QUALITATIVE ASSESSMENT OF ANTIBIOTICS: SELF-MEDICATION,DISPENSING AND PRESCRIBING BEHAVIOUR IN KASSALA STATE OF SUDAN

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การประเมินเชิงคุณภาพของพฤติกรรมการใช้ยาด้วยตนเอง การจ่ายยา
และการสั่งยาปฏิชีวนะในรัฐคาซาลาของประเทศซูดาน

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ฟารัก เนอร์ เอลดาอิม โอเมอร์ : การประเมินเชิงคุณภาพของพฤติกรรมการใช้ยาด้วยตนเอง การจ่ายยา และการสั่งยาปฏิชีวนะในรัฐคาซาลาของประเทศซูดาน (QUALITATIVE ASSESSMENT OF ANTIBIOTICS: SELF-MEDICATION,DISPENSING AND PRESCRIBING BEHAVIOUR IN KASSALA STATE OF SUDAN) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: ชันทาล แฮร์เบอร์โฮลส์ดร., 115 หน้า.

ที่มา: เนื่องจากความชุกของการใช้ยาปฏิชีวนะที่มากเกินความจำเป็นในประเทศซูดาน รัฐคาซาลาจึงต้องการศึกษาเกี่ยวกับการตัดสินใจในการสั่งยาของแพทย์ รูปแบบการจ่ายยาของเภสัชกร และการใช้ยาปฏิชีวนะด้วยตนเองของผู้ป่วยในกองทุนประกันสุขภาพแห่งชาติในประเทศซูดาน

วัตถุประสงค์ : งานวิจัยนี้จัดทำขึ้นเพื่อศึกษาความคิดเห็นของผู้ให้บริการทางการแพทย์และความรู้ของผู้ป่วย รวมถึงทัศนคติที่มีผลต่อพฤติกรรมการสั่งยาและการใช้ยาปฏิชีวนะในรัฐคาซาลา

วัสดุและวิธีการ : การศึกษานี้ได้มีการประเมินเชิงคุณภาพโดยการสัมภาษณ์ในรัฐคาซา ข้อมูลได้รวบรวมมาจากผู้ที่ทำงานในกองทุนประกันสุขภาพแห่งชาติ รัฐคาซาลา จำนวน 18 ราย โดยแบ่งเป็น แพทย์เฉพาะทาง 5 ราย แพทย์เวชปฏิบัติทั่วไป 6 ราย เภสัชกร 2 ราย ผู้ช่วยแพทย์ 2 ราย และผู้ป่วย 3 ราย ลา ข้อมูลที่ได้ถูกนำมาวิเคราะห์โดยการวิเคราะห์แก่นสาระและเนื้อหาโดยโปรแกรม Nvivo 10

ผลการศึกษา: พบว่าการสั่งยาปฏิชีวนะของแพทย์และเภสัชกรส่วนมากเป็นผลจากปัจจัยภายใน เช่น จำนวนปีที่ปฏิบัติงาน ทัศนคติ เช่น ความมั่นใจ ความเกรงกลัว และความรับผิดชอบ และปัจจัยภายนอก เช่น ปัจจัยที่เกี่ยวข้องกับผู้ป่วย ระบบให้บริการด้านสุขภาพ และบริษัทยา สำหรับการใช้ยาปฏิชีวนะด้วยตนเองเกิดจากการมีความรู้ที่ไม่ถูกต้องและมีพฤติกรรมที่ไม่เหมาะสมของการใช้ยา

บทสรุป : กลวิธีสำคัญที่จำเป็นต้องนำมาใช้แก้ปัญหาการใช้ยาปฏิชีวนะมากเกินความจำเป็นในรัฐคาซาลา ได้แก่ การให้ความรู้ มีกฎข้อบังคับ และมีแนวทางปฏิบัติสำหรับผู้ให้บริการทางการแพทย์ รวมถึงการมีโปรแกรมให้ความรู้เกี่ยวกับการใช้ยาปฏิชีวนะสำหรับประชาชนทั่วไปในรัฐคาซาลา

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Back ground: The prevalent over use of antibiotics In Sudan and the eastern Kassala state requires further study of physicians' decision-making process, pharmacists' antibiotics dispensing pattern as well as patients' antibiotic self-medication pattern in National Health Insurance Fund in Sudan.

Objective: This study therefore seeks to explore and investigate health care professionals and patients' knowledge and attitudes that influence their behavior of prescribing and using antibiotics in Kassala State.

Materials and methods: Semi-structured interviews were conducted in Kassala State. The data were collected from 18 participants, who from three localities i.e. (5 specialists, 6 general practitioners, 2 pharmacists, 2 medical assistants and 3 patients). The qualitative thematic analysis was done used Nvivo 10.

Results: The findings reveal that; most antibiotic prescribers and pharmacists are influenced by intrinsic factors such as practice years, attitudes (i.e. confidence, fear, and responsibility) and extrinsic factors such as; patients related factors, health system factors and pharmaceutical companies. Self-medicated patients appear to have incorrect knowledge about and inappropriate behaviour towards antibiotic use.

Conclusion: Interventions to overcome the challenge of antibiotic overuse in kassala state are recommended. These include education, regulation, implementation of Standard Treatment Guidelines (for health professionals) and programs to promote greater education about antibiotics usage in the general population of Kassala State.

Field of Study:	Health Economics and Health Care Management	Student's Signature ....
		Advisor's Signature ....
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List of abbreviation

CME	Continuing Medical Educations
CMS	Central Medicine Supply
CT -SCAN	Computed Tomography -Scan
EML	Essential Medicines List
ENT	Ear Nose Throat
EPI	Expanded Program of Immunization
FMOH	Federal Ministry of Health
GAVI	Global Alliance for Vaccines and Immunization
GDP	Gross Domestic Product
INRUD	International Network of Rational Drug Use.
LTCF	long-term care facilities
MRI	Magnetic Resonance Imaging
NHIF	National Health Insurance Fund
NMPB	National Medicines and Poisons Board
RDF	Revolving Drug Fund
SDG	Sudanese Genaih
SNHA	Sudan National Health Account.
STGs	Standard Treatment Guidelines
TPE	Total Pharmaceutical Expenditure.
URTI	Upper Respiratory Tract Infections
UTI	urinary tract infection
WHO	World Health Organization.

CHAPTER I

1.1. Introduction

In medical field inappropriate, ineffectiveness and economically inefficient use of medicines is commonly tackled throughout the world in health care demanding, especially in developing countries.in Sudan there were many problems tackled related to behavior in using medicines, especially antibiotic use.

1.2. Irrational use of medicine and antibiotics

In 1985, WHO organized a conference in Nairobi, Kenya, discussed the rational use of medicines since that time efforts had increased to improve and rationalize medicine-use practices in developing countries, the essential tool for such work is an objective and standard methods to describe drug-use patterns and prescribing behaviour in health facilities (Laing, 1990).That conference in Kenya developed the road map for improving the rational use of drugs and defined it as: "patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community" (WHO, 1987) .

Moreover, the WHO and INRUD have developed a standard methodology to investigate medicines use problems, implementing and evaluating interventions to promote the rational use of drugs (WHO, 1993). WHO mentioned many indicators to investigate drug use in health care system, one of these indicators prescribing pattern of antibiotic.

Holloway in 2005, said; little being spent on the promotion of rational use of medicines. The global prescription drugs sales in 2000 were \$282.5 billion and medicine promotion costs were \$15.7 billion in US in same year. In 2002-03, global WHO expenditure was \$2.3 billion, of which the WHO expenditure on promoting rational medicine use was only 0.2% (Petersen, 2009).

Many studies had been conducted to document medicines use patterns, and benchmarking over prescriptions, poly pharmacy, inappropriate use of medicines, use of unnecessary expensive medicines and overuse of antibiotics and injections were the most common problems of irrational medicine use by prescribers as well as consumers.

Improving medicine and antibiotic use would have valuable financial and public health benefits. Hogerzeil and others mentioned that effective and specific strategic intervention in medicine use , need more researches especially in sociocultural factors manipulating influence of medicine use interventions, particularly from a user point of view, and developing countries should technically supported in this area, because design of available studies is generally weak (le Grand, Hogerzeil, & Haaijer-Ruskamp, 1999 (le Grand, Hogerzeil, & Haaijer-Ruskamp, 1999)

But in Sudan medicine prescribed, dispensed and used irrationally, as example study done conducted by Ahmed and Awad in 2010, the assessed medicine use practice in four teaching hospitals, the study sample using systematic random sampling, they picked 150 encounters, determined consultation time and dispensing time for 150 out patients, and interviewed 150 of out patients evaluated the dispensing practices and parents' knowledge. From each hospital, they used the WHO drug use indicators methodology, they found that; the number of medicines per encounter was 2 within WHO benchmark range, generic name was 49.3% , WHO standard was 100% , prescriptions containing antibiotics was 81.3% , prescriptions contain injections was 3.5 % .The mean of consultation and dispensing times were 4.7 minutes and 28.2 seconds , respectively. The percentage of medicines dispensed was 80.1%, 55.7% of medicines were adequately labeled, and 83.5% of parents knew the right dosage of all medicines dispensed for their children. The percentage of availability of key drugs was 81.3%. The essential medicines list was not available at the 4 hospitals (A. M. Ahmed & Awad, 2010).

Another study carried by Shargali and others in (2009), they studied the availability , quality of medicines and drug prescribing pattern in public and private sector in six Sudanese states using WHO drug use investigation method , they found good availability of medicine with acceptable quality , but there were bad storage system in public and private sector. And medicine availability according to essential medicine list EML was 82 %, but the dispensed medicines was 85% and storage condition level was 56-65% , in other hand the number of medicines per encounter were ; 2.3 , antibiotics was 66% and injectable was 27% . The doctors slickness to diarrheas STGs was 64% and the patients who know how to use this medicines were 50% (Cheraghali, 2009).

Berih and others in (1989) studded the dispensing practice (by pharmacist) in 63 pharmacies inside Khartoum state in case of visited pharmacy by mother to treat her child from acute diarrhea, the study revealed that, the 5% dispensed oral rehydration salts ORS, 6% dispensed ORS and antibiotics, 67% dispensed antibiotics, and 12% cases recommended to see the doctor. (Berih, 1989)

We conclude that ineffectiveness and economic inefficient use of medicines (prescribing, dispensing and use) is observed throughout the world in health care systems, especially in developing countries and Sudan one of these developing countries used medicine irrationally.

1.2. Antibiotic use standard

There are wide debate on medicine regarded as antibiotic or antimicrobial , but the "WHO" classified these medicines as follow to considered as antimicrobial for prescribing indicators ; penicillin , antiinfective dermatological, antiinfective ophthalmological agents ,antidiarrheal drugs with streptomycin neomycin ,nitrofuroxazide or combination ,and other anti-bacterial (WHO, 1993).

Percentage of prescribed prescriptions contains an antibiotics : there is no standard, but less than 30% is accepted in parallel studies shown worldwide (Mustafa, (2013).

1.3. Rationale of the study

This study will conducted to flash the light on the knowledge, attitude and behaviour of prescribers, pharmacists , and the patients as mile stones of medicine uses , hence many studies conducted in Sudan by many researchers revealed there were irrational and inappropriate use of medicines specially anti biotic use(A.I.Awad, (2007),(A. M. Ahmed & Awad, 2010) and (Mustafa, (2013). For example a review done by, Awad and others of published studies conducted in Sudan from 1991 to 2004 found that the percentage of encounters of antibiotics prescribed were 48% to 63% in primary health centres , and 41% to 43% in teaching hospitals(A.I.Awad, (2007). Also there was study done in 2010 by Ahmed and Awad conducted in the outpatient settings in four pediatrics hospitals in Khartoum, showed the irrational use of antibiotics, as 81.3% of prescriptions involved an antibiotic , and self-medication of antibiotic was 48.1% (A. M. Ahmed & Awad, 2010) . But there are NO studies, at least published in Sudan

conducted on what is behind the attitudes and behaviour of prescribers, dispensers, and patients towards antibiotic use.

In national health insurance there are problem of antibiotic uses in all states, as it represent 31% of the annual NHIF medicine supply budget around 152,671,000 SDG = 25,445,166 $(NHIF, 2014). While the annual report of the state showed the cost of the antibiotic represented 36.63% of the Kassala state medicines supply budgets around 13,174,266 SDG = 2,195,711 $ (Kassala, 2014). And study held by Mustafa showed the percentage of antibiotic prescription in NHIF in Sudan were highest in three states ; in north Darfur 71%, West Kordofan 67% , and Kassala state was 66%, 95%CI [61%, 70%](Mustafa, (2013).

But we select kassala due to the high expenses on antibiotic consumption ,although the price of antibiotics in Sudan is low because most of antibiotics manufactured locally , the other reason is we seeking to select higher prescribing pattern in NHIF in Sudan because the antibiotics and medicines in NHIF issued only by prescriptions , so we choose kassala rather than other two highest prescribing pattern states (North Darfur and West Kordofan)because of security issues due to civil wars in these two states , time constraints and cost issues.

In Sudan there were many efforts and scattered activities to improve the use of medicine especially antibiotic use (A.I.Awad, (2007) , NHIF seeking to improve these efforts through multidisciplinary body.

In this context , the contribution of this study to support these efforts through conduction of this study in high prescribing antibiotic pattern state as case, to understand the knowledge, attitude and behaviour of those providers and antibiotic users, to come up with their views on antibiotic prescribing behavior and formulate intervention recommendations based on their knowledge and attitudes, and Awad conducted systematic review study to revise and determine the improvement of drug in Sudan in 1991 to 2004 they stated ;that more investigation of drug use needed, and mixed academic research body most inserted in multidisciplinary body , so this study will be one of first academic document to this body(A.I.Awad, (2007) .

1.4 Problem and Its significance

In NHIF there were many studies conducted ,at the level of head quarter and states , showed irrational prescribing pattern of antibiotics represented by (61% to 78%) of prescriptions(Mustafa, (2013). Even in annual individually states reports which assembled at the level of HQ showed that antibiotic cost was one of the five highest cost category and the percentage of antibiotic prescriptions was (58 % to 71%) in NHIF.(NHIF, 2002-2011)

Mustafa, conducted study in NHIF (in 2012 published , had evaluating medicine use indicators , the core was antibiotic prescriptions pattern , study revealed that kassala one of the highest with (66% ,95%CI) (Mustafa, (2013).

The existence of a problem has been well demonstrated by quantitative methods, but qualitative studies are much needed to shed light on the root causes of antimicrobial misuse, and to identify interventions needed.

The study will be intended primarily to bridge the gap of knowledge about the reasons behind excessive prescribing and use of antibiotics in Health Insurance in" kassala state.

1.5. Research question

To understand the knowledge and attitudes behind health care professionals' behaviour towards prescribing and dispensing antibiotics and patients' antibiotic self- medication?

1.6. Research objectives

1.6.1. General objective

To investigate and illustrate health care professionals and patient knowledge and attitudes that influence their behaviour of prescribing and use of antibiotics.

1.6.2. Specific objectives

1- To understand the doctors' (general practitioners, specialists and medical assistants) knowledge, attitudes and behaviour of prescribing antibiotics in NHIF Kassala state.

2- To understand the pharmacists' knowledge and attitudes of dispensing antibiotics in Kassala state.

3- To understand patients' knowledge, attitude and behaviour about their, perceived health, satisfaction antibiotic, and self-medications.

1.7. The scope

The study investigated the antibiotic use practice among:-three groups of prescribers. First, (6) general practitioners (GPs), (5) specialists, and (2) medical assistants, who work with NHIF in Kassala state. Second, two pharmacist, who work with NHIF in Kassala state. Third, (3) patients in self-antibiotic medication, who are covered by tha NHIF insurance system and had self-medications during last three months.

The interview were conducted In executive directorate of NHIF in Kassala state during 20-30 of May 2015 in outpatient facilities, i.e. hospitals and health centers and clinics in case of contracted specialist whose provide health care for insured patients in their clinics.

Kassala state comprises of 11 localities in eastern part of Sudan, but in this study doesn't not screen all localities due time constraint, and other factors. As example, the specialist and pharmacist found in three localities; kassala , Halfa Algadeeda, and Khashm algiraba(Kassala, 2014) . most of infrastructure concentrated in this three localities(Kassala, 2014). And also if we consider the frequency of patient attendant, almost in these three localities were "kassala 55%, halfa algadeeda 15.2%, and algiraba 9%" with total attendant 79.2% of the total patient attendant in kassala state (kassala, 2014).

To above mentioned reasons the study was conducted in these three localities

But the study considers the distribution of service according to urban, rural area, and nomads. And care provision direct or indirect facilities in these localities.

CHAPTER II

Background

2.1 Country background

Sudan one of the biggest country in Africa before separation of the south part, but now is located in area of 188200 km2 in northern part of Africa region, neighbored by Ethiopia and Eritrea on the east, and Egypt and Libya on the north, chad and central African republic on the west, and Kenya, south Sudan, Uganda and democratic republic of Congo on the south. The total population about 37.96 million(Bank, 2013)of more than 500 ethnics(A. AHMED, 2006) which are distributed in eighteen states composed of 192 localities represented by 62% rural areas, 30%urban area ,and 8 % nomads, with growth rate of 2.4% 2011-2015. The education in primary-secondary gross enrolment ratio (female/male per 100) 2006-2012 was 55.3/61.7, and education in female, third-level students % of total in 2006-2012 was 47.2%(United Nations, 2013)

2.2. Health care system in Sudan

The health care provisions in Sudan as one of the developing countries the, challenging facing the government because the incremental demand to health with scarcity of resources and low public spending on health. Hence the public health expenditure was 8.7 % of total government expenditure, while out of pocket spending was contributing up to 64.3% of the total health expenditure (SNHA, 2008).

The health system in Sudan suffers from fragmentation of financing and health services production institutions, the absence of co-ordination and unified system raises up the administration cost and inefficiency as well as equity in distribution of health care outlets among communities. The health services are more concentrated in urban areas with fewer portions in rural areas, which are more in need for the services. This disparities and inequitable accessibility bear poor more financial burden, for instance, transportation and absenteeism. The financial barriers prevents poor to access the services and result in worsen health indicators and social and economic complications.

The Sudan health system had three level of administration system. Begin from the federal level which responsible of policy making, planning, supervision, coordination, international relations and partnership. The state government's level responsible for planning, policy making and implementation at state level and localities are mostly responsible for policy implementation and service delivery. Many responsibilities still remain shared between the different levels for example early preparedness and response to disasters and epidemics, monitoring and supervision of tertiary level (specialized centers).

Accountability, is not clear and governance role not structured well yet. This this theme emerged due to weak information system and the inability of the line ministries to return performance or provide additional support to states. Staff Performance appraisal was done through the annual confidential report, which forms the criteria for promotion, but is mostly written on routine basis without assessment objectives of the individual performance. The public health-care system is rely mainly on primary health care provision, with village primary health care units and dispensaries referring to urban rural hospitals and health centers, in other hand tertiary level care provided in sub or more specialized hospitals. In 1990s statements Health services provision was free, but health facilities now providing services on a fee-for-service basis resulting in the majority of the population not being able to access and afford primary health services(A.I.Awad, (2007).

Availability of functional infrastructure varies between 100 % in Khartoum to only 20 % in peripheral states(SNHA, 2008). And likewise the other infrastructure, like health technology management system, and investigating tools.

2.2.1. Health care function in Sudan
Expenditure on health care system wise indicates almost 60% spent on remedial service, out of which 35%, 25% spent on inpatient care and outpatient care respectively, moreover 4% on preventive care and primary care , 6% on health administration , and 5% on other related health functions. But pharmaceutical care had a big share of utilized services , hence it represent 23% (SNHA, 2008).

2.2.2 Financing healthcare in Sudan
The financing of health system almost out of pocket spending on health services represent 60%, the remaining percentage 30% came from government, non-

governmental organizations, and other health insurance schemes public and private. Moreover, the Expanded Programme of Immunization EPI which provides vaccines for Children are supported by the Global Alliance for Vaccines and Immunization GAVI (WHO, 2010).

The total pharmaceutical spending TPE in Sudan in 2010 was SDG 2,833 million US$ 1,349 million, which accounts for 2.2% of the GDP and 36 % of the total health spending (Mustafa, (2013).

2.2.3 The Provider's payment mechanism

The provider's payment mechanism one of the important issue in achieving the goal of health Services care provision like efficiency, equity and sustainability, and it has direct impact on health professionals and patients satisfaction. World health organization "suggest that the goal of the providers payment system should improve efficiency, quality, ensure accessibility, offer patient physician choice and easy to implement (WHO, 1996).

The payment mechanism depend on health care policy of the premises and it is level of health care provision for example primary level, secondary level and tertiary level. There are many types of payment mechanism; fee for services, capitation and budgeting the objective of health care provision has important role in selection of payment mechanism.

In Sudan almost payment mechanisms, In terms of provider payment the current situation in Sudan can appear somewhat confusing this resulted of confusing terminology. Basically a direct financing system but with a lot of overlapping channels to providers from various public bodies and programs Federal Ministry of Health , National Health Insurance Fund and Governmental organization with little coordination in (public) funding streaming. And absent of managerial aspects between financing body and payers of health services bodies.in NHIF to some extent the relations between the health care providers and NHIF system to some extent is clear, because NHIF had many contracting polices, through which pay for providers for example; fee for services, flat rate, per head and salary, but fee for service is core of providers payment mechanism, especially indirect health services, and evaluation of these mechanisms not done in scientific way , but indirectly through revision of indirect health services center claims, in feedback there is always high cost of prescription and

laboratory investigations rather than NHIF direct centers claims , so in real world it has direct impact on supply induce demand.

