' cost to 30%. In 2005, restricted tenders for purchasing medicines were implemented. This system was able to produce a medicine cost discount range between 35 and 38% for the period from 2005 and 2009.[4] Although effective health care applies decentralized systems, some aspects are often handled more effectively at the central level.[5] Centralized procurement of medicine increases the quantity obtained under each purchase contract (bulk) and usually reduces the medicines' price. Therefore, the NHIF-Sudan adopted a centralized procurement system for purchasing medicines. Medicine can be classified in different ways according to their mode of action, indication and chemical structure. Many classification systems differ and each one has its advantages and limitations. The usefulness will depend on the aim, the location used and the user's knowledge of the methodology.[6]

Drug classification systems use for organizing the formularies, preparing drug lists and use as tool for drug statistics and utilization research. Examples of these classifications are Anatomical Therapeutic (AT) classification and Anatomical Therapeutic Chemical (ATC) classification.[7] The AHFS

Classification System is more commonly used in North America; it is a pharmacological/therapeutic classification system. The AHFS code is a 6-digit number, which includes three levels of information arranged in a step-up / step-down manner. For example, all AHFS codes starting with 20 represent a broad class of drugs for Blood Formation and Coagulation. Additional information is provided for sub-categories of this class as digits are added.[8] AT classification was developed by the European Pharmaceutical Medicine Market Research Association (EphMRA) and the Medicine Business Intelligence and Research Group (PBIRG). Medicines in this system are classified into groups at three or four different levels. This system is used worldwide by International Medical Statistics (IMS) for providing the medicine industry with market research statistics.[9] Since 1982, WHO Collaborating Centre for Drug Statistics Methodology in Oslo, Norway has maintained the ATC classification system. The system provides a global standard for classifying medical substances and is a tool for medicine utilization research. This classification system is widely used in Europe, Australia, Canada, Japan and Malaysia, as recommended by the World Health Organization (WHO).

Although, medicine expenditures in NHIF-Sudan is on increasing and the number of medicines included in list also increased, there is absence of proper medicine statistics and thus leading to an inaccurate information on pattern of medicine use. There is also an absence of international medicine classification for conducting medicine utilization research in the country. Medicine statistics data available in the NHIF-Sudan are mainly based on financial figures and not generally available for all interested parties needed in medicine sector in Sudan.

The purpose of this study was to assess the NHIF-Sudan medicine expenditure trends over the period between 2006 and 2010.

The specific objectives were:

1. To describe and compare the medicines expenditure in NHIF-Sudan from 2006 to 2010.
2. To explore and compare the therapeutic groups that account for the highest expenditure.
3. To explore and compare the therapeutic groups that account for the highest contribution to the increase in total medicine expenditure.

MATERIALS AND METHODS

Aggregate data on medicine consumption were obtained from NHIF-Sudan for the period between 2006 and 2010. The internationally recognized ATC classification system was selected and used in this study. Most researchers and organizations, such as those in the WHO Collaborating Centre for Medicine Statistics Methodology (Oslo), MSH, USA, Nordic countries, Australia, Canada and Malaysia, use the ATC system.[9-15] In this system, drugs are classified into groups at five different levels. The first level indicates the anatomical main group. The second level indicates the therapeutic main group. The third and fourth levels are chemical/therapeutic/pharmacological subgroups. The fifth level indicates the chemical substance.[16] The NHIF-Sudan medicine lists for 2006 and 2007 classified according to the ATC system.

Therapeutic category analysis reviews the volume of use and the value of the various therapeutic groups and subgroups of drugs. In this technique, all medicines consumed on a quarterly basis (aggregate data) were listed by volume and value of consumption. Each medicine was classified by the ATC classification system. The list was then rearranged into therapeutic categories and the percentage value of items in each category summed, in order to identify the categories accounting for the greatest expenditure. In this study, the analysis was executed at the two levels of the ATC system: first level (anatomical main group) and second level (therapeutic subgroups). The medicine classes that accounted for the highest expenditure were determined and percentage contributions to total medicine expenditure by ATC main groups calculated. The top second-level therapeutic subgroup was calculated by determining the change in the expenditure for each group between 2006 and 2010 and then dividing this change by the differences of the total expenditures of the two years (percentage of total change). Average Annual Growth Rate (AAGR) for ATC main groups and top second-level therapeutic subgroup was calculated. [15-18]

Data management and statistical analysis

Aggregate spending data of medicines obtained from the NHIF-Sudan database were checked to ensure completeness. Data were analysed with the Microsoft Excel, SPSS for Windows (Statistical Package for Social Science) version 18.

