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Survey of Medicine Prices, Availability and Affordability in Mandalay, Myanmar

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เอ เอ ไคน์ : การสำรวจราคายา การมีอยู่ และความสามารถซื้อหาได้ในมัณฑะเลย์ เมียนมาร์ (SURVEY OF MEDICINE PRICES, AVAILABILITY AND AFFORDABILITY IN MANDALAY, MYANMAR) อาจารย์ที่ปรึกษาหลัก ผู้ช่วยศาสตราจารย์ ดร. ประเทือง หงสรานากร อาจารย์ที่ปรึกษาร่วม ดร. โรเบิร์ต เชดวิด แชปแมน, 138 หน้า.

การศึกษาภาคตัดขวางได้ดำเนินการที่เมืองมัณฑะเลย์ ประเทศเมียนมาร์ จำนวน 6 แห่ง เดือนมีนาคม ปี 2555 วัตถุประสงค์หลักของการศึกษาคือการระบุถึงราคา การมีอยู่ และความสามารถซื้อหาได้ของยาที่คัดเลือกแล้วบางชนิด โดยใช้เครื่องมือการวิจัยขององค์การอนามัยโลกและองค์การสุขภาพนานาชาติ (Health Action Internation) มีการเก็บข้อมูลด้านราคาและการมีอยู่สำหรับยาจำนวน 30 ชนิดจากแพทย์ผู้จ่ายยาจำนวน 20 ราย (DD) จากร้านขายยาจำนวน 10 ร้าน (PH) ที่เป็นโรงพยาบาลภาครัฐ จากร้านขายยาจำนวน 30 ร้าน (PP) ที่เป็นโรงพยาบาลภาคเอกชน จากร้านขายยาค้าปลีกภาคเอกชนจำนวน 30 ร้านและจากร้านขายยาค้าส่งภาคเอกชนจำนวน 30 ร้านในเมืองมัณฑะเลย์ จำนวน 6 แห่งในประเทศเมียนมาร์ ราคายาต่างๆได้ถูกนำมาเปรียบเทียบกับราคาอ้างอิงระดับสากล (IRPs) เพื่อให้ได้อัตราส่วนราคายา ค่าจ้างแรงงานรายวันระดับต่ำที่สุดของคนงานของรัฐที่ขาดทักษะถูกนำมาใช้เพื่อวัดความสามารถซื้อหาได้ของยาต่างๆ

ในทุกๆภาคส่วนราคายาสามัญ (ที่ตั้งราคาไว้ต่ำที่สุดและที่ตั้งราคาไว้สูงที่สุด) มีมูลค่าน้อยกว่าราคาของผลิตภัณฑ์ยาที่มียี่ห้อต้นฉบับ นอกจากนี้การมีอยู่ของยาที่มียี่ห้อต้นฉบับมีระดับต่ำมาก (น้อยกว่าร้อยละ 4) ในภาพรวมการมีอยู่ของยาสามัญอยู่ในระดับปานกลาง (ร้อยละ 50-66) MPR ของยามียี่ห้อต้นฉบับมีตั้งแต่ 2.9 ชนิด สำหรับ Salbutamol ในภาคค้าส่งเอกชนไปจนถึง55.1 ในภาคส่วนอื่นๆ 2: PP สำหรับ Atorvastatin. ค่ามัธยฐานของ MPR ของยาสามัญที่มีราคาสูงที่สุดมีค่าตั้งแต่ 3.2 ในภาคขายส่งเอกชนและ 7.5 ในภาคค้าปลีกเอกชนไปจนถึง 9.5 ใน DDs ค่ามัธยฐานของ MPR ของยาสามัญที่มีราคาต่ำที่สุดมีค่าตั้งแต่ 1.6 และ 2.0 ในภาคขายส่งเอกชนและภาคค้าปลีกเอกชนตามลำดับไปจนถึง 3.1 ใน DD ราคาต่ำที่สุดและสูงที่สุดมีความแตกต่างกันอย่างหลากหลาย ในภาพรวมยาสามัญที่มีราคาสูงที่สุดมีราคาแพงกว่ายาสามัญที่มีราคาต่ำที่สุดคิดเป็น 2.5 และ 3.5-4 เท่า ในภาคขายส่งเอกชนและภาคอื่นๆตามลำดับ ประชาชนมีความสามารถหาซื้อยาสามัญที่มีราคาต่ำที่สุดมากกว่ายาสามัญที่มีราคาสูงที่สุดในแต่ละประเภทของภาคส่วนการค้ายา การวิเคราะห์แบบสองทางของความแปรปรวน พบว่าความแตกต่างระหว่างราคาสุทธิและสัดส่วนราคา ของยาที่มีราคาที่ถูกและราคาที่แพงไม่แตกต่างกันในทางสถิติ แต่ประเภทของภาคส่วนการค้ายามีความแตกต่าง อย่างมีนัยสำคัญทางสถิติ $p = 0.004$ และ $p < 0.001$ ตามลำดับ(และการมีปฏิสัมพันธ์ของภาคชั้นของยายังมีความสำคัญอย่างสูง)$p < 0.001$และ $p =$(0.044 และความแตกต่างด้านราคามีสูงที่สุดในยาปฏิชีวนะและความแตกต่างด้านสัดส่วนราคาต่ำที่สุดในยารักษาโรคระบบทางเดินหายใจ

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ปีการศึกษา…….2554……..