One of interesting papers that measured the impact of payment mechanism on prescribing pattern , paper done in Thailand by John Bryant and Aree Prohmmo in (2004) examined the effect of payment mechanisms on prescription patterns in four district hospitals in provincial Thailand. On public insured out patients over sixty either those patients, went to hospital which contracted with insurance schemes based on fee-for services fund or capitation. The study aimed to describe financial and non-financial influence on the doctors prescribing decisions and to test the differences in the cost of prescriptions, between fee-for services patients and capitation. The data collected from treatment records during 2000 to 2001, surveys in 13 rural and urban communities served by the four hospitals, collecting data on a total of 733 residents aged 60 or over, and 25 in-depth interviews ,16 from community and 9 were with staff from the hospitals or the Ministry of Public Health.

The study found that encounters costs for fee for service patients were higher than those for capitated patients, controlled for age, sex, diagnosis and (to some extent) socioeconomic status .The cost difference due to probability of received expensive medicines, rather than difference in quantity prescribed (John Bryant, 2005).

2.3. Distribution of health care work force

The health workforce density and distribution in Sudan as follows:

Licensed pharmacists were 1.53/10,000, pharmacists in the public sector were 0.39/10,000 , pharmaceutical tech and assistants (all sectors) were 0.64/10,000 , physicians all sectors were 2.8/10,000 and nursing and midwifery personnel all sectors were 8.4/10,000 (Mustafa, (2013).

In other hand the number of health care provision institutes in Sudan mainly consists of 866 hospitals, 1568 health centers.

Sudan had one bed per 1000 population. The hospitals distribution were not based on equity and efficiency. For example, the FMOH manage 29 hospitals in Khartoum, 58hospitals in Gezira and only 6 in west Darfur. On the other hand specialized hospitals mainly located in Khartoum city. (SNHA, 2008).

2.4. Pharmaceutical services management

The pharmaceutical services in Sudan regulated through NMBP as regulatory authority was created in 1996. And planed, monitored through general directorate of pharmacy which affiliated to Federal Ministry of Health FMOH in coordination with directorate of pharmacies in other states. Central Medicine Supply CMS, a body affiliated to the FMOH, plays the major role in medicine supply for public sector in Sudan. CMS with it is legends states RDF, Revolving Drug Fund Khartoum RDF and private sectors are the main suppliers of the medicine in Sudan. Local manufacture produce 24% of medicines in Sudan, the locally manufactured medicines are mainly generic medicines; include oral and topical dosage forms. However, the current share of local medicine industry in production of essential medicines was 5% (Abdol Majid Cheraghali, 2009).

2.4.1. Medicines and pharmaceutical regulations in Sudan

As stated in country constitution 2005, there were many levels of regulations (all the states have decentralized regulations, included localities), and federal level (central level). But in case of pharmaceutical services it controlled and regulated through medicine and poisons enactment for year 2009, which forced through NMPB the National Medicines and Poisons Board, the official medicines regulatory body in Sudan which had sets of legal provisions that regulate: for example medicines prices controlled at manufacturers, wholesalers and retailers levels. Advertising of medicines which is prohibited to the public, while the regulations of medicines promotions are not enforced. Licensing of manufacturers, wholesalers, distributors and pharmacies must be run under supervision of registered pharmacist.

The Sudan Medical Council and National Medicines Poisons Board developed prescribing and dispensing rules and guidelines, but not enforced. On the other hand National Standard Treatment Guidelines STGs for the most common disease have not been produced by the Federal Ministry of Health, while the National Essential Medicines List EML exists but it is not publicly available and was lastly updated in 2007 and now update is under processing. There are legal provisions and rules to govern and licensing prescribing practices that restrict dispensing by prescribers, which is only allowed where there are no dispensers in peripheral areas. But the prescribing and dispensing practice in Sudan is differ, hence most prescribers specialists, GPs and medical assistants dispense medicines including antibiotics through drug seller in

peripheral areas mainly and sometimes in urban Ares. On the other hand most pharmacists dispense and prescribe antibiotics in their pharmacies, but the 2009 medicine and poisons law prohibit this practice but it is not enforced out, due to conflict between federal level and state level, but this law and medical council law determined the prescribing responsibility for specialists, GPs and medical assistants as prescribers clearly and the role pharmacists as dispensers.

2.5. National Health Insurance Fund Profile

National Health Insurance Scheme in Sudan was first implemented in 1995 and now the population coverage is 34.8 % 12,6millions out of the total population (NHIF, 2014). It is a social insurance scheme in which the unit of coverage is the family, and the insured people pay their premiums according to their ability and receive services according to their needs.

2.5.1. Benefits package

It includes all general Doctors' and Specialists' medical care, inpatient & outpatient services including emergency & accidents, surgical operations, dental care, Laboratory & Radiography including CT-scan and MRI, Maternal and Child care. For the medicines, the insured patient pays 25% of the cost co-insurance of the medicines within the NHIF Medicines list, which is updated every two years. For the medicines that are not available at pharmacies that provide services for NHIF insured patients, the NHIF reimburses 75% of the cost of the medicines to the patients the patient normally pays 25% of the medicines cost, however this only for medicines included in the NHIF Medicines list. NHIF provides medical services through 1599 health centers and hospitals as shown in table 1. , 316 which represent 19.8% of the total facilities of them are owned and run by the NHIF and provide services to both insured and non-insured patients and the rest of facilities provide the services through reimbursement system (NHIF, 2014). According to the NHIF law, 80% of the budget should be allocated for medical services and the remaining 20% for administrative cost, rehabilitation and development.

Table 1 NHIF health care provision facilities in Sudan

No	State name	Hospitals #		Health centers #		The total
		Direct provision	Indirect	Direct	Indirect	
1	Khartoum	0	44	0	307	351
2	Sennar	0	23	32	37	92
3	Al-Gaziera	0	77	9	248	334
4	Al-gadarif	0	28	18	70	116
5	Red sea	0	15	5	24	44
6	River nile	0	34	23	51	109
7	White nile	3	23	28	12	67
8	North Darfur	1	12	29	3	48
9	Blue nile	1	15	23	6	45
10	West Darfur	0	13	9	0	22
11	Noth kordofan	6	18	40	10	74
12	North state	0	29	12	37	78
13	kassala	0	15	20	18	53
14	South kordofan	2	12	7	8	29
15	South Darfur	0	19	23	31	73
16	West Kordofan	1	8	20	7	36
17	Midle Darfur	0	3	11	0	14
18	Eeast Darfur	0	11	11	2	14
	The total	**14**	**394**	**302**	**889**	**1599**

2.5.2. Health and pharmaceutical services in NHIF

The total frequency of patients in 2014 were 13.157.000 of which 10,471,868 patients visited general practitioners 79.6% and 544,079 visited medical assistants 4.13%, and 13.3% out of the total attendance cases were referred to specialists inside the state while the referral rate outside the state of patient's residence is 5 in 1000 cases.in other hand , the poor families had the highest attendance 5,096,208 followed by Public Sector 4,863,577, the self-employees 1,053,975, the pensioners 1,395,744 and the private sector 217,716.(NHIF, 2014)

The pharmaceutical expenditure represented 36% of the total health services expenditure in NHIF, and the antimicrobial medicines had 31% higher rather than other pharmacological groups. However, this due to the high consumption of antibacterial, although the prices of these medicines are considerably low due to the local manufacturing of most of them.(Mustafa, (2013)

2.5.3 NHIF medicine list and reimbursement system

The NHIF medicines list includes 591 items of medicine distributed on 19 disease categories almost covered all disease pattern in Sudan, it was updated in 2013, in term of strength of listed medicines and according to prescribing levels, the list categorized into four classes:

Class A; included primary health centers medicines prescribed by general medical doctors, class B; in to addition class A, the medicines used or prescribed in rural hospitals included, class C; Medicines used in hospitals with specialist departments in addition to A &B medicines and class D: Medicines used in specialized centers or specialized units in hospitals (in addition to A, B& C (NHIF, 2013).

The patients must have specific stamped colored prescription indicate the level of prescribers for example green color prescription No 100 means general practitioner prescriber, red colour No 101 mean specialist and consultant prescriptions accordingly the medicine dispensed in specific pharmacy health center pharmacy if the medicine is not available referred to NHIF central pharmacy if not available referred to private contracted pharmacy. For the medicines that are not available at pharmacies that provide services for NHIF insured patients, the NHIF reimburses 75% of the cost of the medicines to the patients the patient normally pays 25% of the medicines cost, however this only for medicines included in the NHIF Medicines list. The free medicines for

Malaria are prescribed in a special prescription sheet and dispensed free of charge for the insured patients but the prescribing should comply with the guidelines of the National Malaria Program (NHIF, 2013).

2.6. Kassala state profile

Kassala state is on of states that represent the eastern region of Sudan and it has international borders with Eretria country, with an area of 42,282 km2, and total population of 1,710, 000. The number of persons in family size is 6.2\ family. Compose of 48.4% women of the population of the State, 35% of the state population were reported extremely poor.(Routrayb, 2014)

The state consist of 11 localities, the state annual growth 2.5%, the rural population represent 53%, urban 35%, and pastoral was 12 % .(Faki & Herberholz, 2014)

2.6.1 Health care system in Kassala state

There were wide variations in infrastructure in health system, in urban which quite different from rural area , hence it generally almost dominant and well equipped in three localities Kassala, New Halfa and Algirba.(Faki & Herberholz, 2014)

The main health indicators, show there are many problems threats people and should be tackled and ranked, prioritize to more effective and valuable intervention as shown in table 2

Table 2 Health indicators in Kassala state

Indicator	measurement
Infant mortality rate per 1000	56
Under 5 year mortality rate per 1000	81
Maternal mortality	1.4 %
Birth under medical supervision	64.5 %
Birth under medical supervision in public hospital.	13.3 %
Diarrhoea among children under 5	16.5 %
Global acute malnutrition	29.3 %
Illiteracy rate age +15	56 %

Source: manipulated from Wael Ahmed 2014

The governance of health system in kassala state conducted by the state ministry of health in coordination with FMOH as source of laws , legislations ,orders and practice organization outlines, as example STGs and protocols.

The medicine supply system in kassala state mainly achieved by RDF, NHIF as public providers and private sector which represent the majority of the logistic.

2.6.2. Kassala Executive Directorate

Kassal state one of 17 states that managed and directed by NHIF head quarter as source of policy, plan, monitoring and evaluating of states performance. kassala executive directorate was established in 1997 at that time , it affiliated to the state ministry of health , but now under supervision of ministry of community, cultural,   youth, and sports affairs in kassala state ,same as NHIF head quarter under supervision of federal ministry of welfare and social security.

The health services provision in NHIF Kassala state based on the policy of three trends firstly, direct health care provision in this case the facilities management operations run by executive directorate and sometime owned by NHIF , secondly through contracting purchasing of health services, to the health insurance subscribers, mainly the health services bought from ministry of health and private sector, Finally partnership through contracting system between NHIF and other public sectors , ministry of health as example.

Generally, NHIF drive accessibility to health care upon three levels of care, the first one is primary health care which represent the entrance to insured people to get services, second level is consultant and specialist level in which the insured peoples get the health care services either at NHIF facilities or hospitals private clinics, and the third level the specialized hospital level at which insured peoples can get tertiary level of services.

The total numbers of health facilities that provide health care services for insured peoples in kassala state are 53 outlets comprise of 15 hospitals and 38 health centers. While 20 facilities of which provide health services through direct system, in the other hand 18 facilities provide health care through indirect and partnership or contracting policy table 3 show the distribution of health care services in NHIF kassala state(Kassala, 2014). This services provided through 88 general practitioners, 47 specialist, and 37 medical assistant as prescribers, 8 pharmacist, 22 assistant

pharmacist1 and 26 drug sellers2, as dispensers, but assistance pharmacist and drug sellers work by the law under direct pharmacist supervision (kassala, 2014).

The GPs and medical assistants are the first point in health care provision , after that the patients referred to more specialized services , so the health care provision referral system in NHIF as follows ; medical assistant refer to GP, to specialist, and to consultant at tertiary level .

Table 3 Distribution of health care provision facilities by localities.

No	Locality	Hospital	Health center/clinic
1	Kassala Town	3	20
2	Kassala Rural East	0	2
3	Kassala Rural West	0	1
4	New Halfa	4	3
5	Nahr Atbara	1	2
6	Algirba rural	1	3
7	Wad Alhelaw	1	2
8	Aroma Rural	1	1
9	Shamal Aldelta	1	2
10	Hamieshkoreib	1	1
11	Telkuk	2	1
	The total	**15**	**38**

Source: Kassala annual report 2014

2.6.3. Pharmaceutical supply system in NHIF in Kassala state:

The medicine supply system in NHIF is mixed system, central and decentralized system executed quarterly every three months, hence annual states need assessment pooled in NHIF head quarter , which executed by unified governmental supply system, in CMS include other public partners. The items which not supplied by CMS the state purchase it directly from their local supply system companies and drug agencies.

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1 Assistant pharmacist as people who complete three studying years in academic pharmaceutical institutions.

2 Drug seller defined as peoples that complete short courses in pharmaceutical studies, but sometimes they had no pharmaceutical studies.
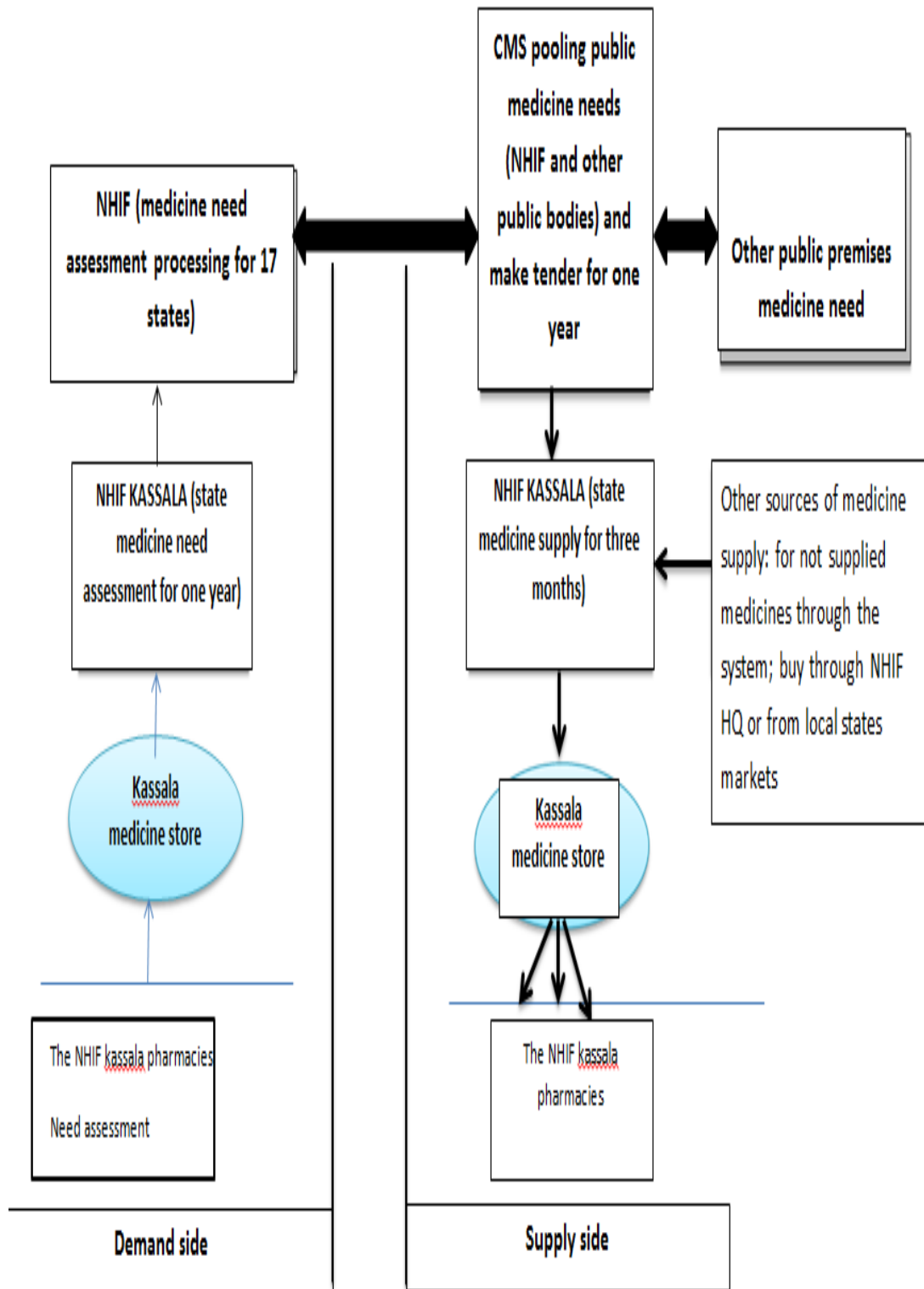
Figure 1 : Demand and supply system of medicines in Kassala state

CHAPTER III

Literature review

Discuss the published literature on the area of antibiotic use prescribing, dispensing, and patient self-medication to identify relations and contradictions in the literature and determine the existing knowledge and relationship of the antibiotic use pattern variables and behavior globally.

Moreover, this exploring aims to tackle the gaps of the knowledge in antibiotic use, prescribing behavior and attitudes at Health Insurance settings in Kassala state.

3.1 Knowledge

Is defined as "An awareness of the existence of something, for example, procedural knowledge" (Fleming, Bradley, Cullinan, & Byrne, 2014).The knowledge of the target groups of the study meant the, awareness of health care professionals of existence of guidelines, consequences of antibiotics prescribing and dispensing and the progress of antibiotics resistance, in addition to the knowledge lead the self-medicated patient to seek for OTC antibiotics and it usage consequences.

3.2 Attitude

Defined as "a predisposition or a tendency to respond positively or negatively towards a certain idea, object, person, or situation"(dictionary, 2015). Measure the different types of attitude of targets group towards antibiotic prescribing, dispensing and usage that predispose the health care professionals to prescribe and dispense antibiotics and patients seeking for self-medication.

3.3 Behaviour concept in terms of practice

Behaviour; is define as the total of human activity in society, and on the individual level and practices are combinations of routines and/or habits towards the achievement of objective. "Human behaviour is composed of cognitive, physical and social actions, which constitute activities"(Wilson, 2009). And here the study tackling the behaviour of target groups behind their knowledge and attitudes towards antibiotic use.

Globally there are prioritizing for the in appropriate medicine use, focus on antibiotics use problem, because of it is serious consequences and impacts on health status as in case of antibiotic resistant, or serious adverse reactions and side effects, or economic impact hence over use of antibiotics cost a lot of money, especially in developing countries where there are scarce and limited resources. Moreover inappropriate consequences of medicine treatment lead to erosion of the patient confidence on the health system and specific facility, which may lead to inaccessibility.

Medicines play a crucial role in improving the health outcome of population. So improve access to quality medicines is not enough to get benefit from medicines, but also the appropriate use which has become a global concern.

The practice of antibiotic use globally is shown there is an inappropriate and irrational use of antibiotic, hence the percentage of patients with an antibiotic prescribed was similar in all regions and it remained stable over time at between 40% and 50%.Over 70% of viral infections were treated with antibiotics in Africa, while adherence to clinical guidelines in treatment of acute respiratory tract infections was the highest in Latin America. Fig.2

Between 2000 and 2010, globally consumption of antibiotic medicines increased by 36%. For example Brazil, Russia, India, China, and South Africa accounted for 76% of this escalation. Generally antibiotic consumption varied significantly with season in most countries. Moreover there was increased in Carbapenems consumption by 45% and 13% in Polymixins (Van Boeckel et al., 2014).

(Source: WHO, 2009)
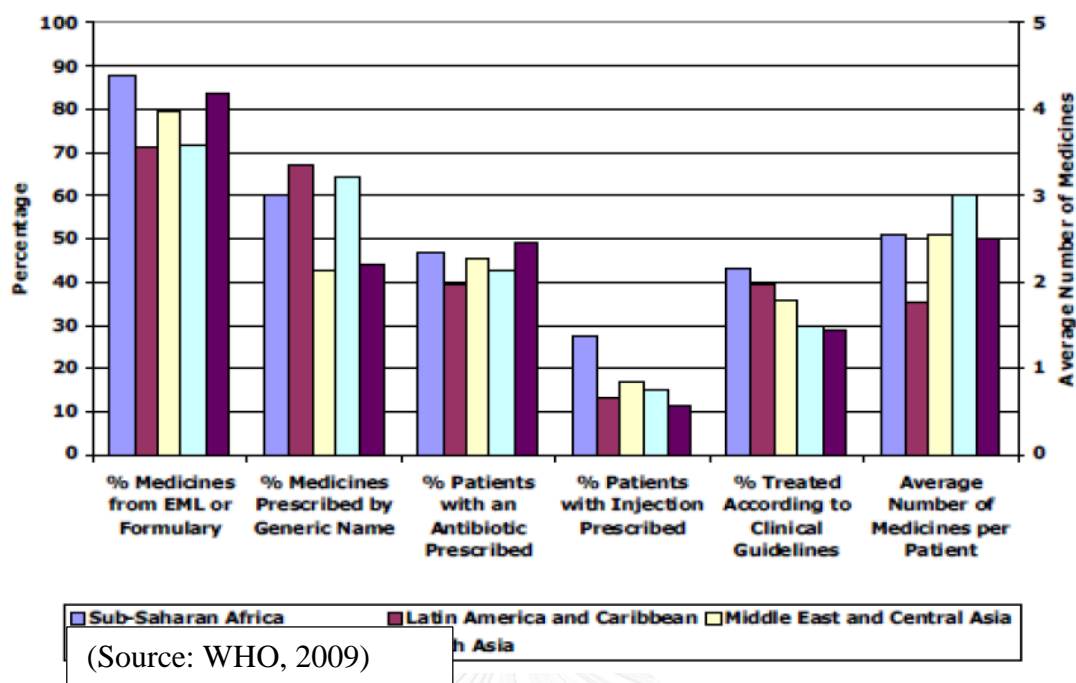
Figure 2: Prescribing indicators around the world by regions.