RESULTS

Medicine expenditure trend in NHIF between 2006 and 2010

Figure 1 displays medicine expenditure trends in NHIF-Sudan from 2006 to 2010. Total medicine expenditure was SDG 232.03 million that approximates to USD 86.90 million. The overall medicine expenditure increased by 391.95% (from SDG 4.47 million in the first quarter of 2006 to SDG 21.99 million in the first quarter of 2010).

Breakdown of medicine expenditure by main therapeutic class

Table 1 shows the annual medicine expenditure by main therapeutic class in NHIF-Sudan for the years 2006 to 2010. The medicine classes that accounted for the highest expenditure were medicines related to general anti-infectives for systemic use (40.37%), followed by medicines related to the alimentary tract and metabolism (14.11%), medicines related to the cardiovascular system (9.79%) and anti-parasitic products, insecticides and repellents (8.62%). These classes were responsible for approximately two-thirds of the medicine expenditure (72.89%).

Table 2 shows medicine expenditure changes and percentage contribution of the ATC main groups between 2006 and 2010. Among the top four groups, medicines related to general anti-infectives for systemic use made the largest contribution to increases in the total medicine expenditures (48.59%),

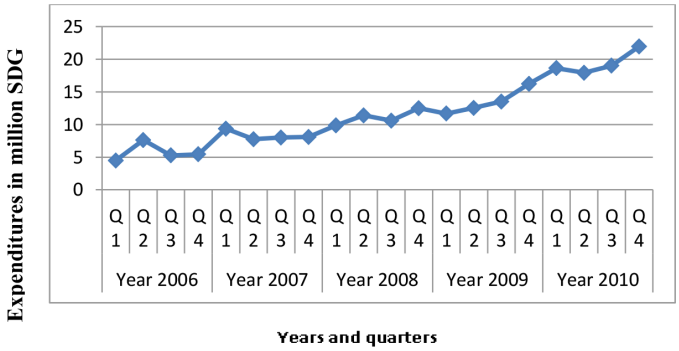

Figure 1 : Quarterly medicine expenditure trends in NHIF-Sudan, 2006 to 2010.

Table 1: NHIF medicine expenditure by ATC main group, based on retail prices SDG -2006-2010							
S. No	ATC/main group	Expenditure in million SDG					
		2006	2007	2008	2009	2010	2006-2010
1	Alimentary tract and metabolism	2.35	4.74	5.80	8.65	11.2	32.74
2	Blood and blood-forming organs	0.26	1.64	1.81	3.02	5.06	11.79
3	Cardiovascular system	2.78	3.78	4.33	4.8	7.02	22.71
4	Dermatologicals	0.07	0.71	1.33	0.93	1.03	4.06
5	Genito-urinary system and sex hormones	0.46	0.65	2.38	1.59	1.99	7.07
6	Systemic hormonal preparations, excluding sex hormones	0.83	0.25	0.34	0.40	0.58	2.40
7	General anti-infectives for systemic use	6.89	12.89	18.09	22.31	33.5	93.66
8	Antineoplastic and immuno-modulating agents	0.00	0.01	0.04	0.05	0.02	0.11
9	Musculo-skeletal system	0.91	2.06	2.10	3.06	5.14	13.26
10	Nervous system	1.69	1.37	1.38	1.76	2.15	8.36
11	Anti-parasitic products, insecticides and repellents	5.32	2.72	3.94	3.58	4.44	20.00
12	Respiratory system	0.45	1.58	1.83	2.33	3.34	9.53
13	Sensory organs	0.82	0.72	0.90	1.37	1.82	5.64
14	Various items	0.00	0.10	0.10	0.14	0.30	0.64
Total		**22.83**	**33.22**	**44.39**	**54.01**	**77.59**	**232.03**