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ลายมือชื่ออาจารย์ที่ปรึกษาหลัก.....

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KEYWORDS: MEDICINE PRICES, AVAILABILITY, AFFORDABILITY, MANDALAY, MYANMAR

AYE AYE KHAING: SURVEY OF MEDICINE PRICES, AVAILABILITY AND AFFORDABILITY IN MANDALAY, MYANAMAR: A CASE STUDY IN 6 TOWNSHIPS OF MANDALAY, MYANMAR. ADVISOR: ASST. PROF. PRATHURNG HONGSRANAGON, PH.D., CO-ADVISOR: ROBERT SEDGWICK CHAPMAN, M.D., M.P.H., 138 pp.

A cross-sectional study was conducted in 6 townships of Mandalay, Myanmar, in March, 2012. The main purposes of this study were to identify the price, availability and affordability of selected medicines. Methodology developed by the World Health Organization (WHO) and Health Action International (HAI) was used. Price and availability data for 30 medicines were collected from 20 dispensing doctors (DD), 10 drug stores in public hospitals (PH), 30 drug stores in private hospitals (PP), 30 private sector retail pharmacies, and 3 private wholesale pharmacies in Mandalay District. Medicine prices were compared with international reference prices (IRPs) to obtain medicine price ratios (MPRs). The daily wage of the lowest paid unskilled government worker was used to gauge the affordability of medicines.

In all sectors, prices of both lowest and highest priced generics were lower than the price of originator brand name products. Availability of the originator brand was extremely low (<4%). Overall, availability of the generics was moderate (50-66%). MPR of the originator brand ranged from 2.9 for salbutamol in private wholesale to 55.1 in drug stores in private hospital for atorvastatin. Median MPR of the highest priced generic ranged from 3.2 in private wholesale and 7.5 in private retail to 9.5 in DDs. Median MPR of the lowest priced generic ranged from 1.6 and 2.0 in the private wholesale and private retail respectively to 3.1 in DD. Lowest price and highest priced were differed with greater variations. Overall, highest priced generic was 2.5 times and 3.5-4times more expensive than lowest priced generic in private wholesale and other sectors respectively. People can afford lowest priced generic more than the highest priced generic in all the sectors. Two-way analysis of variance showed that mean absolute and proportional price differences between lowest and highest priced generics did not differ statistically significantly by sector, but did differ by drug class (p=0.004 and p<0.001, respectively). Sector-class interactions were also significant (p<0.001 and p=0.044, respectively). Absolute differences were highest for antibiotics, and proportional differences were lowest for respiratory medicines.

Field of Study:……Public Health……..…Student's Signature……

Academic Year:…….2011……Advisor's Signature……

Co-advisor's Signature……

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LIST OF ABBREVIATIONS

Caps	capsules
CCS	Community Cost Sharing
CMSD	Central Medical Stores Department
DDs	Dispensing doctors
EML	Essential Medicine List
HAI	Health Action International
HPG	Highest priced generic
IB/OG	Innovator brands/originator brands
IRPs	International Reference Prices
LPG (E)	Lowest Price Generic (Equivalent)
MPR	Median Price Ratio
MEDP	Myanmar Essential Drugs, Project
OECD	Organization for Economic Co-operation and Development
PH	Drug stores in public hospitals
PP	Drug stores in private hospitals
PR	Private Retail sector
PW	Private wholesale sectors
SPSS	Statistical Package of Social Science Software
Susp	Suspension
Tab	Tablet
WHO	World Health Organization

CHAPTER I

INTRODUCTION

1.1 Background information

Governments recognize access to health care services is a fundamental human right, enshrined in international treaties. However, the fundamental right to health cannot be fulfilled without equitable access to essential medicines for priority diseases. Access to essential medicines is part of the fulfillment of the right to the highest attainable standard of health or in other words the right to health which is also one of the United Nations' Millennium Development Goals (MDGs) (WHO, WHO medicines strategy, 2004-2007). However, we see many of people across the world without the treatment that they need. The reasons are becoming clearer now: the price, the availability and affordability of medicine which plays significantly important factor.