3.4 Irrational use of medicine and antibiotics

In transitional and developed countries

The inappropriate use of medicines is not only widespread; but it is costly and extremely harmful both to the individual at micro level and the population at macro level as a whole.

Drug adverse reactions rank among the top ten causes of death in the USA and estimated cost to the country between US$ 30 and US$ 130 billion every year.

In Europe, some countries are consuming three times the quantity of antibiotics per head of populace in compared with other countries which had similar disease pattern.

Over 90% of all antibiotics (Moro, 2009)are prescribed at the primary care level in Europe, and are mostly prescribed for respiratory tract infections in children. The main causes of antibiotics prescribing are Upper Respiratory Tract Infections URTI acute tonsillitis, bronchitis and otitis media,(Holstiege, 2013), however these are mostly viral self-limiting conditions and no antibiotic treatment is needed(Arroll, 2005).A longitudinal study conducted in 25 European countries between 1997 and 2003, showed that, the volume of outpatient antibiotic use increased with high seasonal variation ,increase of 30% in the first and fourth quarters compared with the second and third quarters, and Penicillins were the most prescribed outpatient antibiotics , while the use of Cephalosporins,tetracyclines and Sulphonamides remained the same or decreased,

but quinolones increased. Same study revealed that Italy is one of three countries which have the highest prevalence of antibiotics expressed as defined daily dose per 1,000 inhabitants .The Italian child is took antibacterial medicines three times more than a Dutch child, and four times more than a British child. The overall prevalence in Italy at the national level is 50.5%, however there are differences in prevalence rates between Regions, which ranged from 42.6% in Lazio to 62.1% in Puglia, which are mainly due to the variation of diagnostic uncertainty, parents expectations of antibiotic prescriptions, the existing healthcare system and patient- or parent-related socio-cultural and economic determinants (Ferech et al., 2006)

Irrational use of medicine and antibiotic in developing countries

Many studies(Iruka N. Okeke, 1998) tackled several strategies have been proposed for fighting the inappropriate use of antibiotics by clinicians. Antibiotic prescription rates often reduced through, antibiotic monitoring systems, hospital formularies and antibiotic treatment protocols. Implementation of a national essential drug list can limit the antibiotics availability to prescribers. However, adoption of these strategies does not assurance optimum antibiotic use by clinicians in developing countries because of irregular drug supply, availability of drugs from unofficial sources, and financial limitations also affect antibiotic choices(Munishi, 1991) and(Laing, 1990).

Irrational use of medicine and antibiotic in Asia

There many studies conducted in Asia continent ensured there were variances in antibiotic use pattern, among countries. As example study conducted to assess the medicines use among outpatients in western Nepal, showed the percentage of prescriptions with antibiotics Was 26.4 % (Lamichhane, 2006). And in Cambodia showed , although the distribution of (STGs), essential medicines list and availability of medicines at health centres, but the percentage of medicines with antibiotics was 66%(Chareonkul, 2002).

Two studies conducted in China recently Dong and Jiang , produced different results, the first one was conducted in Western china revealed that the percentage of encounters with an antibiotic was 48.43%.and the second study was conducted in Sichuan Province found the percentage of antibiotics was 85.18%(Dong, Yan, & Wang, 2011; Jiang, 2012).

In Thailand anti-infective drugs (including antibiotics) are the top value for being imported and manufactured since 2000. In 2007, this drug group was accounted for approximately 20,000 million baht 625 m. US$ or 20% of all medicine values (Sumpradit et al., 2012).

Irrational use of medicine and antibiotic in Africa and Arabic countries
In early of 90s WHO presented a package of drug use indicators generated and tested in 12 developing countries. Described practical applications, which include the use of indicators to improve awareness among prescribers in Malawi and Bangladesh, to clarify priorities for intervention (e.g. poly pharmacy in Indonesia and Nigeria, injections overuse in Sudan, Uganda, and Nigeria, with low percentage of patients who knew the dosage regimen in Malawi), and to calculate the impact of interferences in Yemen, Uganda, Sudan, and Zimbabwe, one of these indicators was prescribing indicators which it measured according to the method stated in WHO indicators measuring manual , they found that antibiotic prescribing was high in Uganda and Sudan 56% and 63% and 29% in Zimbabwe Similarly, for the percentage of prescriptions contain antibiotic prescribed the median of 41 % in the 12 countries mirrors actual prescribing, not optimal values(Hogerzeil et al., 1993). table 3.

Almost the percentage of patients received antibiotic prescription were similar in all regions in Africa and it remained stable over the long time between 40% and 50%. Over 70% of viral infections were treated with antibiotics in Africa.(WHO, 2009).

A medicine use indicator study carried in Tanzania in children less than five years old revealed that, the percentage of encounters with an antibacterial prescribed was 30.5%(Nsimba, 2006).

Table 4 Result of antibiotic prescriptions screening in African (12)countries

NO	Country name	% Of Antibiotic prescribed
1	Yemen	46
2	Uganda	56
3	Sudan	63
4	Malawi	34
5	Zimbabwe	29
6	Tanzania	39
7	Nigeria	48

Source: Adapted from Hogerziel, 1993

Other many studies conducted in Arabic countries showed varies practice of prescribing pattern; with high percentage of prescriptions contain antibiotics as in Yemen 66.2 % and Jordan 61 % and low in United Arab Emirates 31.1% and Saudi Arabia 32.2% as shown in table 4. Another study was done in different wards of the Zawiya teaching hospital, Libya, over a 15-month period. Found that the ward with the highest number of prescribed antibiotics (35%) was surgery, while the ward with the lowest number 9% was ENT and the frequency of prescriptions of antibiotic was 65% for surgery in 2008 and 58% for medicine in 2009 (Prakash Katakam, 2012).

Table 5 Arab countries: comparison of antibiotic prescribing indicators in previous studies.

No	Country	The Year of the study	% of encounters with an antibacterial prescribed
1	Kuwait	2010	39.1
2	Saudi Arabia	2010	32.2
3	Bahrain	2010	45.8
4	United Arab Emirates	2010	31.1
5	Jordan	2001	61
6	Yemen	2010	66.2
7	Egypt	2009	58% of cases received antibiotics were not appropriate.

Source: Adapted from Mustafa, 2013

Irrational use of medicine and antibiotic use practice in Sudan

Studies conducted in Sudan revealed there were over use of antibiotic in prescribing, dispensing, and self-medication, recent cross sectional descriptive study carried out at Khartoum state in primary health care centers, tackled the prescribing pattern in 27

health centers, analyzed 810 prescriptions found that, the prescriptions containing antibiotic were high 71.8 %(ELSALAHI, MUDAWI, & AHMED, Aug 2014).Also study in 2010 by A.M and Awad conducted in the outpatient settings in four pediatrics hospitals in Khartoum, showed the irrational use of antibiotics, as 81.3% of prescriptions involved an antibiotic(A. M. Ahmed & Awad, 2010).

Awad and Idris in 2005 studied Khartoum community in self-medication of antibiotics and anti-malarial medicines, through questionnaire to 1750 adult persons, they found self-medication with antibiotics/antimalarial was associated with age, gender, income and level of education. And they conclude that; the prevalence of self-medication with antibiotics/antimalarial in Khartoum State, is alarmingly high, hence 73.9% of the study population had used antibiotics or anti-malarial without a prescription within one month before to the study. And 68.8% of the participants who had self-medicated gained the drugs directly from private pharmacies. They found that self-medication behaviour varies with a number of socioeconomic characteristics.(A. Awad, Eltayeb, Matowe, & Thalib, 2005).

A review done by, Awad and others of published studies conducted in Sudan from 1991 to 2004 found that the percentage of encounters of antibiotics prescribed were 63% to 73% in primary health centers, and 59% to 65% in teaching hospitals, table 5. , while inappropriate prescriptions of antibiotic for adult was 58% , children 77% , and giadrdiasis\amoebiasis was 82 % (A.I.Awad, (2007).

Table 6 Antibiotic prescribing indicators comparison in Sudan states

Parameter	Nile province	Khartoum state	Khartoum state	Khartoum state	Developing countries
Date of survey	1991	1996	1998	2004	1990-1994
Type of facility	Primary health centre(37)	Primary health centre(Mol PG & 2004)	Hospital (12) ;health centre(75)	Teaching hospital (Mol PG & 2004)	Primary health centre(12)
Encounters per facility	30	30	>100	100	varied
Antibiotic prescribed (%)	63	73	59	65	43

Source: Adapted from A.I.Awad etal 2009

Community drug-use habits among peoples in various regions in Sudan were studied in 469 household units by (Yousif, 2002). He found, about 97.7% of the investigated families had at least one medicine kept at home. And a high rate of self-medication was 46.9%, repeated use of unfinished stored drugs was 55.0%, also there was a high rate of drug exchange among families 59.3% with poor compliance 71.2%.

In Sudan there is still a great need to more investigation of prescribers and dispensers attitudes and behavior regarding the use of antibiotics , and take their views in consideration to formulate effective intervention to rectify the use of medicine generally and antibiotics in particular , because the study conducted by (A.I.Awad, (2007) stated that;

In past ten years the drug use indicators were worsened, despite the implementation of managerial, regulatory and training interventions strategies.

We conclude that most of the investigation studies focus on the antibiotic quantitative indicators and patients' attitudes rather than qualitative investigation nor searching behind health providers' attitudes and behavior.

Irrational use of antibiotic in Sudan at (NHIF)

Study done in 2012 by (Mustafa, (2013) in NHIF Sudan designed according to the WHO investigating drug use indicators manual ,conducted in 5 representative states 2,401 prescriptions was drawn from the total patients' encounters 420,000 of the selected 20 Health centers in 2012. The study revealed the use of antibacterial medicines was so high 64% on average in NHIF, and it is similar to the results from previous study in Sudan, which was on average 61%. The prescribers in River Nile State prescribed antibacterial less often (52%, 95%CI) than those in the other states, while the use of antibacterial in North Darfur was the highest with (71%95%CI). On average Sinnar, Kassala and West Kordufan showed similar results with (65%,95%CI), (66%,95%CI), and (67%, 95%CI)respectively. The study results showed the high extent of irrational prescribing particularly in high percentage of antibacterial prescribed(Mustafa, (2013). And also there were many unpublished studies carried out in NHIF Sudan in executive directorates at different states tackled the drug use indicators, revealed there were over use of antibiotics regarding prescribing pattern.

3.4.1 Rational medicine use indicators

The rational use of medicines characterized by; appropriate indication, appropriate medicine, appropriate patient, appropriate information and appropriate monitoring. Moreover the WHO and INRUD have developed three types of drug use indicators, these are :(WHO, 1993)

The prescribing indicators

These including; average number of medicines per encounter, percentage of medicines prescribed by generic name, percentage of encounters with antibacterial prescribed, percentage of encounters with an injection prescribed, percentage of medicines prescribed from EML and Complementary indicators which include average cost of medicines per encounter.

Patients care indicators

Those indicators includes; average consultation time, average dispensing time, percentage of medicines actually dispensed, percentage of medicines adequately labeled and patients' knowledge of correct dosage.

Health Facility Indicators

Those includes; availability of copy of Essential Medicines List or formulary and Availability of key medicines.

Generally the percentage of prescribed prescriptions contains an antibacterial: there is no specific standard, but less than 30% is accepted in parallel studies shown worldwide (Mustafa, (2013).

3.4.2 Harmful consequences of irrational use of antibiotics

Overuse and misuse of antibiotics is a particularly serious problem worldwide. Newly emergent infectious diseases are gradually threatening the health of people. If antibiotics treatment failed , these will lead to increase in morbidity, healthcare need, waste and ultimately early mortality(Livermore, 2003) and (Harbarth S, 2005). Furthermore, antibiotics are required for other treatments taken for in need diseases in developed countries, such as surgery and cancer chemotherapy, which would become unattainable with the disappearance of officious antibiotic treatment.

Irrational and in appropriate use of medicines generally harm the individual at micro level and population at macro level wasting resources. If we took as example adverse drug events it had morbidity and mortality and range among the top ten causes of death

in the United States of America, in other hand they had been valued to cost £466 million per annum in the United Kingdom of Great Britain and Northern Ireland and in USA cost US$ 5.6 million per hospital per year. Antimicrobial resistance is rapidly increasing worldwide due to antibiotic irrational use, which causing significant morbidity and mortality, it had been estimated that antibiotic resistance cost USA US$ 4000–5000 million annually and European €9000 million (Cameron, Ewen, Auton, & Abegunde, 2011).

In Sudan there were many studies conducted to tackle the volume of antibiotic over use harmfulness, but there were no cut final figures evaluated the volume of disaster, but one of these studies conducted in Khartoum state explored the occurrence of resistance to six commonly-used antibacterial agents in faecal coliforms in children in Khartoum. This study alarmed about the use of antibiotics problem and showed the high occurrence of possibly transferable antibiotic resistance in gut commensals of children in Sudan may be of importance in the management of enteric and other infections requiring antibacterial treatment (P. Shears, 1988).

Other consequences related to the use routine utilization of health care services among patients and health care providers, in accessibility and affordability of services particularly in Sudan and NHIF, as example lost resources. Hence between 35–60% of national health budgets are spent on medicines (NHIF, 2002-2011).

Out-of-pocket purchases of medicines can cause severe financial hardship to individuals and their families this includes the antibiotics.

Also eroded patient confidence, worsened by the overuse of limited medicines, antibiotic may be often out of stock or at unaffordable prices and as result erode patient confidence. Negative health outcomes because of inappropriate use of antibiotic.

3.5 Prescribers' knowledge, attitudes and behaviour towards antibiotics prescribing

There were many studies around the world conducted to tackle out the factors behind the knowledge, attitude and behaviour among prescribers, as example;
(Murphy, (2011)conducted study in Ireland authenticated that, the prevalence of antibiotics used in primary care was 20.16%.Also the study revealed that, the first cause of antibiotics use was the upper respiratory problems represent 64.72% , followed by

skin 10.21%, and urinary tract disorders 8.63%, but 78% of antibiotics prescription were against the clinical guidelines which was common in most of the classes of antibiotics used, which are supposed to be as 2nd and 3rd line for the upper respiratory tract infection. This was due to either diagnosis or reasons for consultation in addition to the non-clinical factors, like the patients pressure, especially those who pay for the GPs consultations, who are more expected to receive antibiotics.

Focus groups conducted in USA aimed to, highlights differences in physician and parent perceptions about in appropriate antibiotic use, done by Barden and others with parents and with pediatricians and family physicians to assess their attitudes regarding the use of antibiotics. The participants were recruited through telephone interviews, from random sampling of all pediatrician and family physicians, potentially one invited to four FGDs each one contained 12 physicians, in other hand parents FDGs carried at their work sites and churches

Questions for physicians encouraged discussions on methods of treatment of upper respiratory infections, concerns the use of antimicrobial for nonspecific infections, as example, and questions for fathers and mothers guided discussions around the decision-making process to search for health care for their child, and their attitudes about the use of antibiotics. The discussion then coded, categorized, and analyzed by recognizing the recurrent themes and assigning categorization codes and, each group analyzed individually and results compared.

Physicians stated that their own antibiotic prescribing might be safely reduced. Parental expectancy to obtain antibiotics was a dominant factor influencing their overuse of antibiotics. Parents shown that they would be satisfied with the doctor visit even though antibiotics not recommended, provided the physician explained the motives for the decision. The study suggested that educational efforts to narrow this communication gap will be important for improving antibiotic use (Barden, Dowell, Schwartz, & Lackey, 1998).

In Australia questionnaire study done by Cockburn carried in Newcastle to test general practice among practitioners, non-randomly selected 22 practitioners and 336 of their patients with a newly diagnosed medical condition.

The study end up with association existed between patients' hope and doctors' awareness of patients' expectation . For all kinds of patient expectation, patients were

frequently obtain medication when the practitioner guessed the patient want medication, rather than when the prescribers endorsed no expectation to the patient. so the doctors' opinions about their expectations had strongest impact on medicine prescriptions. (Cockburn & Pit, 1997)

And other study carried in Sweden by Ljungberg in 2007 in primary health care to find out the factors that influence doctors prescribing medicines, semi-structured interviews were conducted with 15 hospital doctors in different medical specialties, the sample purposively selected covered different grades and specialties, and the interviews were analyzed from an interpretivist perspective to check things from respondents' point of view, assisted by the NVivo 1.2 software. The information collected was on how writing prescriptions decisions made in general and how prescribers select a specific medicine therapy, concerning information sources used. The result of the study stated that the doctors took the patient-specific factors and cost into consideration, also were influenced by personal practice, colleagues and therapeutic tradition at the hospital or clinic. (Ljungberg C1, 2007)

Study conducted in Ireland by(Fleming et al., 2014) undertake qualitative interviews, in depth semi-structured interviews investigated antibiotic prescriptions in long-term care facilities LTCF , captured the views of the key healthcare professionals. The study came up with that antibacterial prescribing in LTCFs mainly influenced by the environment and frame of healthcare delivery in LTCF. They recommended that there was a need for "behavioural regulation" strategies such as antibiotic periodic screening of antibiotic use in LTFCs , and setting goals such as intervention functions, education, audit, feedback and monitoring to "improved antimicrobial stewardship" (Fleming et al., 2014).

Another sources of antibiotic misuse is poor patient compliance which may lead for bacteria resistant, physician patient communications are often insufficient. It can be short e.g., a mean of 54 sec was recorded in a Bangladeshi study, and of poor quality e.g., in Mexico, weak patient physician communication some time responsible for the noncompliance of patients with antibiotic dose schedule .And because patients often came from remote area and suffer large expenses for medical care, they were always not return back for follow up checkup. The opposite condition the prescriber visiting his patient is difficult logistically, especially in rural Africa. In addition, the patient may

be incapable to read medicine package labels , other reasons drawn from supply system of medicines in facilities in public and private sector, hence these antibiotic distributed to these facilities may expired or due to expired, sometimes in developing countries may counterfeited or adulterant because these countries had no qualified laboratories to detect this problem, so this lead to antibiotic resistant and health harmfulness (Iruka N. Okeke, 1998).

In South Korea investigated knowledge, beliefs and behavior of physicians e.g. family practitioners and pediatricians and pharmacist through self-administered questionnaires in primary health care, and the pediatrics parents through telephone interview, regarding the use of antibiotics for the pediatric common cold. They end up with that physician's knowledge and faulty beliefs can be more important factors for inappropriate antibiotic prescription(Cho H, 2004). Other study carried out by Anita and others in New Delhi in India explored the factors influence the behavior of prescribers, through focus group discussion for 36 prescribers was analyzed through grounded theory, they end up with important factors identified for antibiotic prescriptions by doctors; as example uncertainty of diagnosis, expectation from the patients and perceived demand practice sustainability and financial considerations, medical representatives influence and inadequate knowledge. In public sector doctors, besides the above mentioned issues, overstocked, near-to expiry antibiotics and lack of time were the factors that stimulated antibiotic overuse. Doctors also mentioned certain patient behavior and negligence in regulation for prescribing and dispensing of antibiotics as provoking the problem of antibiotic misuse. Interventions like Continuing Medical Educations CME for doctors, awareness rising of patients, shared decision making and stricter rules and regulations were suggested to promote rational use of antibiotics in the community. They conclude that the exploration of doctor's attitude practice in use of antibiotic will help in a good intervention to promote antibiotic use in community(Anita Kotwania, 2010).

3.6 Pharmacists' knowledge, attitudes and antibiotics dispensing practice

There were many studies conducted in these area, for example research done in Spain in September 2012 by Maruxa Zapata-Cachafeiro and others in a region in north – western Spain, it aimed to realize which attitudes of community pharmacists were

related to inappropriate antibiotic dispensing. This cross sectional study of community pharmacist with total number of 393 as sample size, used exhaustive sampling of the study population, which comprised all community pharmacists from the region were 183 pharmacies and 393 pharmacist. Self-administered questionnaires were used based on previous FGDs done by same research team, the data was analyzed by using logistic regression. The study revealed that, the pharmacist's knowledge and attitudes as patient complacency, are strongly associated with dispensing of antibiotics without medical prescriptions, with no association between OTC and personal and professional characters (Zapata-Cachafeiro et al., 2014).

Study conducted in Portugal between December 2010 and march 2011 in the five districts of northern health region , to search and explore pharmacists knowledge , attitudes , perceptions and dispensing habits insofar as to antibiotics and antimicrobial resistance. The study carried out in 32 community pharmacists used qualitative exploratory in form of 6 FGDs interviews to enable them to collect the qualitative data, every one consist of 4-7 plus moderator. A topic guide was constructed, based on a review of the literature and a previous study with physicians, to facilitate identification of pharmacists' attitudes to antibiotics, bacterial resistance and dispensing habits. Information in this guide was grouped into the following three categories: (1) knowledge and perception of antibiotic use and resistance; (2) antibiotic dispensing process; and (3) suggestions for improving antibiotic use.

The discussion flow for 60-90 minutes until there were no more new ideas. Transcriptions were done and analyzed manually because the number of interviews were not large. This study revealed; the attitudes related to the problem of resistance were attributed external responsibility, to patients, to physicians, to other pharmacies, and to veterinary consumption. Some attitudes were identified that could lead to antibiotic dispensing without a prescription. These attitudes are complacency, precaution and external complacency (Roque et al., 2013).