*Medicines sorted in ascending order 2006-2010

Table: 2. Percentage contribution of ATC main groups to total medicine expenditure in NHIF-Sudan, 2006-2010								
S. No	ATC/main group	2006	2010			2006-2010		
		Expenditure in million SDG	% of total	Expenditure in million SDG	% of total	Expenditure change	% of total expenditure change	Average annual growth rate
1	Alimentary tract and metabolism	2.35	10.29	11.20	14.43	8.85	16.16	47.75
2	Blood and blood-forming organs	0.26	1.14	5.06	6.52	4.80	8.77	110.04
3	Cardiovascular system	2.78	12.18	7.02	9.05	4.24	7.74	26.06
4	Dermatologicals	0.07	0.31	1.03	1.33	0.96	1.75	95.86
5	Genito-urinary system and sex hormones	0.46	2.01	1.99	2.56	1.53	2.79	44.22
6	Systemic hormonal preparations, excluding sex hormones	0.83	3.64	0.58	0.75	-0.25	-0.46	-8.57
7	General anti-infectives for systemic use	6.89	30.18	33.50	43.18	26.61	48.59	48.49
8	Antineoplastic and immuno-modulating agents	0.00	0.00	0.02	0.03	0.02	0.04	0.00
9	Musculo-skeletal system	0.91	3.99	5.14	6.62	4.23	7.72	54.16
10	Nervous system	1.69	7.40	2.15	2.77	0.46	0.84	6.20
11	Anti-parasitic products, insecticides and repellents	5.32	23.30	4.44	5.72	-0.88	-1.61	-4.42
12	Respiratory system	0.45	1.97	3.34	4.30	2.89	5.28	65.06
13	Sensory organs	0.82	3.59	1.82	2.35	1.00	1.83	22.06
14	Various	0.00	0.00	0.30	0.39	0.30	0.55	0.00
Total	**Various items**	**22.8**	**100.00**	**77.59**	**100.00**	**54.76**	**100.00**	

* The percentage may not equal 100 due to rounding.

followed by medicines related to the alimentary tract and metabolism (16.16%), medicines related to the blood and blood-forming organs (8.77%) and those related to the cardiovascular system (7.74%). These four classes were responsible for most of the total increase in medicine expenditures (81.26%). In terms of average annual growth rate for the study period 2006 to 2010, medicines for blood and blood-forming organs had the highest average (110.04%), whereas systemic hormonal preparations, excluding sex hormones, had the lowest average (-8.57%) .

Medicine expenditure for the second-level therapeutic subgroup

Table 3 displays the expenditure of the top twenty therapeutic classes of the second-level therapeutic class, which were approximately 31% of the total number of therapeutic classes (at the second level), accounting for 85.57% of total medicine expenditure from 2006 to 2010. The medicine classes that accounted for the highest expenditure among NHIF-Sudan in 2006 and 2010 were anti-bacterials for systemic use (39.31%), followed by anti-protozoals

Table 3: Medicine expenditure of 20 top classes in second-level therapeutic subgroup, based on retail prices (RP) SDG -2006-2010.

			Expenditure in million SDG					
NO.	ATC code	Description	2006	2007	2008	2009	2010	*2006-2010
1	J01	Antibacterials for systemic use	6.35	12.59	17.75	21.56	32.96	91.21
2	P01	Antiprotozoals	4.80	2.66	3.80	3.45	4.34	19.05
3	A10	Medicines used in diabetes	0.49	1.70	2.38	3.48	4.28	12.33
4	M01	Anti-inflammatory and antirheumatic products	0.90	1.54	1.55	2.48	4.14	10.61
5	A02	Medicines for acid-related disorders	0.01	1.25	1.24	1.78	2.08	6.36
6	C08	Calcium channel blockers	0.14	1.29	1.32	1.27	1.96	5.98
7	B03	Antianaemic preparations	0.01	0.65	1.31	1.47	2.47	5.91
8	A11	Vitamins	0.01	0.57	0.80	1.78	2.67	5.83
9	S01	Ophthalmologicals	0.76	0.65	0.84	1.28	1.75	5.28
10	C09	Agents acting on the renin-angiotensin system	0.27	0.88	0.94	1.50	1.58	5.17
11	R05	Cough and cold preparations	0.12	0.70	0.80	1.23	1.65	4.50
12	A03	Medicines for functional gastrointestinal disorders	0.89	0.66	0.69	0.81	1.00	4.05
13	H02	Corticosteroids for systemic use	0.80	0.18	0.23	0.24	0.34	1.79
14	B05	Blood substitutes and perfusion solutions	0.01	0.53	0.39	1.36	2.00	4.29
15	C07	Beta blocking agents	0.76	0.53	0.50	0.49	0.66	2.94
16	C01	Cardiac therapy	0.73	0.12	0.28	0.16	0.43	1.72
17	N06	Antihistamines for systemic use	0.72	0.21	0.22	0.25	0.21	1.61
18	C02	Antihypertensives	0.59	0.47	0.41	0.45	0.62	2.54
19	G04	Urologicals	0.01	0.27	1.81	0.73	1.17	3.99
20	N03	Antiepileptics	0.29	0.39	0.36	0.56	0.73	2.33
Total			**18.66**	**27.84**	**37.62**	**46.33**	**67.04**	**197.47**

*Medicines sorted in ascending order 2006-2010.