According to World Health Organization (WHO) estimates, one-third of the global population lacks reliable access to needed medicines (WHO, WHO medicines strategy, 2004-2007).Up to 50% of the populations in the poorest countries of Africa and Asia are unable to obtain necessary medicines (WHO/WTO, 2001). A major obstacle to achieving essential medicines and vaccines of 4 million people in Africa and South-East Asia have been price of medicines while 10 million lives a year could be saved by improving access to essential medicines and vaccines (DFID, 2004).

Today in developing countries medicines account for 25-70% of overall health care expenditure, compared to less than 10% in most high income countries (WHO, WHO medicines strategy, 2004-2007).Due to lack of social insurance and inadequate publicly subsidized services, up to 90% of the population in low and middle income countries must have to pay for medicines out of pocket followed by only 20% in high income countries (WHO/WTO, 2001).

Duties, taxes, mark-ups, distribution costs and dispensing fees are often high, regularly constituting between 30% to 45% of retail prices, but occasionally up to

80% or more of the total (Harvary E, 2001) (Levison & Laing, 2003) (European Commission, 2003).

With shrinking incomes and increased inequity as victims of economic disaster nowadays, national policies, medicine pricing and procurement strategies are required to ensure that medicines are affordable because medicines are not only unaffordable for large sectors of the global population, but are also a major burden on government budget (WHO, WHO medicines strategy, 2004-2007).

Pharmaceutical companies infrequently implement the equitable pricing-selling the same medicines at different prices in different countries in accordance with people's purchasing power. Changes in trade regulations and intellectual property, such as patent rights, may also affect the international prices and availability of medicines (WHO, Globalization and Acess to Drugs: Perspectives on the WTO/TRIPS Agreement, 1999).Prices of the same medicines frequently vary between countries (Wanger & McCarthy, 2004); some commonly used medicines in developing countries have been found to be more expensive in compared to industrialized ones (Myhr, Comparing prices of essential drugs between four East African countries and with international prices, 2000) (Bala & Sagoo, 2000) (Bala, K; Lanza, O; Kaur, Sl;, 1998) . Moreover, many studies have shown that affordability is unrelated to purchasing power (Myhr 2000, Bala 1998 & 2000). World Health Organization's (WHO) Medicine price indicator guides support the sales prices of generically equivalent medicines from large wholesalers to government. However, it does not include new and essential medicines even though which is patented, and also allocated the price patients must pay in either the public or private sectors (WHO-AFRO, 2000). Thus monitoring prices across medicines, their availability and affordability among different sectors is considerably needed.

In order to protect financial burden of community for buying medicines, a reliable and transparent medicine price policy must be formulated in Myanmar.

1.2 Rationale

Like many developing countries, the health care system of Myanmar is a public-private mix in both financing and delivery (MOH, 2011). In all the states and division of country, the public health system has developed and expended over the year. In contrary, private sector medical care is notable absence in most townships and rural areas of the country even though the rapid growth of private sector medical concentrates in the large cities.

According to health in Myanmar 2011, government sector (Ministry of Health) is the main organization of health care delivery and the private sector is mainly providing ambulatory care in Myanmar.

According to (WHO, World Health Report, 2005), Since there is no state funded community health insurance and negligible coverage of social insurance, major source of health expenditure is private expenditure and among this 99% of private expenditure is out of pocket expenditure in Myanmar although public health expenditure increased. In country like Myanmar, there is insufficient supply and fewer resources from the government public sector in compare to the demand.

Government alone is not able to finance the health care delivery system with the sky rocketing medical care costs, global economic crisis, the advances in medical technology on one hand and the increase in demand and expectations of the public health care on the other. External aid could be no more than a partial solution and it was therefore necessary to look for other sources of financing and developed alternative ways of cost recovery systems. Therefore Myanmar introduced user fees known as community cost sharing (CCS) for pharmaceutical, diagnostic services, pay wards and other services between 1993 and 1996 (WHO, Financing drugs in South - East Asia: Myanmar, November 1996)

It had designated 25% of hospital beds as private beds. The trust funds for the unaffordable patients are also established in many hospitals. Well wishers also donate buildings and equipment for the hospitals.

Although CCS is already implemented in Myanmar for more than decade, due to lack of state funded or community based health insurance and negligible coverage of social security scheme, majority of households still pay out-of- pocket if there is some kind of illness threatened their family members where majority of payment is particularly for buying medicines.

Therefore it is essential to study key medicines covering the spectrum of the global disease burden particularly it falls on low income countries like Myanmar: the related prices of originator brand medicines and their generic equivalents, about prices in different parts of the same country and the same city, about the relationship between procurement prices and final prices to patients, about the affordability of treatment of ordinary people and about international differences in prices for the same medicine. Also the utilization of medicines among community is obviously out-of-pocket and medicine prices are considerably high in Myanmar. To formulate an effective strategy or policy to regulate medicine prices, the essential and preliminary step is to conduct a proper research for prices, availability, and affordability of essential medicine. This research hopefully will fulfill this mandatory mission.