Study conducted in Sudan in July 1988 by Abdullah A. Berih and others, aim to study the dispensing practices of Khartoum and Khartoum north pharmacies regard to management of infantile diarrhea, Sudanese woman presented with pharmacist with simulates of an infants with acute diarrhea, 63 pharmacies were visited . Study conducted in one month during mentioned period, a 26-year-old female Sudanese

student dressed like a local woman visited the convenient pharmacies in study scope area. She had been trained to present the pharmacist with a brief fabricated description of her one-year-old child's acute diarrhoea. The study revealed; Whether or not pharmacists who recommend antimicrobial therapy do so because they trust it is beneficial (and not harmful) to patients, because they fear missing a curable cases, or because of increased financial return is unclear. And suggest that the pharmacists who take a history, either modify their dispensing habits or well trained in health assessment than those who did not (Berih, 1989).

3.7 Patient knowledge, attitudes and behaviour towards antibiotics use

The study carried out in china by (Wen, Y. and others in 2007) measured the factors the affected patient behavior towards antibiotics self-medication in 6 food markets simply randomly selected from 40 , eligible candidates randomly recruited with total number of 30 market vendors were selected . In -depth interviews were used, they asked about their health seeking behaviuors based on their past experiences with self-medication and hospital care. ATLAS.ti soft-ware package was used to analyses the interview data, the coded system outlined based on a conceptual framework, and few concepts emerging from preliminary reading of transcripts. Iterative coding revision of coding was done in census of researchers team, until each code could independently applied with acceptable consistency. Code families identified under frame work. The study results showed that, self-medication was viewed as more affordable in terms of money and time, in other hand confidence in understanding health problems, the ease of accessibility of local pharmacies, and environmental influence of friends /peers and advertising were all emerged in study.in addition to past self-experience with disease pattern and treatment pathway, socio-demographic factors, and counseling in pharmacy. (Wen, Lieber, Wan, & Hong, 2011) . Another qualitative research through 3 focus group discussion with 25 patients to check the qualitative approach of self-medications motivations in Brazil, done by Naves and others in (2010) they used the critical discourse analysis to interpret the data obtained during interviews. Almost The self -medication practice was common among respondents ,generated by hating long waiting time and quality of the public health care services , former experience with medications, guidance from friends\ or family members and the search for an secret

service provided at pharmacies due to shame and inadequate care environment at health care services (Naves, Castro, Carvalho, & Merchán-Hamann, 2010). Study conducted in Addis Ababa in Ethiopia to assess self-medication practice of consumer, used semi structured questionnaire to collect the data conveniently from 923 respondents in twenty four pharmacies selected according to stratified multistage sampling, analyzed by EPI-info version 6 software. Socio-demographic factors , other consumer conditions like ,;pregnancy women and breast feeding mother , education back ground , illness status which mainly represented by mild conditions(Kloos et al., 1987).

Also antibiotic misuse by public is common in developing countries to many of reasons, shaded by local community culture, for example taking antibiotic to prevent diarrhea after eating contaminant food, or taking antibiotics by prostitute to prevent sexual transmitted disease.(Lansang MA, 1990)and(Abellanosa I, 1996)income of peoples also affect the use of antibiotic by poor people , because they are not capable to complete regimen particularly expensive antibiotics.

A study assessed knowledge, attitude and behaviour of antibiotic use in 2 student sets at Makerere University of Uganda. One thousand students were asked to participate by filling a self-administered questionnaire. Up to 69.3% of the respondents reported that they took antibiotic in last twelve months. The most common symptoms reported as the primary reason were; cough at 16%, followed by sore throat at 7.1% and common cold at 6.1% for antibiotic use with high confidence on health care personnel for prescription(Nambatya Jacqueline, 2011).

Cross sectional study in southern Iranian university student done through self-administered questionnaire asked about self-medication of antibiotic in last three months, the study revealed that , (50%) of self-medication choice based on medical knowledge between medical students ,and on a previous prescriptions by a physician was (32.6%) for the non-medical students. So the dominance of self-medication with antibiotics between medical and non-medical students was high (Sarahroodi, Arzi, Sawalha, & Ashtarinezhad, 2006).

A Validated questionnaire survey was conducted to approximation the occurrence of self-medication with antibiotics in Jordan and weighed the factors associated with antibiotic misuse; data was collected from a sample of 1943 households 9281 persons. The factors associated with Self-medication with antibiotics were found to be

associated with income, age, and education level, and they relied on efficacy of treatment.(Al-Azzam, Al-Husein, Alzoubi, Masadeh, & Al-Horani, 2007) . Study conducted in 24 community pharmacies located in Abu Dhabi, to examine the influence of pharmacists` demographic characteristics on dispensing antibiotics purchased with and without a prescription in the community pharmacies. The data were collected through a closed-structured questionnaire; participating pharmacists conducted a total of 1645 antibiotic transactions. The study end up with that the gender and socioeconomic status of the patients had a significant effect (p=0.012, p=0.001) in buying antibiotics without treatment encounters(Abasaeed, Vlcek, Abuelkhair, Andrajati, & Elnour, 2013).

In Sudan study conducted by (Idris and Awad) to estimate the prevalence of self-medication with antibiotics and antimalarial in Sudan, carried out at 5 undergraduate student universities in Khartoum state used self- administered questionnaire for 1300 students using multistage stratified cluster sample; randomly 5 universities selected 2 public and 3 private from which faculties and student were selected using systematic random sampling. Data were analyzed by (SPSS version 14, Chicago IL), the study revealed that self-diagnosis and self-treatment with antibiotics/antimalarial was highly prevalent (79.5%) among undergraduate university students in Khartoum State , due self-confidence and previous experience with similar sicknesses represented by 92%., the perception that pharmacies were low-cost alternatives,30% of respondents consider antibiotics safe and they can use it and stop it at any time as you felt improvement and over the counter availability of antibiotics at the community pharmacies.in addition to demographic factors (A. Awad et al., 2005).

Awad and others in September 2004, they conducted study on self-medication practice in Khartoum state, aimed to estimate the occurrence of self-medication with exclusive medicines and herbs in Khartoum State of Sudan, and to estimate factors related with self-medication. The study used pre piloted questionnaire to collect the data from a sample of 1200 individuals, selected from all three cities that compose the state, through multi stage stratified clustered sampling. Data were entered into the Statistical Package for Social Sciences (SPSS, version 13) and descriptive analysis conducted. The study revealed that ; higher income respondent less behave to self-medication , university graduate and those with least secondary education appear behave more to self-

medication as respondents with age less than 40 years , university educated people may have more knowledge about the disease and medicines rather than others , but large proportion of them had relatively income because they are often state-employed. They stated complex socioeconomic and behavioural factors have been reported as a major cause of antibiotic resistance in developing countries (AbdelmoneimIsmail Awad, Eltayeb, & Capps, 2006).

3.8 Effect of other factors on antibiotics use knowledge, attitude and behaviour

Pharmaceutical industry:

Internet research done by J Rhee in period 2000 to 2008, through a literature review of articles, books and reviews dating in this period, from New York Times and electronic searching engines using Google Scholar, Ovid Medline and Pub Med to determine the influence of pharmaceutical industry had on healthcare professionals' prescribing habits. The researchers used the key word of study title; pharmaceutical companies, influence, health care providers, pharmaceutical sale representatives, prescribing habits, and ethical. The lit review stated that Studies shown roughly 90% of physicians intermingle with pharmaceutical companies' medical representatives, even though the evidence showed they provide deviated information is in case of the drug they promoted, this resulted in inappropriate prescribing habits. And concluded that the pharmaceutical industry had a vital role in health care influence, through many methods and cunning ways as example; they invest plenty of money in research, development and marketing. As example through marketing they can influence health care providers and patients in to prescribing, or wanting these specific medications (Rhee, 2008).

Journal article written by David and others 2003 about psychology in prescription Era , they stated that ; the effect of education or advertising of pharmaceutical companies on prescribers was enormous , hence the estimated annually spend up of pharmaceuticals company companies up to $ 13000 per physician promotion medication in USA . Although there may be valuable education program, but they primary designed also programs to get more prescriptions of physicians. In meta-analysis of 29 studies, found that company which sponsored events and courses mentioned positive effects of the companies' medications two to three times more often than other courses. Hence physician prescribed its medication 5% to 19% more often

afterward. Also authors mentioned that companies can track the prescribing practices of doctors throughout their careers. Once doctors began to meet with pharmacy companies medical representatives since medical school and continue at a rate of about four times per month, and general practitioners express a greater willingness to prescribe medications that are not clinically indicated if the patient requests it, if the drug industry representatives meet them at least once a week. There is even evidence of many physicians that allowing medical representatives into their clinics to meet with patients, periodical medical diagrams, and recommend medications in a surveillance program designed to promote medication for uses unapproved by the Food and Drug Administration (Antonuccio, Danton, & McClanahan, 2003).

In Sudan there was cross sectional study done by Idris KM and others in 2009 determined the impact of pharmaceutical promotion on medical practice in Sudan prospectively. Used questionnaire as tool to collect the data from 600 interviewed doctors from different specialties and different health settings in Sudan, and the questionnaire was designed to extract demographic characteristics as well as general views, opinions and perception of the doctors to the impact of pharmaceutical industries on their prescribing pattern. The data analyzed and the results was 89.9 % of the questioned doctors accept medical representative's visits and 48.1% of them preferred group meeting style. 95.5 % of the respondent receive the promotion pharmaceutical information as admitted, only 13.7% express no positive impact of this information on their medicine prescribing pattern. The majority of physicians 83.7% had free medical samples, from these companies (Idris KM, 2009).

3.9 Literature review conclusion

We conclude from all these studies there were many factors affects knowledge, attitude and behaviour of prescribers, pharmacist and patients towards antibiotics use. For prescribers and pharmacist those factors were; socio-demographic factors age, sex, university education, previous clinical practice years, medical specialization, and continuous medical education, but in other study in conducted India end up with neutral effect of university education on antibiotic prescription (Sahoo KC, 2010). Knowledge was tackled as important affecting factor especially in the antibiotic resistance area, guidelines, diagnostic uncertainty and disease pattern. Attitudes identified as one of the

major factor affect antibiotics prescribing and dispensing with direct relations of antibiotics use as example of these attitudes (ignorance, indifferent, complacency, fear, responsibility and confidence).Other factors not directly related to prescribers or pharmacists but none the less reported as influencing the antibiotic use as example; patients related factors (age, sex, signs, symptoms, quick fix, allergy to antibiotics, co-morbidity, pregnancy, anxiety, economic and social factors and educational level), health care system related factors(pressure of time related to patients volume, communication and organizational model, implemented policies/guidelines, accreditation level of practice setting, ownership of practice location, lack of diagnostic test facilities, patients could use the same prescription more than once and patient's health insurance)and other factors tackled as example pharmaceutical industry, cost saving for (the patients and health system for example semi structured interviews carried out in Iceland to explore general practitioners' GPs' reasons for prescribing antibiotics by telephone (H. E. Björnsdóttir I, 2001). And lastly financial incentives and patients communication barrier which captured in semi-structured qualitative interview study carried out in Netherlands LTCF among 13 physicians and 13 nursing home nurses (van Buul et al., 2014).if we stress many factors that tackled in few studies but important for Sudan context, as example reasons for the choice of specific antibiotics, study carried out in UK aimed to tackle out the reasons behind choice of florquinolones antibiotics, interviewed 45 of GPs used a grounded theory approach to data collection and analysis, the study end up with; the reasons behind fluroquinolones selection were; related to a number of clinical considerations, perceptions of patient expectations and organizational influences. The study conclude Choosing of powerful prescribing , broad-spectrum antibiotics such as fluroquinolones, as well as choosing to keep these agents in reserve, was based on social responsibility. Another study conducted in India to identify factors determining the attitudes and practices of prescribers, through questionnaire for 285 participants one of result the   most commonly prescribed three antimicrobials were amoxicillin 21%, ciprofloxacin 18%, and co-trimoxazole 11%) and conclude; patient demand/expectations, patient satisfaction, pus-filled discharge, and fever were strongly push practitioners to prescribe antibiotics(Sivagnanam G, 2004). Study conducted in Great Britain aim to understand and explore the factors that influence their prescribing and why general

practitioners prescribe antibiotics for some cases of sore throat? Among general practitioners through interview for 40 GPs in general practice, the results were; they sometimes not certain about antibiotics benefits for patients, but prescribe to more sick patients in consideration of other factors as example; patients socioeconomics back ground, patients pressure time, they comfortable with this prescribing pattern and not prescribe to maintain the patients doctors relationship(L. P. Kumar S, Britten N. , 2003).

For the patients related factors to antibiotics self-medication seeking were tackled as follow; socio-demographic factors (age, sex, income, education level, insurance card and socio-cultural and economics status) patients antibiotics knowledge, attitude and behaviour towards antibiotics use. So the gap in the literature, the existing studies done in Sudan are most likely quantitative, yet deeper understanding is necessary.
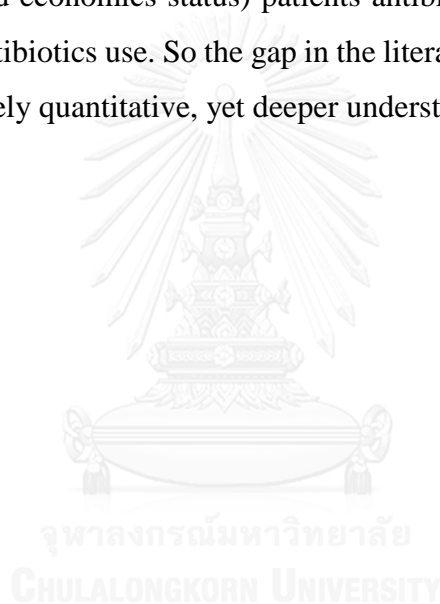
CHAPTER IV

Conceptual framework

Manipulating human behaviour in relation to antibiotics use is a long journey which includes many factors as example; intrinsic as example (knowledge, attitudes, social norms, socio-economic conditions, , experiences, and bio-physical and socio-behavioural atmosphere) and extrinsic factors as example peer pressure (António Teixeira Rodrigues a, 2013).

Actually the health care provision based on demand and supply behavior, when we talk about antibiotic prescribing behaviour we can category this in to ;internal factors and external factors.

4.1. Intrinsic factors

These factors affects knowledge, attitudes, and behaviour of prescribers and pharmacists represented by socio-demographic factors for example previous clinical practice; years of practice, Continuous medical education university education and other factors like diagnostic uncertainty, desire for a quick fix expressed by the physician, and financial incentives promoted the over prescription of antibiotics.(Paredes P, 1996),(K. K. Björnsdóttir I, Hansen EH., 2010)and(Mol PG & 2004, 2004).

Physicians' attitudes were identified as the major factor that had direct influencing on antibiotic decision making for example; physicians' ignorance (it is the lack of relationship between overprescribing and antibiotic resistance linked to lack of knowledge), Complacency which motivate the providers (to prescribe according to the patients expectations), responsibility of others "attitude underlying the belief that responsibility for generating antibiotic resistances lies with other professionals", Confidence or "self-reliance felt by physicians when prescribing antibiotics" , Indifference which represented by "lack of motivation to feel positively or negatively "tending to the problem of antibiotic prescribing, and fear was also commonly described: (i) on the one hand, fear of more serious complications and (ii) on the other

hand, fear of losing patients (Kuehlein T, 2011),(Vazquez-Lago JM & . 2012)and(Mol PG & 2004, 2004).

4.2. Extrinsic factors

The patient as demand side there are many factors affect the perception, behavior and attitudes of the patients towards health care demand and need as example; patients clinical conditions symptoms, signs, and anxiety)educational level, economic and social factor, desire for a quick fix expressed by the patient/caregivers. Others like cost saving.

In other hand there were many external factors related to health care system, which affects mainly attitude and practice \ or behaviour of health care professionals, this include; the service provided by NHIF is it directly service or through contracting indirect and partnership, pressure of time no of works hours per day one/two shift, organization model or facility location is it rural health centers or urban health center or peripheral hospital , or teaching hospital, the number of patients attended, implemented NHIF policies and guidelines ,prescribe according to NHIF list , patients had health insurance cards , patient request for antibiotics prescribing , cost related to the health care expenses in existence of many investigations related to antibiotic prescriptions , and competency of drug supply system management (Liabsuetrakul T, 2002),(W. C. Kotwani A, Katewa S, Joshi PC,Holloway K., 2010;; L. P. Kumar S, Britten N.y. , 2003).

4.3 patient's antibiotics self-medication factors

The studies tackling many factors that encourage the patients to seeking for self-medication and especially antibiotics self-medication, these factors represented by; socio-demographic factors as example; age, income, education level, ,tribe health insurance) Environmental influence, (Wen et al., 2011)and (Abasaeed et al., 2013). Knowledge related to antibiotics use (AbdelmoneimIsmail Awad et al., 2006). The attitude, behavior towards antibiotics use to save time or save money (Wen et al., 2011)and (Naves et al., 2010).ill ness status (signs and symptoms) and efficacy of treatment(Al-Azzam et al., 2007).
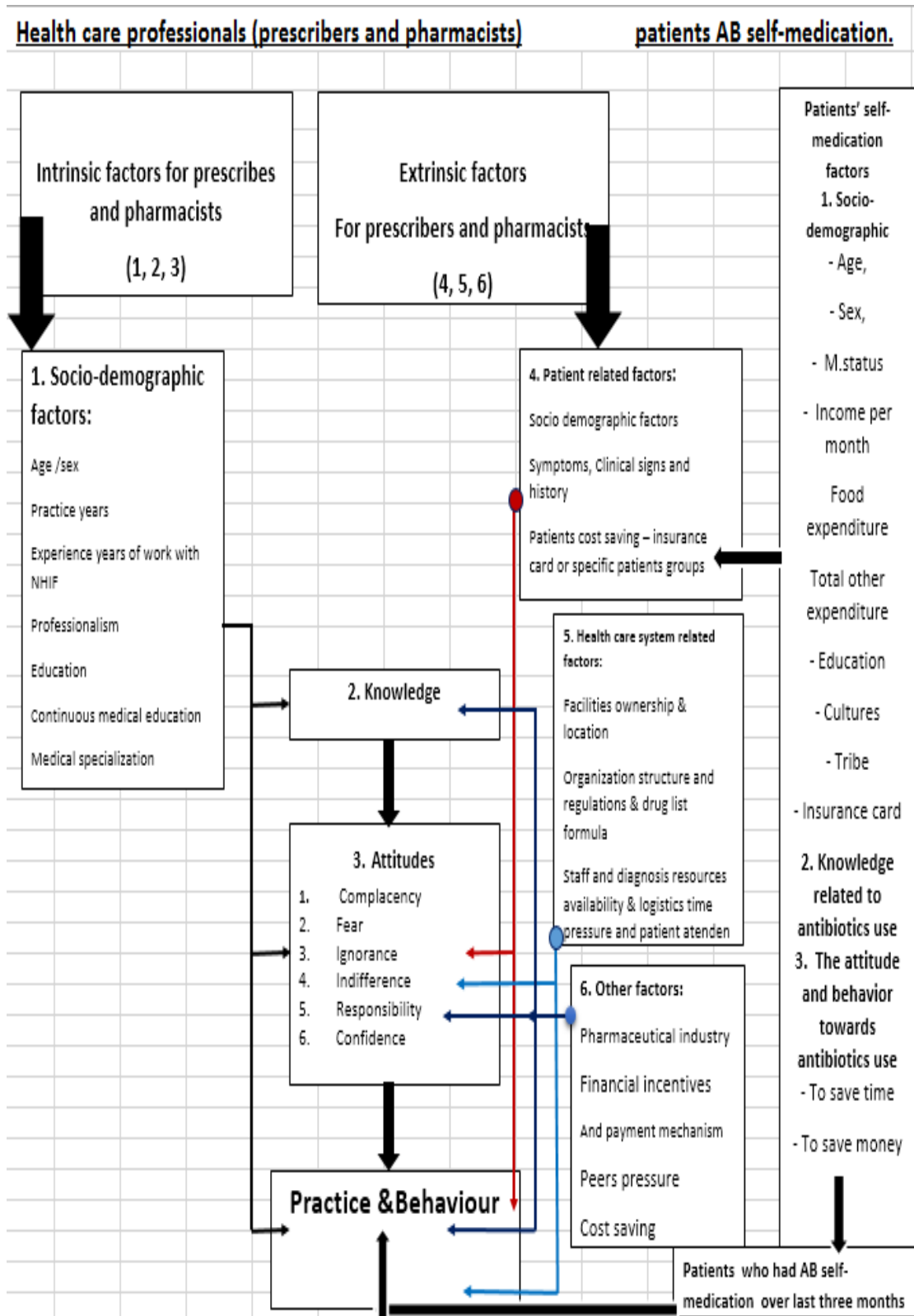
Figure 3 : Conceptual framework of factors that affect
antibiotic use practice

CHAPTER V

Research methodology

5.1. Study design

This descriptive study aim to improve the policy of rational use of antibiotics in kassala state as example; prescribing, dispensing, and patient's use, through searching behind the current attitudes and behavior of antibiotics use practice in kassala state.

The study used primary data collected from targeted sample groups of; general practitioners, specialists, medical assistant, and pharmacists that working for NHIF kassala executive directorate as health providers in outpatient settings in addition to the patients that attend health facilities and content analysis was done.

5.2. Instruments

Semi-structured in depth interviews carried out with medical assistants, pharmacist, GPs and specialists investigated and knew their opinions and experiences of antibiotic prescribing in addition to the opinions of the patients in their antibiotics self-medications in NHIF outpatients' facilities in the kassala state. The interview method was the most possible, because the participants interviewed at their place of work at health centers, hospitals, clinics, and pharmacies. In other hand the patients conveniently interviewed when they visited the pharmacy or health facilities.