(8.21%), medicines used in diabetes (5.31%) and anti-inflammatory and anti-rheumatic products (4.75%).

Table 4 shows the medicine expenditure changes and percentage contribution of the second-level therapeutic subgroup between 2006 and 2010. The top twenty therapeutic classes experienced an average annual expenditure growth rate of 37.68% between 2006 and 2010. Among the top three leading ATC level 2 therapeutic classes anti-bacterials for systemic use made the largest contribution to expenditure growth (48.59%), followed by drugs used in diabetes (6.92%), followed by anti-inflammatory and anti-rheumatic products (5.92%). In terms of average annual growth rate vitamins had the highest average (304.23%) and psychoanaleptics had the lowest (- 26.51%).

DISCUSSION

Medicine expenditures increased dramatically in NHIF between 2006 and 2010 growing at an average annual rate of 35.78 per cent. This growth was greater than the rate of Gross Domestic Product (GDP) which was 8.3% in 2010.[19] These rates are faster than the average rate of inflation measured by Consumer Price Index (CPI) in 2010 (13.08%).[20] This growth may be owed to increases in patient demand resulting from the population's expanded insurance coverage and increases in medical services provision. Medicine expenditures showed a weak positive correlation with population coverage per quarter and with the number of patients per quarter. In 2007, the NHIF formulary was expanded to include generic and innovative medicines. Spending was driven by higher utilization of existing and newer medicines.

Medicine expenditure by therapeutic class analysis indicates that only four out of 14 classes (main level) were responsible for approximately two-thirds of total medicine expenditure between 2006 and 2010. These classes include general anti-infectives for systemic use (J), medicines for the alimentary tract and metabolism (A) and for the cardiovascular system (C) and anti-parasitic products, insecticides and repellents (P). Three of them (J, A and C) and medicines for blood and blood-forming organs (B) were responsible for the total expenditure increase whereas anti-parasitic products, insecticides and repellents (P) showed a significant fall between 2006 and 2010. That fall was the result of international subsidy programmes through global funding which provided free medicines to certain diseases such as malaria, sexually transmitted diseases, tuberculosis, HIV/AIDS and vaccines for children (Expanded Programme of Immunization). Measures for children under the age of five and reproductive health were supported by United Nations Population Fund (UNFPA).[19]

Medicines for blood and blood-forming organs show significant increases in the same period and are one of the classes that contribute most too total expenditure increases, being the fastest growing drug class (an average annual growth rate of 110.04 %). The fastest declining drug class, in terms of drug expenditure, was systemic hormonal preparations, excluding sex hormones (H) (decreased by an average annual growth rate of 8.57%). There was a significant drop in spending on (H) between 2006 and 2010, probably in response to new restrictions imposed on the NHIF-Sudan formulary in 2007.[21]

Medicine expenditure by the second-level therapeutic subgroup indicates that the top 20 therapeutic classes constituted approximately 31% of the total number of therapeutic classes and accounted for 85.57% of total medicine expenditure between 2006 and 2010. The top four medicine

Table: 4 Percentage contribution of top 20 classes in second-level therapeutic subgroup classes to total medicine expenditure in NHIF-Sudan, 2006-2010.