1.3 Objectives

1.3.1 General objective

To ascertain the price, availability and affordability of selected medicines in Mandalay, Myanmar.

1.3.2 Specific objectives

- To identify the prices that people pay for key medicines and analyze variations in prices and availability of the same medicines in different sectors such as private sector and other medicine outlets.
- To explore the difference in prices and availability of originator brands and generically equivalent medicines and identify price variations between products types (i.e. highest priced and lowest priced generics) within the same sector.
- To describe price differences in different types of medicines (e.g., cardiovascular drugs, respiratory drugs, central nervous system dugs).

- To compare procurement prices and patient prices in public sector as well as to compare national prices and standard international reference prices of selected important medicines and analyze affordability of selected medicines.

1.4 **Research questions**

1. What is the price of essential drugs? Do the prices and availability of the same medicines vary in different sectors: private sectors and other medicine outlets?
2. What is the difference in prices of innovator brands and generically equivalent medicines?
3. Do prices vary between product types (E.g. highest priced and lowest priced generics) within the same sector?
4. How do government procurement prices compare with patient prices in the public sector?
5. How do national prices compare with international reference prices?
6. To what extent are brand-name and generic drug prices, and brand name-generic price differences, associated with sector, drug type (e.g., Central Nervous system drug, Cardiovascular drug), and specific sector-drug type combinations (as tested with 2-way analysis of variance)?
7. How affordable are medicines for ordinary people?

1.5 **Hypotheses** (for assessing price difference)

1. In Mandalay, drug store sector is associated with price difference between highest priced generic names and corresponding lowest priced generic drugs.

2. In Mandalay, drug class is associated with price difference between highest priced generic names and corresponding lowest priced generic drugs.

3. In Mandalay, certain specific sector-class combinations are associated with especially high, or especially low, price difference between highest priced generic names and corresponding lowest priced generic drugs (test of interaction in 2-way analysis of variance).

1.6 **Operational definitions**

Medicine -Any dosage form containing a substance approved for the treatment and prevention of disease. The term medicine is used in this study in order to distinguish it from a drug as a substance that is misused.

Essential Medicine -Essential medicines are those that satisfy the priority health care needs of the population. (WHO)

Availability - The products are available in standard formulations.

Affordability -The cost of treatment in relation to peoples' income. In this study, the daily wage of the lowest –paid unskilled government worker (30000kyats/ month) will be used for comparison with the cost of a defined course of treatment for a specific condition.

Innovator (originator) brand - The product that was first authorized worldwide for marketing (normally as a patented product) on the basis of the documentation of its efficacy, safety and quality, according to requirements at the time of authorization. These products always have brand names.

Generic equivalent medicine – A pharmaceutical product usually intended to be interchangeable with the originator brand product, manufactured without a license from the originator manufacturer and marketed after the expiry of patent of other exclusively rights. In this study, generic equivalents refer to all products other than the originator brand that contain the same active ingredient (substance), whether marketed under a brand name (branded generic) or the generic name.

Retailer - A drug store that sells goods to consumers. In this study, retailer is the any medicine outlet or stores including private retail sectors, private drug stores in public hospital and private hospital and dispensing doctors sector.

Wholesaler - A drug stores that buys goods from a manufacture or importer and sells it to retailers.

Lowest-priced generic equivalent - Generically equivalent products with the lowest unit price available at each medicine outlet on the day of the survey.

Highest-priced generic equivalent - Generically equivalent products with the highest unit price available at each medicine outlet on the day of the survey.

International reference price - It is a standard reference prices.