5.3. Study population and data

The study population is the doctors, medical assistant, and pharmacist that they provide health care in NHIF kassala which compose of 11 localities, through direct provision or indirect provision. The study conducted during May 2015.

The sampling strategy recruited the participants of varying years of experience, from different NHIF settings, direct health care services centers, indirect health care services centers, and partnership centers in urban and rural area, of varying patients' attendance.

Table 7 Health care provision in NHIF in Kassala state

Professional group	Direct health care provision	Indirect health care provision	The total
Specialists	31	16	47
General practitioners	56	32	88
pharmacists	8	0	8
Medical assistants	26	11	37
The total	121	59	180

Source: NHIF kassala first quarter report of 2015[3].

5.4. Sample

As mentioned by study done by Isameldin 2012 in NHIF the highest antibiotic prescribing pattern was for urinary tract infection (UTI), typhoid fever , and respiratory tract infection RTI by 94%,92%,90% consecutively, the medium one is OBS in 29% ,the lowest pattern in case of diabetic mellitus DM and hypertension HTN by 13% and less than 5 years old was 84%(Mustafa, (2013). But In NHIF Kassala state there is no UTI and RTI specialism, so we mentioned other option with higher prescribing pattern as benchmarked by study represented by pediatricians.

 The method of sampling carried in two types;

Type one: systematic sampling

First stage; three localities were selected (according to criteria early mentioned as example these three localities represent almost 80% of health care services provision In Kasssala state In addition to most health system infrastructure concentrated in it those localities, Kassal, New Halffa and Algirba.

Second stage: for the specialists prescribing pattern there are three prescribing categories, namely higher prescribers more than 66% as and medium prescribers and lower prescribers. Two of each category were selected as example two of higher prescribers represented by pediatricians, two of medium pattern represented by obstetricians and two for lower prescribers represented by internists. The total number

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[3] Almost the indirect health care provision located in rural area, and specialist found in three localities; kassala , Halfa Algadeeda , and Khashm algiraba.

of 6 specialist, who were selected for the semi structured in depth-interviews, were taken from three localities specialist in direct and indirect health care provision facilities. number of targeted sample distributed among three localities according to the weight of total three specialties specialist number in each locality and the results (three specialist for Kassala locality , two for New Halfa and one for Girba locality. accordingly systemic sampling were done by targeted groups, sampling interval was calculated by dividing the total population by the number of prescribers needed and selection done systematically from prepared list prescribers group according sample interval (5). For GPs the sampling technique will consider direct and indirect services provision in each locality with 2 for each, selected systematically according to Gps list in each locality , so the total number of interviewed GPs was 6 because it was important to interview indirect providers because they represent different providers payment mechanism based on fee for service, on the other hand 3 for medical assistants selected from three localities systematically from medical assistants list for each locality, Kassala, New Halfa and Algirba as mentioned in study scope.

Type two: Convenience sampling took 3(one from each locality) pharmacists work place(we selected them according to their continuous working years with NHIF because all of them had almost same practice years as general, pharmacy type in addition to university variation where they were study according and represented three selected localities of and 3 patients (one from each locality) when they visited pharmacy those patients selected according to ; their self-medication during last three months, variation in age, education level, type of work and tribe in addition to localities representation. for interviews considering the distribution of them on three localities. So the total number of interviewees is 21 and data saturation considered, the details shown in table 9.

But the actually interviewed persons were (18) because there many reasons; there are three drop out of targeted sample, in Girba locality (internist specialist)4

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[4] Because after the study conducted the interview, the advisor asked to refine interview questions, after revision finished, the study seeking for re interview the respondent by new version questions set, but he went abroad and so his interview data was not completed.

Another one was medical assistants sample, we had appointment with third respondent in New Halfa , but at that day he leave on sick and it so difficult to contact again , and it was difficult to replace due to concentrations of medical assistants in Kassala locality already we interviewed two.

The third one was the pharmacist, we must interviewed three conveniently but, the third one was recently (about one weak) shifted to Girba from Kassala, so he had same practice of Kassala locality.

Table 8 Prescribers target group sample population, sample size, and it is distribution

Prescribers	Kassala locality	New Halfa	Al-girba	Sample population
Pediatricians	3	2	1	6
Internists	5	2	1	8
Obstetricians	8	4	2	14
Total	16(57.1%)	8(28.5%)	4(14.4%)	28(100%)
Sample size of 6	3	2	1	6
Interval	5	4	4	
Systemic selection from three specialties	One systematic from each prescribing pattern **1&3&3**	systematic from three specialties **2&6**	Systematic from three specialties 1 **Number 4**	
GPs	58	7	9	74
Sample size 6	2 Systematic selected	2 Systematic selected	2 Systematic selected	Distributed by facility care provision Direct and indirect
Medical assistants Sample size 3	One selected randomly	One selected randomly	One selected randomly	

Table 9 Number of interviewees

No	The interviewee	The number (n=)	Total number targeted number	description	The actual size was
1 2 3	Specialism : Pediatrician OBS Internal medicine	2 2 2	6	Prescribers	5 (because internist girba with incomplete data
4	General Practitioners	6	6	Prescribers	6
5	Pharmacist convenient sampling	3	3	Dispensers	2 because girba pharmacist had same practice with kassala
6	Medical Assistant	3	3	Prescribers	2 circumstances
7	Patients convenient sampling	3	3	Self-medication	3
	The total		**21**		**18**

5.5. Data collection

There was wide variations in health care provision in kassala state , which mainly focused on urban area rather than others , and NHIF health care provision there were many methods in providing health care to increase accessibility , through direct provision , indirect provision , and partnership which mainly resemble indirect provision. All this considered and taken into account when collecting data in addition to variation in sex, age, years of professional experience, for pharmacists. And one-to-one interview conducted at the participant's place of work.

These participants provided consent in person before the start of the interviews.

5.6. Topic guides

The topic guides prepared according to literature review and current practice of antibiotics prescribing in Sudan and particularly in NHIF , more over the opinions of our colleagues ,whose now are decision maker in NHIF in the pharmaceutical field.

Table 10 Interview topic guides

Health providers	Issues included in doctors and pharmacist interviews
A. **Intrinsic factors**	
1. Socio-demographic factors.	**Demographic information ;** Age, practice years, years working with NHIF, and professionalism…etc.
2. Attitudes	Capture of these attitudes that affects the prescribing and dispensing pattern for example :(Attitude confidence, Attitude indifferent, Attitude complacency, Attitude responsibility, Attitude ignorance, Attitude fear.
3. Knowledge	Use medical school knowledge or alertness of a guideline for antibiotic prescribing, the knowledge of kassala state antibiotic resistance, patterns consequences of not prescribing antibiotics, and problems related with antibiotics use.
B. **Extrinsic factors**	
4. Patient related factors	• Clinical presentation/status (E.g. signs and symptoms, additional diagnostic information, clinical history) • Economic and social factors; wish for fast fix by the patients and care. • Patients had insurance or not? • Education level, age and allergic to antibiotics • Patient cost concern • Influence of patients family pressure.
5. Health care system related factors	• Organizational structures • regulations, • Policies guidelines • Type of facility (direct) and facility location. • Patients frequency and time pressure • staff shortage and staff turnover, • Availability of diagnostic resources, financial considerations.
6. Other factors:	• Pharmaceutical industry ,peers influence • Financial incentives and payment mechanism • Cost saving

C. practice and behaviour	• The measure the effect of direct and indirect of intrinsic and extrinsic factors on antibiotic prescription behaviour.
Patients	**Issues included in patients antibiotics self-medications interviews**
1. Socio-demographic factors;	Age, sex, income, marital status, Education, monthly consumption expenditure, health insurance, tribe etc.
2. Attitude	1. How antibiotic started? As prevention or cure.etc. 2. Follow instructions from doctors and pharmacist 3. Get antibiotics expectations. 4. Do antibiotics self-medications, to save time, money…etc
3. Behaviour	1. Early behaviour of antibiotics self-medication 2. Antibiotics usage and storage conditions 3. Behaviour after not effective antibiotics prescriptions 4. How did he got antibiotics 5. Behaviour towards antibiotic side effects and adverse reactions.
4. Knowledge	The knowledge about antibiotics use 6. Term of antibiotic. 7. Symptoms and signs antibiotics used for. 8. The name of antibiotic patients used. 9. The aim of antibiotic use 10. How antibiotics can be started (the source for the patients): home storage, prescription, pharmacy, drug stall. 11. Period of antibiotic use and frequency or regimen. The completion of antibiotic course. 12. Source of antibiotics knowledge.

5.7 Data analysis

The study used Nvivo 10 for windows, but we started analysis when we collecting and transcribing the data because preliminary codes and themes will occur in the process. Considering validity and reliability of the data, an iterative process of data collection and analysis conducted. The data collected precisely from the 18 respondents, the main of language for health professionals was English but broken language occurred, and Arabic language for the patients interviews used and translated by investigators, more over 16 of transcriptions done by investigator and two of transcripts done by physician, in other hand the deductive coding process done according the conceptual frame, and the results drawn from (Nvivo 10 matrix framework and query results)

5.7.1. Data review

Understand of the data collected by reviewing them several times, read and re-read and listen to the tape recordings several times, the quality of the data checked the transcripts until we have a general understanding of the content. As we reviewing, we wrote notes of our first impressions of the data; these initial responses may use it later as we interpret our data. The process of selecting, simplifying, abstracting, and transforming data carried out.

5.7.2. Data organization and display

Qualitative data sets tend to be very lengthy and complex. Once we have reviewed our data and familiar with what we have, we organized our data to be manageable and easy to navigate, and most data initially display as text. The data grouping done by themes drawn from conceptual framework, question asked.

5.7.3. Data coding

The data coding defined as the process of identifying and labeling themes within your data that correspond with the evaluation questions we want to answer. Treating data bit by bit helps to categories.(Dey, 2003)

We will interrogate the data to identify units of analysis (themes categories). Thus as: Highlight" key points" in each dataset, in interview answers according to research question, study objectives and conceptual framework. In substantive statements manner.

Give each key point "a code" to describe the data

These codes will reveal "patterns" across the data (child for child node)

Then we will group the patterns into "categories" (child node)

And will give each category "a title "(parent node)

The "new codes and subcategories" emerged.

The early part of coding were confusing, with a quantity of seemingly unconnected material. However as coding goes up and themes emerge analysis becomes more systematized and arranged" (Ezzy, 2002).

The study install Nvivo 10 for window free trial for 30 days began on 24 June, and WE determined our themes and category deductively according to our conceptual frame work (for example the effect of cost saving (as sub category and "child node") for (category) health system related factors as (child node) for extrinsic factors as parent node, and we coding according to contents of transcripts.

We relate the other core affected themes (knowledge, practice) to the intrinsic and extrinsic factors nodes to it from the themes and categories that had direct effects on it for example "university knowledge . but some time the code coded in more than theme, as example (practice years) coded for intrinsic factor node, at same time coded for knowledge node and so on .The relationships in Nvivo between nodes was made (for example the relationship between intrinsic factors node (affects in one direction from intrinsic to knowledge, that means the intrinsic factors affects the knowledge and so for others figure (4).

Code source relations through different queries was done to see the primary results of coding resources according reference.

In other hand persons demographic factors classification was done and attributed to coded nodes.

We depend totally on frame work matrix query to find out the participants statements related to parent node (themes nodes) (for example what (PT38) said about the extrinsic factors and patient pressure (or patient related factors) and we summarize the statements of all participants in this themes and we revise the coded themes in knowledge and practice and attitudes with this summary to understand it is effects.

 Finally we drawn this themes statement to answer our research question and to achieve our study objectives.

5.7.5 Interpretation of findings and reporting
On getting completed the analysis grid as outcome of the analysis process we need to explain our finding using the themes, categories and the connections between them.

Interpreting the data involves attaching meaning and significance to the analysis. Through; reading the matrix framework, develop a list of key points or findings, major lessons and developing an outline for presenting our findings.

We wrote down the meanings derived as per my understanding from the set of categories and the quotes from the edited version of transcripts, and Stressed on the more significant findings with the help of quotes with proper coding.

Finally we wrote down a report on the outcomes of the data debating on the key themes, and categories derived from the interview process using analysis grid matrix framework.

CHAPTER VI

Results and discussion

The results of this qualitative study will break down in more details. As described above an iterative process of data collection (collected in English (broken English though at time) from health care professionals, in Arabic from patients and translated to English and analysis was conducted as outlined in the previous chapter. All transcripts were coded in QSR Internationals NVivo for windows Qualitative Data Analysis Software version 10 (Ltd., 2012).

Interviews transcripts were read more than one time to authenticate initial phase of familiarization. Most of the interviews were transcribed by the principal investigator, a few of them were transcribed by two assistants (one a physician and the other a pharmacist by profession), trained by the principal investigator. The transcripts were coded into themes, categories and subcategories according to the conceptual framework and interview questions, but emerged themes were also captured. Based on the specific objectives the interviews were analyzed in three separate groups: prescriber group consists of specialists, general practitioners and medical assistants, pharmacist group and patient group. Participants own language was often used in the coding in order to maintain a faithful representation of their opinions and experiences. The naming of the nodes were almost all drawn from conceptual the framework and done manually (for example extrinsic factors and intrinsic factors as parent nodes and health system related factors , patients related factors and pharmaceutical companies as child node.as shown in figure (4)
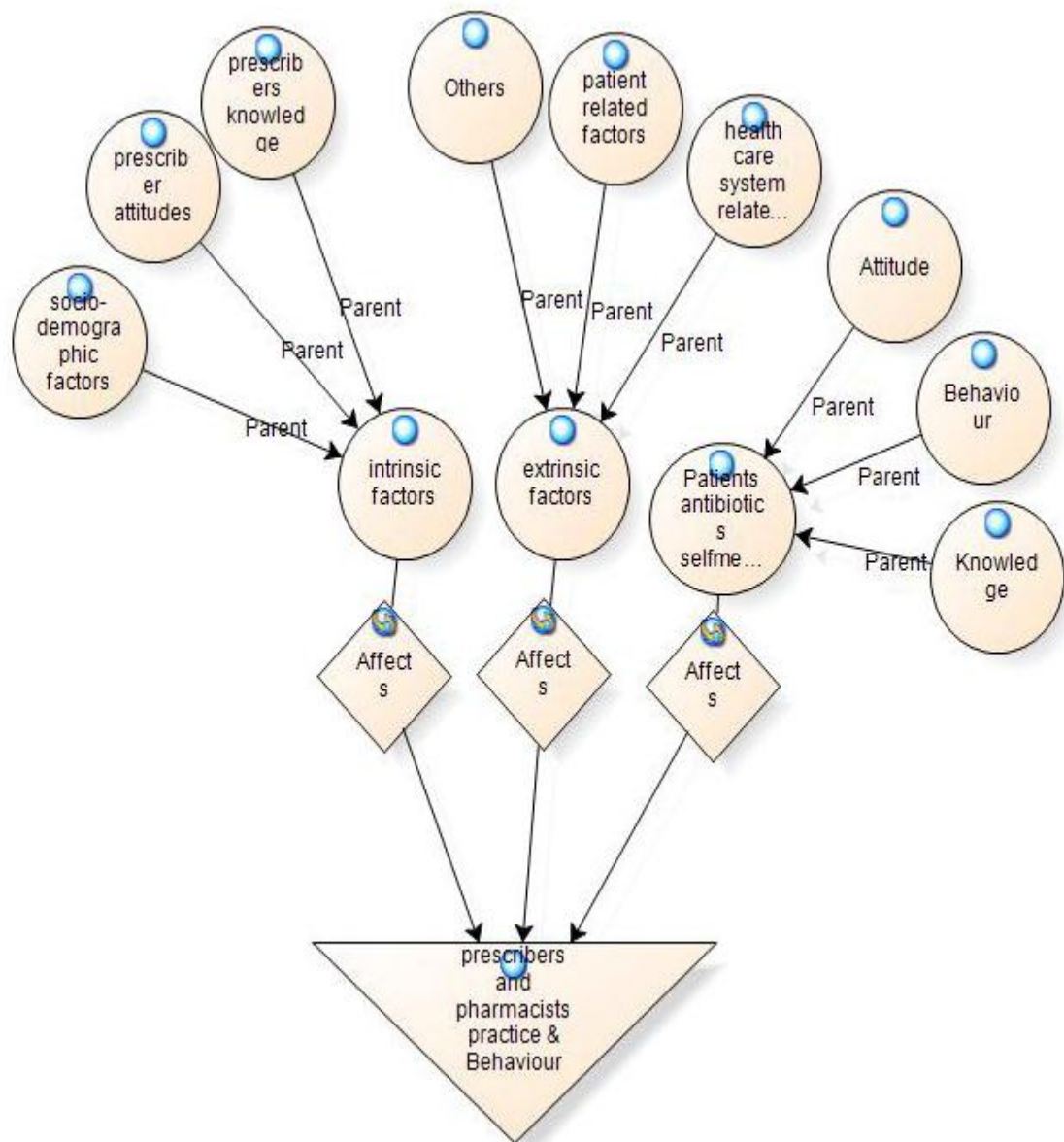
Figure 4 : Node model relationships

Figure 4 showed the relationship between intrinsic and extrinsic factors that affect the antibiotics practice and behaviour of prescribers and pharmacists. Hence intrinsic and extrinsic factors were created the parents node. Which represent the major themes drawn from respondents' transcription. These nodes include categories (e.g. patient related factors) shown as child node with other sub categories inside this child node (e.g. signs and symptoms) so all the relations correlated inside nodes well, and the affects relation shown in one direction drawn from parents node to practice node.

In addition to patients self-medication effects on prescribers and pharmacists practice and behaviour towards antibiotics decision.

6.1. Results

Eighteen interviews were conducted in total (13 prescribers (6 GPs, 5 specialists, 2 medical assistants), 2 pharmacist and 3 patients) from NHIF settings. Participant demographic characteristic are provided in Table 11 Participant quotes are represented in italics by profession (General Practitioner = GP, Specialist = Spt, Medical assistants = MA, Pharmacist = Ph. and patients = Pt.) and the corresponding number refers to their recording audio number, the number after the comma refers to the number of line in transcripts (transcripts available on request), details in Table 11 and figure 5 show the relation between practice years and reference code. The most salient quotes, however, are shown in table 12. Key findings are also summarized in table 12.
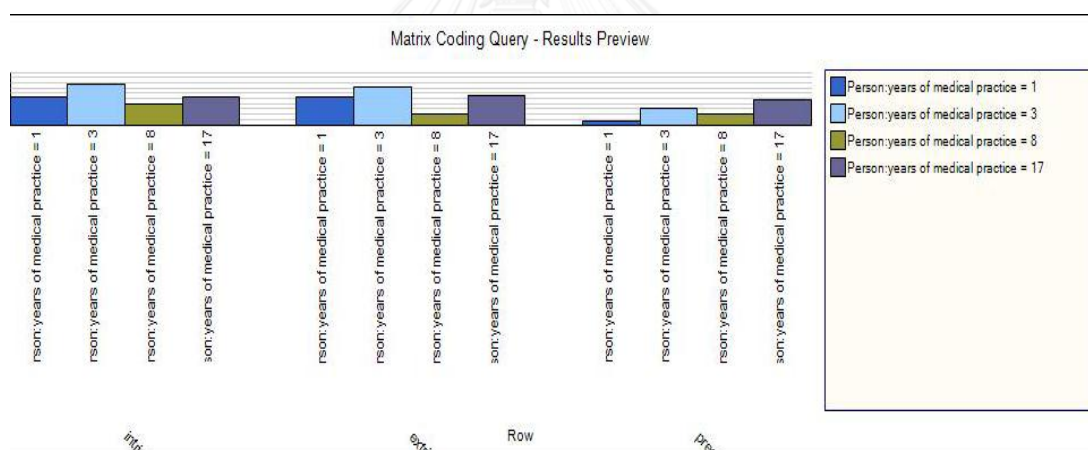
Figure 5: Practice years and reference source

Figure five illustrate the relationship between coding reference number (in intrinsic factors and extrinsic factors that effects antibiotic practice) and practice years of respondents.

Table 11 Socio- demographic information

Specialist	Gender	Specialty	Practice years	NHIF facility (health care provision)	Years working for NHIF		Locality
Sp 40	Male	Pediatrician	17	Indirect	10		Kassala
Sp 33	Male	Internist	11	Direct	0.5		Kassala
Sp 25	Male	obstetrician	14	Direct	14		Kassala
Sp 51	Male	Internist	8	Indirect	6		New Halfa
Sp 39	Male	obstetrician	30	Indirect	15		New Halfa
General practitioners		GP					
Gp31	Male		1	Direct	1		Kassala
Gp 42	Female		3	Indirect	1		Girba
Gp30	Female		1	Indirect	1		Kassala
Gp 34	Male		8	Indirect	0.5		New Halfa
Gp 40	Male		3	Direct	7 months		Girba
Gp 35	Male		2	Direct	1		New Halfa
Pharmacist							
Ph 32	Male		4	Direct	3		Kassala
Ph 39	Male		5	Direct	3		New Halfa
Medical assistants							
1. MA 30 Male			40	Direct	7		Kassala
2. MA 50 Male			23	Direct	7		Kassala
Patients		Age Year	Monthly income **SDG**	Consumption expenditure **SDG**	Education	Tribe	Marital status
1. Pt 36 Male		57	1000	2500	Bachelor	Halanga	Married

2. Pt 38 Male	75	4000	3500	Primar y	Half way	Marrie d
3. Pt 50 Male	30	6000	6000	Primar y	Rash ide	Marrie d

Table 11 showed the demographic information of prescribers, pharmacists and patient. It showed different variations in practice years among specialists and medical assistants but general practitioners with nearly at same range due to high turnover of medical officers abroad, and most of specialists provide health care through indirect policy, and pharmacist had same range of experience because they prefer to work in private sector. We see different age groups and different levels of education of interviewed patients, with different income with high consumption and expenditure. The above numbers accompanied target groups abbreviations indicates the rank of audio recording.