No.	Second-level therapeutic subgroup	2006		2010		2006-2010		
		Expenditure in million SDG	% of total	Expenditure in million SDG	% of total	Expenditure change in million SDG	% of total expenditure change	Average annual growth rate
1	Antibacterials for systemic use	6.35	34.03	32.96	49.16	26.61	48.59	50.94
2	Antiprotozoals	4.80	25.72	4.34	6.47	-0.46	-0.84	-2.49
3	Drugs used in diabetes	0.49	2.63	4.28	6.38	3.79	6.92	71.91
4	Anti-inflammatory and antirheumatic products	0.90	4.82	4.14	6.18	3.24	5.92	46.45
5	Drugs for acid-related disorders	0.01	0.05	2.08	3.10	2.07	3.78	279.77
6	Calcium channel blockers	0.14	0.75	1.96	2.92	1.82	3.32	93.43
7	Antianaemic preparations	0.01	0.05	2.47	3.68	2.46	4.49	296.44
8	Vitamins	0.01	0.05	2.67	3.98	2.66	4.86	304.23
9	Ophthalmologicals	0.76	4.07	1.75	2.61	0.99	1.81	23.18
10	Agents acting on the renin-angiotensin system	0.27	1.45	1.58	2.36	1.31	2.39	55.53
11	Cough and cold preparations	0.12	0.64	1.65	2.46	1.53	2.79	92.56
12	Drugs for functional gastrointestinal disorders	0.89	4.77	1.00	1.49	0.11	0.20	2.96
13	Corticosteroids for systemic use	0.80	4.29	0.34	0.51	-0.46	-0.84	-19.26
14	Blood substitutes and perfusion solutions	0.01	0.05	2.00	2.98	1.99	3.63	276.06
15	Beta blocking agents	0.76	4.07	0.66	0.98	-0.10	-0.18	-3.47
16	Cardiac therapy	0.73	3.91	0.43	0.64	-0.30	-0.55	-12.39
17	Psychoanaleptics	0.72	3.86	0.21	0.31	-0.51	-0.93	-26.51
18	Antihypertensives	0.59	3.16	0.62	0.92	0.03	0.05	1.25
19	Urologicals	0.01	0.05	1.17	1.75	1.16	2.12	228.89
20	Antiepileptics	0.29	1.55	0.73	1.09	0.44	0.80	25.96
Sub-total	**Second-level top 20**	**18.66**	**82.22**	**67.04**	**86.41**	**48.38**	**88.35**	**37.68**
Grand total	**Total medicines**	**22.83**	**100.00**	**77.59**	**100.00**	**54.76**	**100.00**	**35.78***

* The percentage may not equal 100 owing to rounding.

classes that accounted for the highest expenditure were anti-bacterials for systemic use (J01), anti-protozoals (P01), drugs used in diabetes (A10) and anti-inflammatory and anti-rheumatic products (M01). Three of them (J01, M01 and A10) were largely responsible for the total expenditure increases whereas anti-protozoals (P01) showed a significant fall between 2006 and 2010. The fastest growing drug class was vitamins (A11), which had the highest average (304.23 %) and the fastest declining drug class, in terms of drug expenditure, was psychoanaleptics (N06) (- 26.51%). It was found that the above results show almost similar to the morbidity patterns in the country.[2]

Better understanding of pharmaceutical expenditures and to highlight areas for potential policy intervention were the main significance behind this research. There are numerous health reform initiatives in the literatures that suggest ways for cost containment stategies.

The pharmaceutical market affected by both demand and supply sites. Demand side affected at four different levels includes physicians, pharmacists, patients and payment mechanism. Supply side which generally related to patent and regulatory issues.[22]

Recent systematic review of published literature, 2000–2010 on policies to promote use of generic medicines in low and middle income countries (LMICs). This review found that there were lack of such policies in LMICs. Key barriers as identified by the review; are negative perceptions of health providers and consumers (e.g., generics are of lower quality) in addition to the perceptions of private sector towards highest profit margin.[23] Three principal steps were suggested by the above review for successful pro-generic medicine policies in LMICs include strong medicines regulatory system, a competitive market for medicines, education and training of prescribers, dispensers and consumers to support the introduction and use of generic medicines.[23]

In NHIF-Sudan several polices were conducted inorder to control medicine costs in the supply side, a positive medicines list was available in NHIF-Sudan since 1996. Inter-brand-competition policy, was introduces in NHIF-Sudan since 2002. It was successfully reduced medicines prices to about 40% of the tender fund if the bases was the wholeseler prices.[24]

CONCLUSION

Medicine expenditure data are useful in healthcare planning and budgeting and for assessing the efficiency of services provision. This study provided analysis of health insurance scheme in Sudan. The primary goal was to produce valid and standard statistics on medicine expenditure between 2006 and 2010. Findings expected to contribute towards a better understanding of medicine expenditure in NHIF-Sudan. From the comprehensive analysis, medicine expenditure has significantly increased NHIF-Sudan between 2006 and 2010. It was observed that general anti-infectives for systemic use (first

level classes-anatomical main) and anti-bacterials for systemic use (second level-therapeutic use) were accounted for the highest spending and highest contributions to the increase in total medicine expenditure between 2006 and 2010. Further studies needed to investigate medicine utilization trends in NHIF-Sudan. To manage medicines costs effectively, principles for good pharmaceutical procurement practices are highly recommended.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

ABBREVIATIONS

None.

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