1.7 **Conceptual Framework (for assessing price differences)**

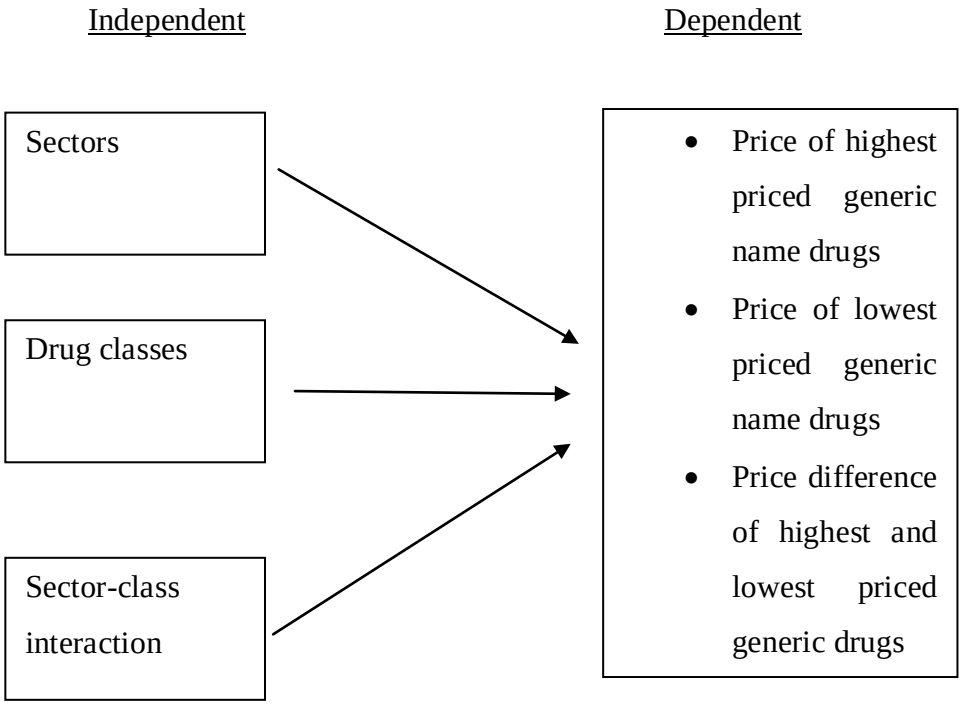


Figure 1

CHAPTER II

LITERATURE REVIEW

2.1 Drug financing in Myanmar

2.1.1 Country profile

In South East Asia, Myanmar is the second largest country with an area of 676,578 square kilometers. The widest point from the north to the south is about 2200 kilometers and from east to west is 925 kilometers. The neighboring countries are China, Laos, Thailand, Bangladesh, and India. Moreover, there is the Bay of Bengal on the west and Andaman Sea on the south. (MOH, country profile, health in myanmar, 2011)

According to health in Myanmar, 2011; the estimated population of Myanmar in the year 2009-2010 is about 59.13 million with the growth rate of 1.29 percent. Whereas 70% of the population resides in the rural areas and the remaining are urban dwellers. Among them 49.73% is male and 50.27% is female.

Administratively, the country is divided into (14) states and regions. It consists of 67 districts, 330 townships, 64 sub-townships, 2891 wards, 13698 village tracts and 64817 villages. Myanmar falls into three well marked natural divisions, the western hills, the central belt and Shan plateau on the east, with a continuation of this high land in the Tanintharyi. (MOH, country profile, health in myanmar, 2011)

Health in Myanmar, 2011 (country profile) said that the country is divided by three parallel chains of mountain ranges from north to south divide the country into three river systems, the Ayeyarwady, Sittaung and Thanlwin. Myanmar has rich natural resources such as land, water, forest, coal, mineral and marine resources, and natural gas and petroleum.

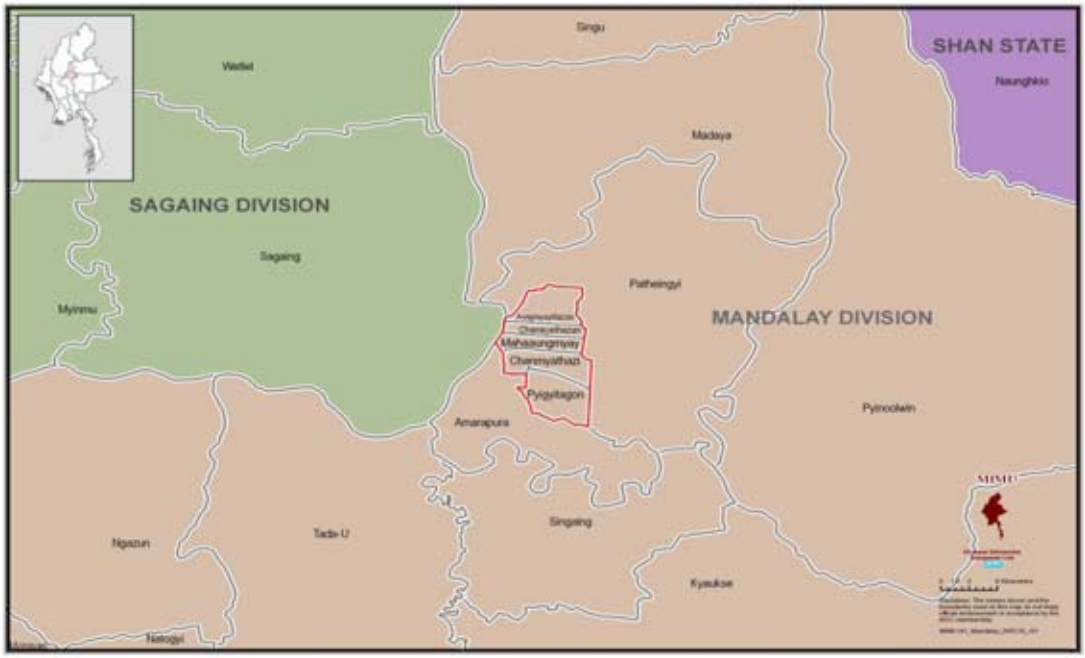
Health in Myanmar, 2011 (country profile) mentioned that Myanmar enjoys a tropical climate with three distinct seasons, the rainy, the cold and the hot season. The rainy season that lasts from mid-May to mid-October. Then the cold season follows

from mid-October to mid-February. The hot season precedes rainy season and lasts from mid-February to mid-May.