Knowledge

We seeking to understand and illustrate the knowledge of interviewees about antibiotics prescribing, dispensing and use in addition to their knowledge and aware-ness about antibiotics resistance In Kassala state. Knowledge is defined as an awareness of the existence of something, for example, procedural knowledge as defined in Chapter III. Figure 5 shows the different prescriber target groups and their reference coding sources.

6.1.1 Prescriber interviews
Prescribers' knowledge

Regarding the influence of medical school on antibiotics prescriptions, most respondents report that university education had a passive role on the knowledge built about antibiotics, which helps them in antibiotics prescribing practice. They stated that they acquired most antibiotics prescribing knowledge from practice field or specialties study.

But some specialists said it had positive impact on antibiotics prescribing in general.

> *"The general information in school were enough to prescribe safely antibiotics."(Spt 40, 15)*

They added that they need more information because antibiotics knowledge updated every day.

All of the prescribers rely on their medical practice years in antibiotics prescribing pattern but the GPs junior prescribers rely more.

> *"Sometimes I use my experience (experience years) in antibiotic prescribing."(GP 31, 90)*

> *"My good prescribing pattern based on information from experience."(GP 30, 69)*

They talk about the sources of knowledge that had direct effect on their antibiotic prescribing decision. They stated that the pharmacists working for pharmaceutical companies had major role. Other sources are scientific journals, medical books, pharmacists as colleague, few national protocols for example Sexual Transmitted Diseases Infection, Human Immunodeficiency Virus, WHO guidelines, Royal College Obstetrician guidelines and American colleague guidelines.

But British National Formulary had major influence on antibiotics prescribing practice in Sudan.

There are different responses by prescriber to the case presented during the interview about patient with fever, sore throat pain, indicating that it is an ambiguous area of antibiotics prescribing. Some of them said they will prescribe antibiotics.

> *"Just we follow the case, because we write simple antibiotics, if he came back we know there is the source resistance and refer him to specialist."(GP35, 102)*

And other said will not prescribe antibiotics;

> **"He didn't need antibiotic unless we clarify more symptoms and clinical considerations, but primarily not need antibiotics."(Spt 40, 86)**

Questions about antibiotic prescriptions for patients with preconditions for example pregnancy, renal failure and liver dysfunction, revealed that all respondents had no specific reference information to refer to. They rely on experience and inserted medicine leaflets and most of them use the term "safe antibiotic prescriptions for complicated cases condition". The medical assistants expressed they refer those patients to the general practitioners.

> *"We use insert leaflets of medicine to prescribe antibiotics for complicated cases." (GP40, 72)*

> *"If I notice any case abnormality, I will refer patient to medical doctors."(MA 30, 75)*

All of them had not enough knowledge and information about antibiotics resistance existence in Kassala state, due to lack of studies and researches in this area. But from antibiotic treatment failure they noticed there were emergence of antibiotic resistance due to bacterial resistance rather than failure of patient adherence treatment behaviour.

*"The emergence of resistance to antibiotics, tackled from the patient attended clinics may be two time in 10 days, and they are not recovered although they follow my instructions to use the medicine."(**GP 34, 84)**

UTI, is debatable area of emergence of antibiotic resistance, because of uncertainty prescribing pattern around continuous antibiotic treatment failure and turbid urine even after it cured especially in pregnant women and elderly patients. Even one of interviewee expressed that for elderly UTI patients he begins treatment with the medicines used in sensitivity culture prior the patient subject to urine sensitivity culture (for example Amikacin, Ofloxacin etc. This due to a ware ness of dangerous of antibiotic resistant related to UTI because it is area where antibiotics over prescribed.

"In my practice, I saw many pt. with UTI using antibiotics for long time and still complaining."(SPt 33, 98)

"We begin with Ofloxacin and then Amikacin if no Improvement, I will shift to the urine culture ,although I know that many doctors will not agree with me."(SPt 51, 146)

Prescriber's attitude

According to literature review six different attitudes were identified in the studies selected and defined. In this study we captured these attitudes according to study objective as follows (Lopez-Vazquez P, 2012).

Attitude confidence; Self-reliance felt by doctors (specialist, general practitioners and medical assistants) and pharmacists when prescribing or dispensing antibiotics.

Doctors and medical assistants expressed professional confidence in caring for NHIF patients with infection, and antibiotic prescriptions.

"*Always I have no difficulty in selection of correct antibiotics."(Spt 51, 20)*

Attitude indifference; Lack of motivation of health care professionals to feel positively or negatively towards the problem of antibiotic over prescribing.

There is different feeling among prescribers; some of them feel that NHIF motivate irrational prescribing and in appropriate use of antibiotics, despite the emergence of

resistance as they stated. Others expressed that; antibiotic prescribing in Kassala state is a "jungle" and uncontrollable and feeling terrible.

"I noticed from the cases came to NHIF health center , there were a lot of antibiotic treatment failure , that mean there is resistant to antibiotic in NHIF and Kassala state as general , but am not worry about that because we can try another antibiotics." (GP 40, 22)

"In general there is jungle practice concerning antibiotic prescription."(Spt 39, 22)

Attitude complacency; Attitude that motivates the prescribing or dispensing of antibiotics to fulfil professionals' perceptions of their patients'/parents' expectations. Few of the interviewees express directly or tacitly that; they respond to the patient's antibiotic demand, but most of them ignore patient's demand and do their right prescribing practice based on evident base medicine as they expressed.

"Sometimes, patients with simple infections refuse to receive the simple antibiotics and they like to have the strongest antibiotic". (GP 42, 31)

"I trying to discus with them another antibiotics treatment and most of them agree, if refused I prescribe according to their needs". (GP 34, 27)

Attitude responsibility; Attitude that underlying the belief that responsibility for generating antibiotic resistances lies with other professionals.

All prescribers said that the responsibility of antibiotics resistance lies with others.

"Pharmacist and patients are more responsible for generating antibiotic resistance."(spt 40, 42)

"Patient if not follow the instruction, some doctors prescribe according patient wishes.(MA 30, 32)

One respondent, however, expressed that he was also responsible

"All medical prescribers including me."(GP 34, 31)

Attitude ignorance; Is the lack of relationship between overprescribing and antibiotic resistance, linked to lack of knowledge of antibiotics problem.

They noticed there were a lot of antibiotic treatment failure, so they guess there was emergence of antibiotics resistance, in addition to the sensitivity.

"I have no experience with resistance, but from my practice I notice some patients after received the appropriate antibiotics came back suffering from the same symptoms".(spt 25, 36)

"Increase the resistance, because bacteria will progress the resistance to antibiotics. Because many treated antibiotics cases came again, for example tonsillitis treatment failure."(GP 35, 34)

Others said no relation between antibiotics resistance and antibiotics over prescribing.

"Over use of antibiotics by patients lead to resistant, and doctors at their clinics prescribe anything, but no relation between them."(GP 40, 35)

Attitude fear; Relating to fear of possible future complications in the patient and/or fear of losing patients.

Most of them express they fear of patients case complications, so they prescribe antibiotics as prevention.

"Sometimes the injured patient and serious cases we prescribe antibiotics to protect him from future complications."(GP 31, 44)

"Sometimes I prescribe antibiotics because of fear of expected complication."(spt 25, 41))

But few of them said they fear the patient not come to clinic again, and take antibiotic from near pharmacy.

"Some patients demand antibiotics if i not prescribe it for them, they will go to pharmacy and buy it."(MA 50, 160)

Practice and behavior;

There are many factors that affect the health professionals prescribing pattern these factors could be intrinsic (like prescriber socio-demographic attributes) or extrinsic factors (for example factors related to the patients, factors related health care system, pharmaceutical industries, payment mechanism, peers pressure and cost saving issues). So all these factors were tackled that it had direct influence on antibiotics prescribing pattern in NHIF in Kassala state.

NHIF insured patient pressure on prescribers to prescribe antibiotics has impact on antibiotic prescribing behaviour.

"The patients thought they must have medication, because they prepaid for NHIF."(spt 40, 29)

As few of them expressed directly the insured patients' one of the causes of prescribing expensive and costly antibiotics.

"The health insurance card motivate the prescriber to write expensive medicine."(MA 50, 183)

"Insured patients demand more investigations, referral and specific antibiotics".(GP 30, 122)

The cost and affordability to the patient is one of important issues in antibiotic prescribing, it has crucial influence.

"Sometimes the patient express he could not pay expensive antibiotics, so I prescribe cheaper antibiotics for him."(GP 35, 175)

"Dose regimen and its costing had direct effect on my antibiotics prescribing decision."(spt 39, 111)

"Patient condition and his income affects."(GP 42, 71)

"I consider the cost to the patients. Because most of the patients in eastern of Sudan were poor."(spt 33, 183)

The patient compliance to treatment determine the type of antibiotics.

"But the type of antibiotics depend on other factors like patients compliance, how frequent antibiotics he used in past history of antibiotics and financial aspects to the patients and side effects to the patients. "(SPt 40, 91)

There were many tribes in eastern Sudan with different languages, they had direct effect on prescribing according to their culture and language barriers. Many interviewee expressed some times there is communication barrier between them and those patients.

Many tribes for example Rashida more complaining rather than others, they believe on expensive medicine and they proud about treating their kids with allot of money. In other tribes there were a communications barrier it is difficult to know the symptoms from their description. (spt 40, 192)

"Rashaida are more demanded for Amoclan and Amixime antibiotics."(gp 30, 122)

Other factors related to the patients i.e. gender, education, tribe and social status and community culture also had direct effect on antibiotics prescribing practice.

"Usually female complain more."(GP 35, 133)

"Education and income had effect".(Spt 30, 132)

"Male, well educated, and insured patients, are more affecting factors on antibiotics prescribing decision."(GP 34, 135)

Patient expressing antibiotics demand had different response from prescribers, some of them ignore and others response.

"If the patient request for antibiotic is correct I will prescribe if not I will convince him this is not write option."(Spt 33, 133)

"Sometimes I prescribe certain antibiotic just to reassure patient."(spt 25, 89)

"The patients always demand Amoclan antibiotic, but is not permitted to me to prescribe as restricted by NHIF list."(MA 50, 134)

Many of interviewee expressed that; the lack of laboratory investigation resources and inaccuracy of results had direct effect on antibiotic prescription decision.

They expressed the most thing that affect decision of frequent antibiotic prescribing is;

"Lack of laboratory investigations specially sensitivity culture and accuracy of laboratory results."(Spt 40, 169)

"Laboratory resources and it is availability effect antibiotics prescribing because we didn't send the patient outside for more investigation."(GP 31, 158)

"in Kassala there is deficiency in advanced diagnostic tools."(spt 33, 157)

Many of them stated; NHIF regulations and it is essential medicine list affect positively and negatively the antibiotics prescribing practice.

"NHIF list has advantage and disadvantage; the list will reduce the antibiotics resistant, in other hand this restrict the GPs to prescribe suitable antibiotics, and this push us to refer the patients to specialist to prescribe strong antibiotics."(GP 40, 179)

The pharmaceutical companies had obvious influence on prescribers by pushing them autonomously prescribe the specific company trade name as few of them expressed, but from practice and prescriptions revision all of them highly prescribe in trade name.

"I use the brand names, but pharmaceutical companies have no direct connection with health center staff."(MA 50, 23)

In general pharmaceutical companies had dominant role and direct influence in antibiotic prescribing behaviour in KASSALA state as general and specifically NHIF.

"Pharmaceutical companies in hospital gave us medicine sample, we redistribute this samples to the poor patients through prescriptions. "(GP 31, 192)

"When there is free sample from pharmaceutical companies I prescribe to test the effectiveness of this new antibiotics."(GP 34, 180)

"Really I prescribe in trade because of quality of these antibiotics although it is expensive (e.g suprax , klavox , baciflox)"(Spt 51, 177)

The pharmaceutical companies had wide effect even on pharmacist in NHIF and other facilities in kassala state, which indirectly affects the prescriber's behviour and practice.

"Always am NOT prescribe antibiotics in generics because there is no enough pharmacist in Girba, they are drugs sailor and they may dispense wrong or incorrect antibiotic."(GP 40, 190)

Peer and colleague had normal effects on antibiotic prescribing due to many aspects as they mentioned for example; key opinion leader prescribers had direct role , through training in field and direct consultation or peers discussion.

"Yes; because from experience (samixon and levexon) are more effective, I don't know any name of pharmaceutical companies just I know that from hospital (Key Opinion Leaders) colleague". (GP 34, 169)

"Sometimes we ask senior peers about the appropriate antibiotics."(GP 42, 174)

Provider's payment mechanism has no direct effect on antibiotic prescribing process in NHIF in kassala state as all of them state that except one.

They don't care about cost saving for NHIF , just they concentrate on the patient treatment benefits' , most of them thought that ; NHIF already made cost saving by decreasing health services packages and supplying generic medicines and so on.

"NHIF list already reduce the cost to health system, but always I give the patient the suitable antibiotics treatment."(GP 35, 177)

"There is cost consideration but mainly for patient rather than NHIF."(Spt 39, 170)

Other factors related to the localities as example in New Halfa there is wide spread asbestos allergy, in Girba the number of pharmacist is less than needed.

"Over prescribing of simple antibiotics in New Halfa due to (UTI), (RTI), and asbestos allergy which come from water network asbestos bib lines, I prescribe antibiotics for these cases to prevent the secondary infection occurrences.(GP 34, 34)

"Antibiotics prescribing here is more because most patients come from rural area, with complicated cases."(GP 30, 79)

"Rendering of patients between clinics masking symptoms."(spt 40, 138)
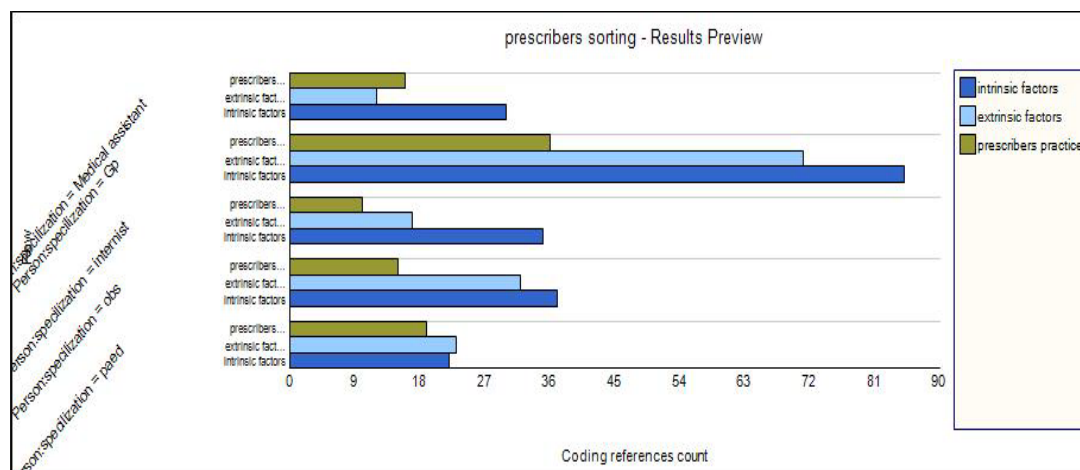
Figure 6: Prescriber target group and reference coding sources count.
Illustrate the three target groups and the reference coding count for them (according to specialism, general practitioners and medical assistants) for three themes (intrinsic factors, extrinsic factors and antibiosis practice) we note GPs had more references at intrinsic and extrinsic factors)

Table 12 Most important findings of prescriber interviews

Prescribers interview (Spt, GPs and MA)	Findings	Quotes
A. Intrinsic factors		
1. Socio-demographic factors.	- Most of them report that university education had passive role on the knowledge built about antibiotics, which help them in antibiotics prescribing practice, they stated that they acquired most antibiotics prescribing knowledge from practice field or specialties study. - All of prescriber rely on their **medical practice years** in antibiotics prescribing pattern but the GPs junior prescribers rely more on these.	*-"The method of teaching at university just give outlines and when you graduated even you don't know the name of antibiotics"(Gp40, 17)*

		"- Easy to select correct antibiotics according to my (9) years' work experience and according to my work with good senior consultant during my career" *(GP 34, 18)*
2. Attitudes	**Confidence** - Doctors and medical assistants expressed professional **confidence** in caring for NHIF patients with infection, and antibiotic prescriptions. - But others expressed difficulties in antibiotic prescribing decision due to investigation resources availability. **Indifference** - Some of them feel that NHIF motivate irrational prescribing and in appropriate use of antibiotics, despite the emergence of resistance. **Responsibility** **-** All prescribers said that the responsibility of antibiotics resistance lies with others. **Ignorance** **-** Most of them said; there is no evidence there is antibiotic resistance in kassala state due to lack of studies and research. **Fear** - Most of them express they fear of patients case complications.	*- "I am not suffer or found difficulties to choose the suitable antibiotic." (MA 50, 18)* *- "Yes; it's very difficult, because in most of cases we prescribe antibiotics not on basis of culture and sensitivity".(Spt 25, 19)* *-"The supporting of health insurance to the patients by paying 75 % of prescription cost, breed pressure on Gps to prescribe over medicines and refer a lot of patients to specialist, this cause antibiotic*

		over prescribing." *(Spt 40, 25)* *- "Unnecessary prescription of antibiotics from doctors and paramedical is main cause of resistance."(spt 33, 34)* *-"Some pharmacist dispense antibiotics without prescription, so am not included in this practice."(MA 30, 33)* *- "We have no evidence, but over prescribing of antibiotics is main cause of the resistance. Am not aware of antibiotic resistance; because there is lack of studies."(spt 40, 145)* *- Here in New Halfa there is allergy of asbestos used in water network bib lines, we prescribe antibiotic with antihistamine to avoid the secondary infection."(GP 34, 34)*
3. Knowledge	-They stated the university had little effects and gain their knowledge from field and source of knowledge (BNF,	*- "Always i use BNF and my boss instructions and I*

	pharmaceutical companies. Etc. - UTI, is debatable area of emergence of antibiotic resistance, because of uncertainty prescribing pattern around (continuous antibiotic treatment failure and turbid urine even after it cured especially in pregnant women and elderly patients).	*saw Sudan hand book guides but i never use it before. i think this sources are not enough but we prescribe certain group of antibiotic not need much information."(GP 40, 57)* - "*Medical representative are always here, we update ourselves from their presentation."(Spt 39, 41)* - *"We begin with ofloxacin and then amikacin) if no Improvement , I will shift to the urine culture . Although I know that many doctors will not agree with me."(SPt 51, 147)*
B. Behaviour	- The years of experience had direct effect on the antibiotic prescribing reduction, compared himself with other colleague more experienced than him. - NHIF insured patients Pressure on prescribers to prescribe antibiotics has impact on antibiotic prescribing behaviour. - The cost and affordability to the patient is one of important	- *"I think another factors like experience affects prescribing pattern, i.e. the most experience doctors prescribe less antibiotics."(spt 40, 118)* - *The patient of NHIF were very poor and not able to pay for*

	issues in antibiotic prescribing, it has crucial influence. - Symptoms, age and signs of the patient and laboratory results oriented the prescribers towards antibiotic prescribing. - NHIF policy in medicine supply system had effect as they expressed, sometimes the availability of specific antibiotics in specific facility, made the antibiotics prescribing easy rather than narrow choices - Many of them stated; NHIF regulations and it is essential medicine list affect positively and negatively antibiotics prescribing pattern. -The pharmaceutical companies had obvious influence on prescribers by pushing them autonomously prescribe the specific company trade name. On the other hand they prescribe in trade name to be readable for dispensers. - The belief of the cost reduction of NHIF medicine effect on the prescriber's behaviour.	*changing antibiotics, if decide to change it to more potent antibiotics. Generally insured patient in Girba were poor."(GP 40, 114)* -*"Before I took decision I consider; antibiotic side effects, social status of the patient could he pay for this antibiotics or not?"(GP 34, 73)* -*"The history of the patient, examination and more laboratory investigation are done before antibiotics prescribing."(MA 50, 129)* -*"The antibiotics logistic system in NHIF sometimes influence, because we prescribe samixon they dispense another trade name based on financial issues."(spt 40, 224)* - *"NHIF Drug list play important role in antibiotic prescription*

		positively because not all antibiotics prescriptions open."(Spt 25, 172)
		- "NHIF list constraint us and affect our decision negatively, because we prescribe simple antibiotics."(GP 30, 145)
		- Pharmaceutical industries sometimes had direct effect on our involuntary habitual prescribing for example we prescribe the common known trade names for example ; flagyl , samixon.etc. Trade names."(spt 40, 240)
		-"I usually use the trade name because it's more familiar to the pharmacy staff especially drug-sellers."(GP 42, 178)
		-"No expenses reduction consideration to health system, because all ready NHIF drug list offer simple

		antibiotics."(GP 40, 196)

6.1.2 Pharmacist interviews
Pharmacist knowledge

To understand the influence of medical school on antibiotics dispensing knowledge and opinions, all of them report that university education had passive role on the knowledge built about antibiotics. They stated that most of their antibiotics knowledge derived from practice field.

They show different responses of dispensing antibiotic or not for interview case (patient with 39 C fever, nasal discharge and throat pain for three days) ;

"NO I will not give him antibiotics; because may be he has malaria, or some other infections rather than bacterial infection, maybe I give him just my advice or I will give him corticosteroids, lozenges if he has mild bacterial infection."(ph 32, 54)

"This case; Need antibiotics because he has fever which means that he had infection."(ph 39, 40)

Pharmacist attitude;

Confidence attitude

They show high confidence in antibiotic Over The Counter dispensing and they expressed there is no difficulties to dispense antibiotics , because they know the case of patients who come for self-medication well in addition to those patients had some knowledge about antibiotics.