Mandalay

The Mandalay division falls in the Dry zone of Central Mandalay bordering Bago Division, Magway division, Sagaing division and Shan state. The area of Mandalay division is 14,295 square miles and its capital city is Mandalay. Mandalay district consists of seven townships: **Amarapura, Aungmyaythazan, Chanayethazan (downtown), Chanmyathazi, Mahaaungmye, Patheingyi, Pyigyidagun.**

Figure 2: showing Mandalay division and district and its townships



2.1.2 Myanmar health care system

Myanmar health care system evolves with changing political and administrative system and relative roles played by the key providers are also changing although the Ministry of Health remains the major provider of comprehensive health care. It has a pluralistic mix of public and private system both in the financing and provision. Health care is organized and provided by public and private providers.

Ministry of health is taking responsibility of providing promotive, preventive and rehabilitative services to raise the health status of the population. Department of health plays a major role in providing comprehensive health care through the whole countries even though some places are difficult to reach such as borders areas. Some ministries also support health care, mainly curative care, for their employees and their families. They are Ministries of Defense, Railways, Mines, Industry 1, Industry 2, Energy, Home and Transport. Ministry of labour has set up three general hospitals, two in Yangon and one in Mandalay to render services to those entitled under the social security scheme. Ministry of Industry 1 is running a Myanmar Pharmaceutical Factory and producing medicines and therapeutic agents to meet the local needs. (MOH, 2011)

The private, for profit, sector is mainly supporting ambulatory care through some providing institutional care has developed in Yangon, Mandalay and some large cities in recent years. Funding and provision of care is fragmented. They are regulated in conformity with the provision of the law relating to private Health care services. The private, for non-profit which is another sector also supporting ambulatory care through some providing institutional care has developed in large cities and some townships.

2.1.3 Financing health

The main sources of finance for health care services are the government, private households, social security system, community contributions and external aid. Government has raised health spending on both current and capital yearly. Total government expenditure for the health sector is increased from US$ 5.87 million

(176.1 million baths) in 1988-89 to US$810.1 million (24303 million baths) in 2009-2010. (MOH, 2011)

The major share in the public spending on health and the availability of data, estimates on public expenditures on health by financing entities were based solely on spending by the ministry. By functions spending devoted to health related account for30% to 34% follows 32% to 38% of curative and rehabilitative services functions. Furthermore, prevention and public health accounted for about 22% to around 33% and Health Administration and Health Insurance accounted around 3% to 4%.

The Ministry of labour implemented the Social security scheme in accordance with 1954 Social Security Act. According to the law factories, workshops and enterprises that have over 5 employees whether State owned, private, foreign or joint ventures must provide the employees with social security coverage. The contribution is tri-partite with 2.5% by the employer 1.5% by the employee of the designated rate while the government contribution is in the form of capital investment. Insured workers under the scheme are provided free medical treatment, cash benefits and occupational injury benefit. To effectively implement the scheme branch office, workers' hospitals, dispensaries and mobile medical units have been established nation-wide (MOH, 2011)

2.1.4 Drug financing in public sector

The main source of drug financing in the public sector is government revenue. The budget allocated by the health department for drugs from 1995 to 1996 was Kyats 47.20 million (0.59US$ million). Some alternative drug financing mechanisms have therefore been adopted and implemented in hospitals and in some townships. (WHO/SEARO, 1997)

Cost-sharing drug shops are opened in hospitals, with 43 drug items supplied by the Central Medical Stores Depot (CMSD). Drugs are sold at maximum 15% profit margin on the original CMSD price. Among the cash recovered from the drugs, the actual or original CMSD cost of drugs has to be returned to the Government budget.

The remaining cash can be used by the respective hospital drug shop for its further development. (WHO/SEARO, 1997)

According to (WHO/SEARO, 1997), Myanmar Essential Drugs Project (MEDP) was started in 1989 and essential drugs distributions started in 1991, with the assistance of the Finnish Government. A cost-recovery scheme for drugs was introduced in 1994 and MEDP is implemented in 86 townships.

2.1.5 Drug financing in private sector

There are two sources of drug financing in the private sector: private household and community contributions.