"It is not difficult to dispense antibiotic (OTC).I feel like a therapist."(ph 39, 19)

Indifference attitude

There is high percentage of antibiotic (OTC) dispensing in kassala state as general , as expressed and feel uncomfortable about that ;

"According to my practice, may we dispense up to 60 % of antibiotics without prescriptions as (OTC).Yes; am feeling very bad about that."(PH 32, 23)

Practice and behaviour

We want to understand the practice of pharmacist according to the above described knowledge, opinions and attitudes that may have direct or indirect influence in addition to other conditions that attributed to kassala state and NHIF as example environmental context.

Other pharmacies not stick to ministry of health regulations of (OTC) antibiotic regulations area, so this motivate them to dispense antibiotics more frequently, to keep their customer patients. As they stated.

"Sure I fear that to lose the patient, because if a refused to dispense him antibiotics there is a billion of pharmacies else and they are not committed with ethics and they can dispense him antibiotics in respect of profit."(ph 39, 22)

Most of patients attended pharmacies were (OTC) patients and most of them ask for antibiotics (OTC) dispensing.

"In my state about 80 % of pharmacy visitors asking for antibiotics without prescriptions."(ph 32, 96)

They expressed that the insured patients asking for antibiotics , when they need to save their time and seeking for specific antibiotic, may not prescribed by NHIF doctors.

"One of the reasons of insured patient self-medication he doesn't want to spend his time with doctors, because he thought, if he goes to the doctors may not prescribe him specific antibiotics which he expected".(ph 39, 86)

Pharmacists feel they must have wide options to dispense and prescribe (OTC) antibiotics.

"I think the pharmacist can prescribe a lot of medicines with wide list of (OTC) no problem."(PH 39, 83)

They expressed different feeling about the influence of pharmaceutical companies through information, bonus system and cheapest antibiotics.

"The pharmaceutical companies had weak Influence."(ph 39, 91)

They stated that payment mechanism has no effect on their antibiotics dispensing practice , because they paid in salary base mechanism , but other pharmacist in private sector who had percentage on sale , it affect.

"When we have percentage in sales this will affects, but on salary base has not effect."(ph 32, 122)

"Whatever the volume of pharmacy sales my salary is always fix."(ph 39, 98)

Table 13 Most important findings of pharmacist interviews

Pharmacists interview	Findings	Quotes
A. Intrinsic factors		
1. Socio-demographic factors	- All of them report that university education had passive role on the knowledge built about antibiotics. They stated that most of their antibiotics knowledge derived from practice field.	*- "We studying antibiotics in general, and not influence on our knowledge as much."(ph 32, 13)*
2. Attitudes	**Confidence** -They show high confidence in antibiotic Over The Counter dispensing and they expressed there is no difficulties to dispense antibiotics , because they know the case of patients who come for self-medication well in addition to those patients had some knowledge about antibiotics. **Responsibility** They have contrast opinions about responsibility of occurrence of antibiotic resistance, lies between the doctors, pharmacist and patients. **Fear** They show same fear feeling about losing the patients if they are not dispense (OTC) antibiotics for those patients.	*-"Antibiotics dispensing, not that difficult (am confident), because antibiotics used for specific cases. At least most patients have some knowledge about the first generation antibiotics like amoxicillin antibiotic."(ph 32, 102)* *- "The patients responsible of antibiotic resistance rather than pharmacist."(ph 39, 27)* *- "The most responsible are; the medical*

		(doctors and pharmacist)."(ph 32, 45)
		-"If I not give them antibiotics they can easily get it, because all workers in pharmacies here is not pharmacist, so they easily dispense (OTC) antibiotics many times in wrong way."(ph 32, 27) *-"He will go to other pharmacy and get antibiotics from it."(ph 39, 30)*
3. Knowledge	-For specific cases with preconditions for example renal failure patients and pregnant women they have different responses according their knowledge.	*- Most likely when the patient had kidney problems or pregnant I try not to give him an (OTC) drug and advise him to go to his counselor or see doctor."(ph 39, 52)* *- "Pregnancy (month of pregnancy is first trimester or second or…) always give her second and third generation because it is safe."(ph 32, 69)*
B. Behaviour	- The interviewees stated that kassala weather had major role in antibiotics (OTC) dispensing, because always it was hot and prone bacterial	*- "We use antibiotics for any things as generals for many disease in kassala , if the*

	infection which need antibiotics.	*patient had bacterial infection , sore throat pain after drink cold water . Especially during this month (may) because the weather was hot and more infections occurred."(ph 32, 20)*
	- Fever, throat infection, UTI, headache, cough and nasal discharge are more attended cases for pharmacies and it had direct impact on their antibiotic dispensing behaviour. And amoclan and amoxicillin antibiotics were more demanded by patients. - Patients'- pharmacist relation had direct effect on antibiotics dispensing behaviour, in addition to patient pressure on the pharmacist to get antibiotics. - The state ministry of health doesn't enforcement the regulations that organize (OTC) antibiotics dispensing practice. - They expressed different feeling about the influence of pharmaceutical companies through (information, bonus system and cheapest antibiotics).	*-"We dispense (OTC) antibiotics when the patient has fever, throat infection, UTI, headache and nasal discharge or cough. And They request Amoclan antibiotic"(ph39, 43)* *- "Most dispensed antibiotic was first generation (amoxicillin), because had experience with it."(ph 32, 102)* *-"Yes affects; (patient pressure, relation with pharmacist or staff) they easily got antibiotics."(ph 39, 73)* *-"There is no organized inspection*

		campaign from ministry of health due to the few number of pharmacist work there, so no regulation or enforcement for antibiotic (OTC) list."(ph 32, 107)
		- "Affects through (information, bonus system and cheapest antibiotics."(ph 32, 115)

6.1.3 Patient interviews
Patients' knowledge

We want to understand the knowledge of the patients perceived health, satisfaction antibiotics and self-medication, of the interviewees.

They have different degrees of information and knowledge about antibiotics as medicine and treatment process this information concentrated on their believing about antibiotics is medicine that kill the pain and remove inflammation from the blood.

'Antibiotics always decrease the pain, but the oily injection (antimalarial) remove the fever."(pt 50, 47)

They use antibiotics according to their symptoms and signs, the pharmacist is the main source of this antibiotic and information as they expressed.

"Use flaggy for dysentery especially when I have mucous in my stool and tetracycline to minimize my signs and symptoms like gastric pain."(pt 38, 11)

"The pharmacist dispense you a drug and you don't know is it antibiotics or not, but I know that it treat the flu and wound infection."(pt 36, 61)

"Am not sure about the concept or the type or even the name of antibiotics Just I know 500 and 250, for flu symptoms."(pt 50, 51)

In case of pregnant woman, all of them know the medicines generally harm her, they must take her to the doctor.

"For pregnant women, I think it is important to treat them with doctors."(pt 38, 61)

"Just I take my wife to the doctor when she is pregnant, because the medicine may harm her."(pt 50, 63)

The sorting out different sources of antibiotics knowledge; first aid courses, doctors, pharmacist, other health professionals and TV health outreach programs (like Sahatak and Saha wa afia).

Patients' attitude;

Most of them stated they keep antibiotics as reserve, to treat infection, when they feel ill.

"When I go to the gold mining in desert I keep antibiotics with me as prevention."(PT 50, 16)

Some of them stated that; they go to pharmacy more than one time to dispense (OTC) antibiotic for same symptoms, after that if the antibiotic treatment failed, then they will see the doctor.

"Always I took antibiotics from pharmacy i try to complete it is duration and course period, after that if it failed to treat me i go to the doctor."(PT 38, 70)

They have different attitudes towards the expectations of prescription contain antibiotics.

"I expect the doctor to prescribe me antibiotics, if he do not do that .if he gives convinced reasons I will accept, if not I will go to pharmacy."(PT 36, 31)

"I have not specific medicine expected from the doctor to prescribe it for me, I trust him just he can choose or prescribe suitable one for me."(PT 50, 27)

Patients' behaviour:

Use of antibiotic with water and store the medication under bed sheath, pillow and in the refrigerator is the dominant behaviour among interviewees.

"I took my medicine with water as instructed, I store the medicine in cupboard, table and fuddia."(PT 36, 34)

I always took antibiotics with water, and store the medicine under the bed sheath or pillow."(PT 50, 27)

Table 14 Most important findings of patient interviews

Patients interview	Findings	Quotes
1. Socio-demographic factors.	- Some of them thought that; the poor families seeking for self-medication rather than others. -The ability of purchasing specific type of antibiotic from the pharmacy, motivate them to have antibiotics self-medication.	*"Some poor families went to the pharmacy asking for antibiotics treatment because they have no money."(PT 50, 43)* *-"When I haven't 20 SDG (the price of three tablets) I will go to the doctor in NHIF, but as general I know that NHIF medicine is simple, otherwise I will go to the pharmacy."(PT 36, 49)*
2. Attitudes	-Most of them stated they keep antibiotics as reserve, to treat infection, when they feel ill. - They thought, because of Kassala's weather the symptoms of flu will not treated completely, it may reoccur in few days. And always they dispense amoxicillin as (OTC) antibiotic. - All the patients stated that; the high frequency of antibiotic dose regimen cause dosage missing, for example antibiotics taken every 6 hrs. - One of the reasons led the insured patients to (OTC) antibiotics; they said there is general concept in community, thought medicines in NHIF with low quality because it	*-"Always I keep antibiotic in my pocket and in my house as reserve, (for example always I keep flagyl and tetracycline)." (PT 38, 12)* *-"Because the weather in Kassala is so hot and always we have public transportation crowd ness, the symptoms of flu will not disappear or eradicated totally. Always I took amoxil for flu."(PT 36, 67)*

	was supplied from cheapest sources.	*-"I think it so difficult to stick to 6 hourly antibiotics dosage regimen, I always forget to take the dose, so at the end of treatment days I missed 3-4 capsule."(PT 36, 92)*
		-"The general concept in the community; the medicines supplied by NHIF are cheap and second degree, this issue sometimes push me to go to the pharmacists asking for self-antibiotic medication."(PT 36, 54)

3. Knowledge	- They have different degrees of information and knowledge about antibiotics as medicine.	*-"I haven't much information about antibiotics, but I know it remove the inflammation from the blood and treat the flu as general."(Pt 36, 61)*
		-"Am not sure about the concept or the type or even the name of antibiotics Just I know 500 and 250, for flu symptoms."(pt 50, 51)
	-Some of them said complete the antibiotic course and other stated that they know when symptoms cleaned out they must stop treatment and re use it when come back.	
		-"I use the antibiotic according to my clinical situation specially flagyl increase the dose when my gastric pain increase and I stop treatment when my symptoms disappear and I am not complete the course or treatment days and keep the rest in refrigerator , if the symptoms come back I will start it again ."(pt 38, 70)
	-The sorting out of different Sources of antibiotics knowledge; first aid courses, doctors, pharmacist, other health professionals and TV health outreach programs (like Sahatak and Saha wa afia).	*- When I begin to use antibiotics always I complete the course."(Pt50, 60)*
		- My source of antibiotic

		information is first aid courses, doctors and pharmacist.”(PT 38, 64) *“From TV health outreach programs (like Sahatak and Saha wa afia).”(PT 36, 86)*
4. Behaviour	- Gastric pain, amoebic dysentery, fever, chest pain and flu are main symptoms of antibiotic self-medication behaviour among interviewees.	*- “I use my antibiotic (flagyl and tetracycline) when I have gastric pain or flu and dysentery.”(PT 38, 14)*

	-Some of them stated that, it was so easy to get antibiotic from the pharmacy, because you can buy a number of capsule or tablets according to your ability to pay. -Some of interviewees thought that pharmacist dispense good antibiotics rather than doctors.	*"I took antibiotics early; when I was a child my father gave (3 tablets for fever) as preventive in rainy season, and from that time I took it for long time, but now a days when I am ill I go to the doctor."(PT 50, 15)* *-"They dispense you antibiotics according to your ability to pay for example if you want (8 or 16 capsules) they will give it to you. I think many years ago the number of capsules per course were 16 but now I think it is 10 capsules only."(PT 36, 18)* *-"Always I go to the doctor, but sometimes the pharmacists gave me more effective antibiotics rather than doctors with short period."(PT 36, 48)*

6.2 Discussion

This is the first study to investigate the opinions of health care professionals in NHIF in Kassala state and Sudan about antibiotic prescribing, dispensing and use to understand their attitude and behaviour. In addition, this study also examines patients' self-medication. We come up with results through it we suggest recommendations and intervention strategies for antibiotics stewardship in NHIF according to the study findings and participants suggestions for improving antibiotics use in NHIF in kassala state.

The findings have provided useful information help us to understand the NHIF antibiotic prescribing, dispensing and use culture in more details. The challenges relating to antibiotics prescribing in NHIF in Kassala state were identified along with many issues such as the health professionals beliefs about NHIF antibiotic supply system and NHIF health care delivery. This study has found that the antibiotic prescribing, dispensing process is complicated in NHIF and influenced by many factors as tackled in conceptual framework; those factors are attributed to intrinsic factors (Socio-demographic factors, Physicians' attitudes, Physicians' knowledge) and extrinsic factors (Patient-related factors, Healthcare system-related factors, Other factors). And the patient's antibiotics use, as self-medication these factors attributed to the socio-demographic, knowledge and patients attitudes towards antibiotics use.

Health care professionals

Qualitative interviews (semi-structured) with specialist doctors, general practitioners, medical assistants and pharmacists were carried out in three localities in NHIF Kassala state showed the following categories of factors that can influence antibiotic prescribing decisions:

Intrinsic factors (Socio-demographic factors, Physicians' attitudes, Physicians' knowledge) extrinsic factors (Patient-related factors, Healthcare system-related factors, other factors).

In-depth analysis of these factors that may result in inappropriate antibiotic prescribing decisions, such as complication avoidance ('we fear of more complications '), pharmaceutical companies pressure , and patients request pressure by, family members or medical peer.

Intrinsic factors ; these factors are , socio-demographic factors of health professionals , the study captured few factors that had direct effect on prescribing pattern ; for example practice years and years of working with NHIF lead to reduction of antibiotics prescribing as expressed experience affects prescribing pattern in addition to medical specialization which has great influence on prescribing pattern , this goes with study done in Hong Kong (Lam TP, 2001). on other hand influence pharmacist dispensing pattern as mentioned by study done in Spain. More over the participants agreed that university education had no much influence on their antibiotics prescribing practice, but basic information, and their practice knowledge acquired from work field training this results in line with results of qualitative study done in India to tackle environmental factors that develop antibiotic resistance(Sahoo KC, 2010).

Physicians' knowledge; the study found there were ignorance of antibiotics resistance due lack of knowledge because of antibiotic research shortage in addition to ignorance of National guidelines. Same results found in study conducted in Ireland in long term health care facilities used semi structured interview to explore health professional's views about antibiotics prescribing pattern in LTHCF(Fleming et al., 2014).

The study revealed the source of information was not enough and there was no hard copy or even soft copy of the standard treatment guideline they could fellow specially in preconditioned cases for example (renal failure , liver impairment and pregnant women) and drug -drug interaction, Other qualitative study done in Ireland investigate the doctors, pharmacist and nurse views about the use of antibiotics revealed all the doctors not know the standard treatment guidelines (Fleming et al., 2014).

Attitudes of participants more interesting, because six attitudes were captured by study, with different degree of influence, those attitudes were; (confidence; absolutely shown, indifferent; most of them of them expressed it directly, complacency; to some extent, responsibility of others; absolutely shown, ignorance; almost shown, fear; absolutely shown behind fear of case complication) all these attitudes emerged as being the most important factor affecting antibiotic prescription. These finding typical with results done in different countries collected in review study done by(Lopez-Vazquez P, 2012)

The pharmacist's attitudes captured by study were; (confidence, indifferent, responsibility, ignorance and fear) with different degree of influence but must

influencing is fear. This findings resemble results of study used (FGDs) tool run in Portugal explore pharmacists knowledge, attitudes, perceptions and dispensing habit (Roque et al., 2013).

Extrinsic factors; one of these factors patient related factors which showed big role in the antibiotic prescribing practice influence this mainly through; signs and symptoms for example their response to the case of fever of <3 days or throat pain characteristics were associated with antibiotic prescribing, even though there is no scientific evidence to show that antibiotics are necessary this results same as observational study conducted in tertiary care hospital in Cleveland, Ohio(Hecker MT, 2003). And the result for other study carried in sudan aim to study the dispensing practice of Khartoum and Khartoum north pharmacies (through fabricated case visited 63 pharmacies) (Berih, 1989).

In other hand patient socioeconomic factors like cost of antibiotic to the patients was one of dominant factors had direct affect , this was identical with qualitative analysis of semi structured interviews carried out in Iceland to explore general practitioners' (GPs') reasons for prescribing antibiotics by telephone (H. E. Björnsdóttir I, 2001). The pharmacists not mentioned the cost consideration for patients, by they stated that the patients may had many excuses when seeking for self-medication one of which was save money.

Other theme that emerged was patient's communication barriers due to various languages in kassala state as prescribers and pharmacist stated it had direct effect because it lead to uncertainty in diagnosis, the finding captured in Netherlands in long term health facilities through qualitative research tackled factors affected antibiotic prescribing(van Buul et al., 2014). but this theme not captured by pharmacist.

Other reason for antibiotics over prescribing was health insurance card (insured patients) which motivate prescribers to prescribe expensive antibiotics and sometimes prescribers did this to reassure them, maybe there were many study had same result or contradicted but we are not capture it.

Health care system related factors that lead to antibiotics over prescriptions; both directly and indirectly: (i) directly via implemented policies, guidelines; and (ii) indirectly by, say, the influence of patient volume and stress, which encourage antibiotic prescriptions based on self-confidence in antibiotic treatment and/or the fear of more thoughtful complications developing or of losing patients. Our study found that

nobody fellow guidelines and protocols and NHIF medicine list was debatable, some of prescriber for example GPs and medical assistance saw it more constrainable for them because their prescribing level play around simple antibiotics, but many specialist saw it was fair to avoid antibiotics resistance. But all of them stated NHIF always supply the cheapest antibiotics, and this had direct influence in their antibiotics prescribing pattern. Same findings found in qualitative study of GPs' decisions to prescribe broad-spectrum and fluroquinolone antibiotics done in united kingdom(Wood F, 2003).

   Other important and crucial influential factor was the lack of laboratory investigations specially sensitivity culture and accuracy of laboratory results. This results in line with founds in study carried out in India screened attitude of practicing physicians upon prescribing antibiotics (Sivagnanam G, 2004).

The indirect factors that effects the prescribing and dispensing for example crowd ness and patients antibiotics expectation , sometimes prescribers affected by crowd ness and time pressure which may had a role in frequent prescribing of antibiotics , in other hand because of this reasons in addition to NHIF list constraint , sometimes insured patients seeking for antibiotics self-medications. Same results of qualitative study conducted in Britain asked why general practitioners use antibiotics for sore throat, using ground theory interviews(L. P. Kumar S, Britten N.   , 2003).

  In other hand antibiotic (OTC) practice in Kassala state had direct role in over dispensing of antibiotic, because the state ministry of health doesn't enforced the regulations organize (OTC) antibiotics dispensing. This seen in (Brazil, Argentina, Lebanon, Philippines, Taiwan and Nepal)(Gould & van der Meer, 2005)

   There were a lot of other factors had dominant and frequent impact on antibiotics prescribing and dispensing pattern as example; pharmaceutical companies, we found that it had many aspects of influence; it was major source of antibiotics information for prescribers and pharmacist, it had direct effect their on their habitual prescribing and dispensing pattern (always prescribing in specific trade names), it influence their trust on the types and dosage form of antibiotics "really I prescribe in trade because of quality of these antibiotics although it is expensive". This goes with same result from quantitative study conducted in India screened out the factors that influence primary care physicians to prescribe antibiotics(W. C. Kotwani A, Katewa S, Joshi PC, Holloway K. , 2010).

And with questionnaire study carried in Sudan by kamaleldin and others determined the impact of pharmaceutical promotion on medical practice in Sudan prospectively(Idris KM, 2009)

Pharmacist stated that pharmaceutical companies also had influence on their antibiotic dispensing pattern through the sales offers and bonus system, this found supported by the previous study done by kamaledin.

One of other external factors tackled was peers they effect through share of knowledge and training in field or through direct request to his colleague for direct prescribing of antibiotics the patients or themselves, this was in line with results of qualitative study done in India to tackle environmental factors that develop antibiotic resistance(Sahoo KC, 2010).

Other factor payment mechanism they stated ; it had no impact , which contradict with study carried out In Thailand through survey by (John Bryant and Aree Prohmmo in 2004) examined the effect of payment mechanisms on prescription patterns.

Patient self-medication

There were many factors behind our respondent's opinions and attitude towards their perceived antibiotic self-medication those factors mainly encored in (socio-demographic, patients attitudes and patient knowledge)

Patient attitude our study captured their attitude when they express "always we keep antibiotics as reserve" and some time they use it as prevention, and they always use first generations of antibiotics as example amoxicillin.

There were other thought that because of hot and dusty weather, the symptoms of flu will not treated completely in kassala and these symptoms may reoccur in few days. But we didn't capture study with same results.

The study captured the participant's statements about inadherance to doctors or pharmacist instructions due to high frequency dose regimen for example antibiotics taken every six hours.This finding in line with results of study conducted in Taiwan through questionnaire designed to evaluate general knowledge and attitudes towards antibiotic usage. (Changhua Chen1, Yu-Min Chen2).