According to household expenditure survey conducted in Yangon in 1979, it was found that 2.48% of household expenditure was used for medical care including drugs. A similar survey conducted in 1989 showed a result of 2.58% and a rural survey conducted in 1996 showed a result of 2.23% respectively. (WHO/SEARO, 1997)

Government health institutions accept private donations. Many townships have successfully raised trust funds for used in the overall development of institutions, including purchase of drugs. (WHO/SEARO, 1997)

However WHO highlighted that there are numbers of problems in drug financing in Myanmar. Main problems include increasing price of drugs, limited budget allocation for drugs and slow progress in decentralizing drug financing although the government had exempted 76 essential drug items from commercial tax and custom duties. (WHO/SEARO, 1997)

2.2 Millennium development goals and essential drugs

2.2.1 Millennium development goals

At the United Nations Millennium Summit in September 2000, the member states of the UN adopted a program of measures in response to the challenges facing the international community at the start off the 21st century known as the Millennium

Declaration. The declaration took the shape of the eight Millennium development goals (MDGs), which provides countries around the world a framework for development and time-bound targets by which progress can be measured. Out of eight goals, 8th is on international cooperation envisaged for the achievement of the other goals. The MDGs contain the solemn commitments of all countries to promote growth and development (Ministry of National Planning and Economic Development, 2006).

2.2.2 Essential drugs and MDG in Myanmar

Among MDG goals, targets and indicators, target 17 of goal 8 is "In co-operation with pharmaceutical companies, provide access to affordable, essential drugs in developing countries" and relevant indicator 46 to fulfill the target 17 is "Proportion of population with access to affordable essential drugs on a sustainable basis".

In order to fulfill this target, in addition Myanmar Essential Drugs Project (MEDP), the government has been taking measures for such community health care concerns as building or upgrading of hospital, health care centers and specialist hospitals across the nation including far-flung areas. Within the frame work of the health system that people can obtain essential drugs easily and cheaply. The percentage of the using affordable essential drugs on a sustainable basis was 17.5% in 1997 and it gradually up to 74% in 2005. Accordingly, the government has opened the Development Centre for Pharmaceutical Industries of the Ministry of Industry 1 in June 2004.The authorities concerned take good care of medicines produced by various units, products and production process at injection unit and vaccine production unit (Myanmar Millennium Development Goals Report, 2006).

2.3 Unaffordable medicine prices

In 1990, Helper and Strand stated that "pharmaceutical care is the responsible provision of drug therapy for the purpose of achieving definite outcomes to improve a patient's quality of life". These outcomes are (1) cure of a disease, (2) elimination or reduction off a patient's symptomatology, (3) arresting or slowing of a disease process or (4) preventing a disease or symptomatology (Helper & Strand, 1990).

That is why, medicine play an important role in treatment of illnesses and diseases. However, medicines are not only unaffordable for large sectors of the global population, but are also a major burden on government budget. In high income countries, government spend about 10% of their health budgets on medicines, While in low income countries, medicine account for 25% of government health budgets. In most high income countries, insurance covers the major part of medicine costs to the patients but in Africa and South Asia, surveys show that medicine costs can dominate households' health spending, at over 80% of the total. As a result there was an inequality in access to medicines.

A Tanzanian would have to work for 500 hours in comparison with a Swiss to pay for one course of tuberculosis treatment in the private sector (WHO, How to develop and implement a National Drug Policy;2nd Edition, 2001). In 2000, lamivudine used in the treatment of HIV/AIDS, was found to be about 20% more expensive in Africa than in ten advanced industrialized countries (Perez-Casas, 2000).

A report by the commission on intellectual property rights, innovation and public health had said that access to drugs cannot depend on the decision of private companies but is also a government responsibility. Governments of low and middle income countries where there are both rich and poor patients should formulate their funding and price regulation with a view to providing access to poor people. While the poor and governments continue to suffer because of low budgets and the high price of medicines and while there has been a lot of discussion this issue (WHO, Public health, innoviation and intellectual property rights, 2006).

2.4 Medicine price surveys

2.4.1 Development of a standard methodology for medicine price survey

If medicines are to be affordable, an appropriate and well- informed medicine pricing policy is required. This, in turn requires a reliable analysis of medicine prices. The World health assembly had made a number of resolutions that address medicine prices since 1999 (WHO, Core indicators on country pharmaceutical situation, 2000).

Many countries have monitored about the medicine price with various objectives and success without standard methodology has been an obstacle in reliable monitoring and comparisons of prices within and between countries over time. It is obvious that advocacy to promote more equitable access to medicine will be ineffective without a reliable data (WHO/HAI, 2003)

In 2003, WHO and Health Action International (HAI) designed for the collection and analysis of medicine prices in a standardized way. It has been developed for use by governments, nongovernmental organizations, international agencies, researchers, health professionals and consumer organizations. Although this methodology had been designed primarily for use in low and middle-income countries, it is said that it can be applicable to all countries (WHO/HAI, 2003)

It involves a system survey to collect accurate data and reliable information on some certain medicines. Moreover, it is designed to measure medicine prices at a certain point in time, but can also be used to monitor them over a period of time. In addition, it facilitates rapid and reliable data collection and is easily replicable. (WHO/HAI, 2003)

2.4.2 International medicine price surveys using WHO/HAI methodology

There are a variety of medicine price surveys conducted in different parts of the world using the standard WHO/HAI methodology for medicine price survey.