One other factor selected by insured participants push them to do self-medication was medicines supplied in NHIF settings with low quality. This result in line with results of

Brazilian qualitative (FGDs) study to check the qualitative approach of self-medications motivations. (Naves, Castro, Carvalho, & Merchán-Hamann, 2010)

Another finding that patients trust the (OTC) antibiotics dispensed by the pharmacist and it is more effective in addition to save time and money. Same result stated in study done in china measured the factors affected patient behaviour towards antibiotics self-medication, through in-depth interview. (Wen, Lieber, Wan, & Hong, 2011)Bitter taste and side effects of antibiotics sometimes led the patients to self-medication.

Patients knowledge; we found that all interviewed participants had no enough of knowledge about the basic information of antibiotics, some of them didn't know the name of antibiotics and other didn't aware how to store antibiotic. Their information about knowledge sometimes drawn from television programs. Moreover they requested an antibiotics prescribing or (OTC) self-medication when they suffered from flu-like symptoms. This finding in line with results of study conducted in Taiwan through questionnaire designed to evaluate general knowledge and attitudes towards antibiotic usage.(Changhua Chen1, Yu-Min Chen2)

We found that participants believe that, it was not harmful to use antibiotic for any period of time they want and they could stop it and re use it safely without any consequences problems, this is same as results of previous study conducted in Sudan. (A. Awad et al., 2005).

CHAPTER VII

Conclusion and recommendations

This part the study will illustrate the conclusion and final findings of analysis and brief interpretation, more over recommendations and study limitations and possible extensions.

7.1 Conclusion

Rational use of medicine in Sudan is one of health problems that need urgent intervention because all medicine use indicators deviated from WHO indicators, antibiotic use one of the highest deviated indicators, since prescriptions containing antibiotic fluctuated between (41% to 81.3). The question what is (opinions, attitudes) behind this irrational use of antibiotic, because the problem may lead to health care system collapse in Sudan.

In NHIF kassala state the problem of antibiotics use is more serious, because kassala is one of the three state in Sudan that had highest antibiotics prescribing pattern it was (66 %) and antibiotic expenses represent 36.63 % of the state medicine budget.

The aim of the study to understand and discover the health providers' behaviour and attitude of prescribing, dispensing and patients' self-medication, in executive directorate of NHIF kassala state, eastern of Sudan. The study carried out in three localities over 11 localities; kassala, Algirba and New halfa, The data collected via semi-structured in-depth interview from (18) interviewees during May 2015. The study run Nvivo 10 for windows to analyze the data.

Concerning the health professionals

7.1.1. Intrinsic factors

For Socio-demographic factors, physicians' attitudes and physicians' knowledge

In socio-demographic factor ; the study illustrate there was big role for university education, but it captured the effect of practice years and specialism in professionals' knowledge and antibiotics prescribing pattern .in other hand the study revealed that the source of antibiotics knowledge for health professionals was not enough.

In physician knowledge; In addition to not enough source of information, the study revealed there is ignorance for antibiotics resistance in kassala state between prescribers and pharmacists due to lack of knowledge.

In physicians' attitude; there were six attitude captured (complacency, indifference, confidence, responsibility, ignorance, fear) with different degrees of influence on antibiotics prescribing practice, but the pharmacists' attitude, all attitude were captured except complacency.

7.1.2. Extrinsic factors

(Patient-related factors, Healthcare system-related factors, other factors) Patient-related factors; the study showed the signs , symptoms and clinical presentations) were influential on antibiotics prescribing and dispensing pattern, socioeconomic status of the patient was dominant factor in addition to patients 'health insurance , communication barriers.

Health care system related factors; NHIF policies and regulations had great impact (as example; all of respondents stated directly the constraints effects of NHIF list) on antibiotics prescribing pattern and indirect on dispensing pattern, but there was ignorance for standard treatment guidelines and protocols. In other hand lack of laboratory resources and inaccuracy of laboratory results had dominant impact resulted in over prescribing pattern. Other indirect factors tackled were, crowded ness and patients' antibiotic expectations this factors might pushed out the patient seeking for (OTC) antibiotics.

Other factors ; the study found that the pharmaceutical companies in NHIF and Kassala state as general I had crucial role in antibiotic knowledge practice (prescribing, dispensing pattern)

Peer had direct effect on antibiotic decision through share of knowledge and training in the field or they requested from each other to prescribe antibiotics.

But payment mechanism the study showed it had no direct effects.

Regarding patients' antibiotics self-medication;

Patients' attitudes the study showed the patients dispense (OTC) antibiotics to keep it as reserve and use it as prevention in specific symptoms. They thought the hot weather of kassala is one of reasons of over antibiotics self-medication.

Also the study captured in adherence to antibiotics dose regimen and duration and not fellow doctors and pharmacist instructions, which may lead to develop resistance for antibiotics.

The study captured confidence of patients on the pharmacist as they dispensed more effective antibiotic rather than doctors and medical assistants, as one of more influential factor on over dispensing of antibiotic pattern.

The study revealed that the insured patients seeking for (OTC) antibiotics, because they thought the health medicine had low quality.

Patients' knowledge; all participants had no enough knowledge about basic information of antibiotics as example , the name , concentration , regimen, duration and storage conditions, and flu like symptoms was the main requested.

All the patient thought nothing happen if they use antibiotics at any time and stop at any time, just it will cure them rather than harm.

The main finding of the study conclude as follow;

All opinions, knowledge, attitude, behaviour behind antibiotic practice (prescribing, dispensing, use) were capture through understanding of;

Summary of Factors affects antibiotics prescribers' practice;

Intrinsic factors are; (Socio-demographic factors, Prescribers' attitude, Prescribers' knowledge).

And extrinsic factors are ; (Patients' related factors, Health care system related factors, Pharmaceutical companies related factors, Peers related factors, Payment mechanism)

Summary of Factors affects pharmacist' practice;

A.   Intrinsic factors are; (Socio-demographic factors, Pharmacists' attitude, Pharmacists' knowledge)

B.   Extrinsic factors are; (Patients' related factors, Health care system related factors,Pharmaceutical companies related factors, Peers related factors, Payment mechanism)

Summary of factors affects patients' antibiotics self-medication;

(Socio-demographic factors, Patients' attitude, Patients' knowledge).

We confirm that all of these findings will promote a better understanding of health care professionals and patient's awarenss of the factors that influence the antibiotic use

process, and we clarify how such factors influence the decision making process, and highlight their importance in the design of strategies aimed at tackling this concern effectively.

The relation between the prescribers, dispensers, patients concerning antibiotic use in NHIF kassala state according to the study findings lead to overuse of antibiotics and may develop disastrous rate of resistance and wasting more time more resources.

7.2. Recommendations

The study captured the knowledge, attitudes and behaviour behind the practice of antibiotic use in kassala state which need effective strategies to improve antibiotic use, the study suggest;

Knowledge:

The executive directorate of kassala state should build strong information system, about antibiotic prescribing, dispensing pattern (guidelines, antibiotic resistance and updated data base information about antibiotics indication, adverse reaction, interaction…etc. This could be done through formulation of drug and poison information center in NHIF kassala state.

Present information to emphasize importance of not prescribing antibiotics inappropriately. Influential communication of information, supported by consultant Pediatrician and multidiscipline of specialists, through formulation of drug and therapeutic committee in kassala state.

Formulation of infection control committee at kassala teaching hospital as partnership between NHIF Kassala and state ministry of health, to control microbial infection, run researches and as source of antibiotic use information in state.

NHIF Kassala state should provide copies of the available national guidelines and supporting evidence.

Attitude and behaviour:

At NHIF head quarter level antibiotic policies and standard treatment guidelines must be revised and enforced, in coordination with federal ministry of health.

NHIF Kassala state must encourage doctors, medical assistant and pharmacists to promote guidelines, protocols audit and feedback of antibiotics practice in NHIF and

bench mark it with other facilities also tackle the stick ness and deviation from (STGs) and accredit incentives system.

NHIF kassala state should revise organizational structure and investigation resources availability, to encourage rational practice of antibiotics.

Public outreach of rational use of antibiotics.

7.3. Limitations of the study and possible extensions

This study is the first to undertake qualitative interviews investigating antibiotic prescribing in National Health Insurance Fund (NHIF) as general and kassala state in special.

The study captures the opinions of the healthcare professionals involved in antibiotic prescribing and dispensing in NHIF, general practitioners, specialist, medical assistants and pharmacists. In addition to patients as antibiotics self-meditators.

Regarding the qualitative methodology the study sample cannot be representable and the result will not use outside kassala state in NHIF settings.

 Due to the time constraint study didn't check the data saturation.

The study carried in three localities the health care service mainly concentrated in urban area rather than rural area.

One of important internist interview information not completed and excluded.

The pharmacist practice years fluctuated between (1-5) years, at they were at the same level of experience years.

It was not easy to run interview with a female self-medicate patient, due to the local culture and language barrier (local language).

Antibiotic resistance strains evaluation researches must be done, in NHIF and Kassala state.

Evaluating study for NHIF medicine supply system, concerning health care providers and patients satisfaction.

Further same antibiotic qualitative studies should be done in other three state of NHIF executive directorates with (low, medium and high) antibiotics prescribing pattern.

Antibiotic use improvement interventional studies in NHIF.

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APPENDIX A: Prescribers guide questions

Questions for in depth interviews: Prescribers

A. Intrinsic factors

1. <u>Socio-demographic factors</u>

Code: ………… Age: …… Sex …… Years of medical practice after medical school: …………….. Years of working with NHIF: …………….. Locality: …………………
Facility name and it is location: ………………. Type of health care provision type: direct\ indirect. Medical specialization: …………………. Interview date and time: ………………….. Duration: ………mints, Payment mechanism: …………………… University education: Name of School:.……………………………………… Year of graduation: …………..
Continuing medical education in general: …………………………….

2. Physicians' Attitudes

1. Do you think the name of the university you graduated from or the type of education affects prescribing patterns, including antibiotics prescribing patterns, in Sudan? If it does, to what extent?

   How confident do you feel when prescribing antibiotics? Why? Do you think it is difficult to select the correct antibiotic? Why? (Attitude: confidence)

2. What are your feelings about the antibiotics prescribing practice in Kassala state? NHIF? (Attitude : Indifference)

3. Is it possible, sometimes, that you prescribe antibiotics to fulfil perceived patient \ parent expectations? Before they express their demand? Why? (Attitude : Complacency)

4. Do you think the responsibility for generating antibiotic resistances lies with others? Who? And why? (Attitude : Responsibility)

5. From your point of view and your prescribing practice, what is the relation between overprescribing and antibiotics resistance? (Attitude: Ignorance)

6. Do you prescribe antibiotics, sometimes, because of fear of possible future complications in the patients or fear of losing patients- Can we discuss this issue little bit more?

3. Physicians' Knowledge

7. Please can we discuss the importance of antibiotics knowledge for your career, now and in the future?

8. How do you perceive the role of university graduation in the early building of antibiotics knowledge? Was knowledge about antibiotics adequately in the curriculum?

9. Which sources of information do you use and trust as part of continuous medical education on antibiotics or when you have a specific question on antibiotics? Probe: (information from senior colleagues, information from colleagues of the same rank, information from pharmacist, national guidelines for diagnosis and treatment, NHIF guidelines, internet, university and hospital training and seminars- short courses- workshops and conferences)

10. Do you think you have enough sources of information about antibiotics when you need it?

11. A patient comes to the clinic complaining of fever (39 oC), nasal discharge and throat pain for 3 days. Does s\ he needs antibiotics or not? Why?

    a. In case of what symptoms and signs do you frequently prescribe antibiotics?

    b. Always, before you take a decision to prescribe antibiotics, which considerations do you make?

    c. What about the effect of other patient specifications (renal function, liver function, pregnancy) and antibiotics specifications e.g (ability to cross blood-brain barrier, antibiotics interactions with other medicines and food and effectiveness against aerobic bacteria) as existing preconditions.

12. Let us return back to previous case, do you feel that prescribing antibiotics was the right decision in this case? Can you explain this? If effective treatment decision can you support your feeling;

a. What is your understanding of a 'good' prescribing pattern? Probe: (Based on evidence, a formulary, routine, experience, observed effectiveness, etc.)

13. Can you remember and describe a "not good" decision in your antibiotics prescribing? Or that you were in doubt about whether it was a good decision or not?

14. In general, are antibiotics commonly prescribed for the patients of this facility?

15. According to you, how does the occurrence of antibiotics prescribing in this facility compare to the occurrence of antibiotic prescribing in other outpatient settings?

16. Can you tell me something about the occurrence of antibiotic resistance in NHIF Kassala during this year?

a. How often does it occur? Do you tackled it in this facility based on daily practice, or?

b. Do you believe there is an increase in antibiotic resistance? What is your feeling?

c. According to you, how does the occurrence of antibiotic resistance in NHIF Kassala facilities compared to the occurrence in Ministry of Health facilities?

d. Are you well aware of antibiotics resistant development, if not why not?

e. Do you think that antibiotic resistance is a problem in your clinical practice?

B. Extrinsic factors

4. <u>Patient-related factors</u>

17. Can you describe the most recent case in which you prescribed antibiotics?

a. Before you took the decision which considerations did you make?

b. Follow up questions raised when s/he mentions the following things; signs and symptoms, additional diagnostic information, clinical history, age of patient

i.   Were the clinical symptoms clear?

ii.   Are the clinical symptoms often (also) clear in other cases, in which antibiotics were prescribed?

iii.   Are there any patient groups in which the clinical symptoms is are often less clear?

iv.   Do you find proper diagnosing difficult if the clinical symptoms is are ambiguous or not clear? What would you think to do?

18.   Which preferences of antibiotics were expressed by patients, and or family? Are such preferences expressed frequently? To what extent did this occur with your prescription?

19.   Does the time period of the physician-patient relationship affect the way preferences of patients and family are dealt with? How?

20.   May other factors related to the patient demand matter? From your own experience could you explain please? Probe; sex, education, tribe, income, and even insurance card?

21.   Why did you select the specific antibiotic agent prescribed in the above described case? (E.g. patient allergies, patients' renal function, prior antibiotic resistance)

a.   Was this choice based on empirical grounds, or based on culture result at the time of prescribing?

b.   When do you decide to take a culture?

c.   What prevents you from taking cultures?

5. Healthcare system-related factors

22.   According to your experience, which factors may influence antibiotics prescribing other than patient-related or bacteriological factors?

Thoroughly question how and why these things were considered; Probe: time pressure, crowded-ness, staff shortage, staff turnover, presence/ availability of diagnostic resources, provider payment mechanism,

23.   What do you think about the NHIF health care system in Kassala, in terms of encouraging responsible use of antibiotics prescribing?

Thoroughly questions about; antibiotics logistics, organization structure, formularies-, WHO guide -lines, regulations, expenses to health system and essential medicine list, provider's payment mechanisms.

6. Other factors

24. How do your peers affect the antibiotics prescribing for your patients? Probe: training in field, consultants, or when you cover your colleague you try to do the same prescribing behaviour of your colleague.

25. Do you have any experience of prescribing brand-name antibiotics? If yes, explain. Please can you explain in details the role of pharmaceuticals industry in antibiotics prescribing in NHIF from your own opinions?

26. Do cost saving considerations for patient and health care system affect your antibiotic prescribing decision? If yes, please explain?

27. Do you think other factors rather than patient and bacteriological factors can motivate the antibiotic prescribing pattern? For example provider payment mechanism, social expectations, pharmaceutical companies sponsoring sessions and conference etc.

28. Do you believe that there are opportunities to improve antibiotic prescribing by prescribers (including yourself)? How?

29. Do you believe prescribers are open to such opportunities? How?

APPENDIX B: Pharmacists guide questions

Questions for in depth interviews: Pharmacists

A. Intrinsic factors

1. Socio-demographic factors

Code: ………… Age: …… Sex …… Practice years after graduation: …………….. Years of working with NHIF: …………….. Locality: ………………… pharmacy's name and it is location: ……………….Interview date and time: …………….…….. Duration: ………mints, Payment mechanism: ……………………… University education: Name of School: ………………………………. Year of graduation: ………….. Continuing education in general: …………………………….

2. Pharmacists' Attitudes

1. Do you think the name of the university you graduated from or the type of education affects dispensing patterns, including antibiotics dispensing patterns, in Sudan? If it does, to what extent?

     How confident do you feel when dispensing antibiotics? Why? Do you think it is difficult to select the correct antibiotic? Why?

2. Can you tell me about your feelings, as pharmacist, of the OTC dispensing of antibiotics in Kassala state in general?

3. Do you fear that if the antibiotics are not sold at this pharmacy, customers can get it somewhere else? Please can you explain this a little bit more?

4. What is your opinion about dispensing the patients' antibiotic without a prescription when they ask for? And how you relate this to emergence of antibiotic resistance?

5. What will happen if you ignore a patient's request for antibiotics, what do you think?

6. Who is/are most responsible for the emergence of antibiotic resistance?"
   Why?

3. Pharmacists' Knowledge

7. How do you perceive the role of university graduation in the early building of antibiotics knowledge? Was knowledge about antibiotics adequately covered in the curriculum?

8. A patient come to the clinic complaining of fever (39 oC), nasal discharge and throat pain for 3 days. Is he needs antibiotics or not? Why?

  i. In case of what symptoms and signs do you frequently dispense antibiotics?

  ii. Always, before you take a decision to dispense antibiotics, which considerations do you make?

  iii. What about the effect of other patient specifications (renal function, liver, pregnancy) and antibiotics specifications e.g (ability to cross blood-brain barrier, antibiotics interactions with other medicines and food and effectiveness against aerobic bacteria) as existing preconditions.

9. When you dispense antibiotics for patients, what kind of information do you give them?

10. Sometimes, wrong antibiotics are knowingly dispensed by pharmacists because there is no time to explain, would you agree with this statement? How we can deal with this issue? What is your opinion?

B. Extrinsic factors

4. Patient-related factors

11. From your own experience, can you approximately give me the number of customers that ask for antibiotics per day without prescription? And why do they ask for? Thoroughly (patient pressure i.e they insist you to get antibiotics , excuses e.g they are poor and don't want to lose their work by spending time in doctors queues   or patient pharmacist relationship e.g sometimes the patient had continuous frequencies to the pharmacy create this kind of relationships with pharmacist)

12. What brand name of antibiotics or antibiotics generation degree is most requested by the patients? Do you dispense it? Why?

5. Healthcare system-related factors

13. Is over the counter medicine (OTC) dispensing revised and inspected by drug authority to regulate antibiotic OTC dispensing? How? If not, why?

14. Are NHIF insured patients seeking for antibiotics without prescriptions? Why? More or less than uninsured patients?

1. 6. Other factors

15. Pharmaceutical industries are said to have a direct influence on OTC antibiotics. What is your opinion about that? Do you believe that generic antibiotics have advantages?

16. How do your peers affect your antibiotics dispensing without prescription to your patients?

17. In general, do payment mechanisms for pharmacists influence their antibiotic OTC dispensing? Including yourself, how? And Why?

18. In your opinion, what is the percentage of pharmacies that sell antibiotics without a prescription? If it is high, why?

19. Do you believe that there are opportunities to improve antibiotic dispensing by pharmacist, to rationalize it is use (including yourself)? How?

APPENDIX C: Patients guide questions

Questions for in depth interviews: Patients

1. <u>Socio-demographic factors:</u>

Code:………………… Age :……… Sex :………… Average income per month:…………….SDG

Total monthly consumption expenditures: …………….. SDG. Monthly food expenditures: …………………………SDG. Education:……………. Marital status:……… Locality :………………….. City :………… Health insurance: Y-N .Interview date and time:……………….. Duration:………mints

Tribe:……………..

2. <u>Patients' Attitudes</u>

1. What were antibiotics you used during the last three months? Did you use this antibiotic in order to not to get ill, as prophylactic? Why?

2. How did you start to take antibiotics by yourself? Describe your early behavior?

3. How do you use antibiotics, when given by the doctor? Do you follow doctors' instructions? ; Regularly, irregularly, late. Could you tell me in details?

4. If you have symptoms, do you expect the doctor to prescribe antibiotics? And if s/he doesn't, what will do you will do?

5. How do you use antibiotics (with water, tea, before or after meals)? And how do you set storage conditions of your antibiotic in general?

6. When you discover that the antibiotic taken is not effective, what do you do? What is the main sequence you follow?

7. If you suffer from antibiotics adverse effects, what will you do?

8. During your last infection; how did you get antibiotic? Through what pathway? Can you tell me a little bit more? Through clinics, pharmacy, other? If pharmacy, did you request specific antibiotics or consult the pharmacist?

9. Did you do self-medication during last three months if yes, why? For example you do antibiotics self-medications, to save time, money…etc

3. Patients' Knowledge

10. Are you familiar with the term antibiotics? What do you know about it? What do think about this treatment action?

11. Do you know that antibiotic is antimicrobial agent? What is the name of the antibiotics you always self - medicated? Why?

12. Let's talk about the aim of antibiotics use. Can you tell me about your self-experience of antibiotics use? When did you use these last time and what for?

      a. What were your symptoms? Do flu and pneumonia like symptoms always need antibiotics? Tell me.

      b. Which symptoms do you typically use antibiotics for? If these symptoms disappear, what do you do?

      c. What do you know about antibiotic use during pregnancy, renal failure, liver dysfunctions..etc.?

      d. From where do you get antibiotics knowledge? Probe (doctors , medical assistants pharmacists , TV , your friend , relative …)

13. How do you consult physicians and pharmacist about the use of antibiotics?

14. Can you tell me how you use your antibiotic? Frequency or regimen, duration for how long, completion of the course and treatment days? From where do you get the information?

15. Do you have the opportunity to rationalize the use of self-antibiotics how?

VITA