In mid-1999, Consumers International and Health Action International (CI/HAI) conducted a survey on the retail prices of 16 drugs in 36 countries (Bala & Sagoo, 2000). The most striking features in this survey were the following:

- The higher prices of proprietary drugs in some of the developing countries of Africa, Asia and Latin America compared to price in 10 Organization for Economic Co-operation and Development (OECD) countries.
- Wide variation of retail prices in the countries surveyed: the variation in the retail prices of proprietary drugs were much wider (range: 1:16-1:59), than the variation in prices of generic equivalents range(1:7-1:18)

Myhr in 2000 conducted a study in East Africa and Asia. He found out some interesting results. A telling example is fluconazole a treatment for AIDS-related meningitis. In Thailand, where generic competition has lowered prices, fluconazole costs only US$ 0.30. However, this same drug costs US$ 18 in Kenya, where the patent is protected. The author highlighted that the causes of high prices of medicines in Africa and elsewhere in the developing world include strong patent protection, high tariffs taxes and a lack of generic competition (Myhr, 2000).

Utopia also conducted a survey in 2002.Utopia's public sector is relatively efficient in procurement and charges reasonably low prices to patients. And the availability of medicines in the public sector is far from optimal, however, and many people are forced to use the expensive private sector or go without treatment. Prices are considerably higher in the private sector and innovator brands are possibly used more extensively as there are no incentives to prescribe and sell generic equivalents, resulting in treatment being unaffordable for most people. The prices of innovator brands are considerably higher than the price of their generic equivalents. Moreover, the prices of generic medicines also vary and the cheapest generic equivalent is not always the most sold (Medicines of Utopia Network, 2002).

In 2004, Mongolia Ministry of Health was supported by World Health Organization (WHO) and Health Action International (HAI) to carry out a survey of medicine price (MOH, WHO and HAI 2004). The survey showed that lowest price generic equivalent is more available in the public sector and most sold generic equivalent is more available in the private sector. Public procurements are greater than the international standard. Price in the private sector for most sold generic medicines were almost two times the price in public sector. The prices in both sectors are considerably higher than international reference price (MOH, A Survey of Medicine Price, 2004)

In 2004, the Kenya Ministry of Health was supported by World health Organization (WHO) and Health Action International-Africa (HAI-A) to carry out a national survey of medicine prices. They surveyed standard core group of 30 medicines and 15 supplementary medicines in total of 45 medicines in the 53 public

health facilities; 57 private sector outlets and 47 mission/ NGO health facilities. They found out that medicine prices in public sector, private sector and mission/ NGO health facilities were 3.61 times, 17.75 times and 8.52 times more than the international reference prices respectively. According to Kenya Essential Drug List median availability was 65 %. When it comes to affordability, this survey highlighted that affordability of treatments for chronic conditions was much less than affordability of treatments for acute conditions. Moreover, affordability of treatment with generic medicines was more affordability than that of originator brands. (MOH, Medicine Prices in Kenya, 2004)

During 2004-2005, six surveys were undertaken simultaneously in five states of India to assess medicine prices and availability of essential medicines. The procurement price of public sector was 0.27 to 0.48 times the international reference price. However, these medicines were inadequately available and the median availability in the public sector ranged from 0 to 30 per cent. The median prices of medicines in the private sector were less than twice the International Reference Price (IRP), although a few innovator brands were more expensive. There was no observed difference between the prices of the most sold generic and the lowest priced generic available at the facilities. Interestingly, price variation was observed among different generic equivalents of ciprofloxacin in each region. The price of lowest priced generic diazepam in the private sector was thirty three times its procurement price in the public sector (Kotwani, Antia; co-workers, 2007)

Sudan conducted survey of medicine price by using WHO/HAI methodology in 2005. They sampled 20 medicine outlets from public sector, 20 from private sector and 11 from other sectors and surveyed 42 medicines in which 22 from core list and 20 supplementary medicines. Availability of originator brand was almost nil in all sectors whereas lowest price generic equivalent accounted for 52.5%, 90% and 72.7% in public, private and other sectors respectively. Median prices in Sudan were 3.4 times in public sector and 18.2 times in private sector more than that of international reference prices. Regarding affordability, it ranges from 0.1 to 5.3 days wages of lowest paid unskilled government worker (MOH, Medicine price survey in Sudan, 2005)

In 2006, Nicaragua conducted the price of Reproductive Health Medicine, in which public health sector is relatively efficient in procurement and charges no price to patients, but also makes no distinction on ability to pay. In addition, the availability of medicines in the public sector is far from optimal and many people are forced either to rely on the private sector or go without treatment. Moreover, relative to International Reference prices and income, prices are often high in the private sector and NGO sectors. Brand premiums between the highest priced generic or innovator brand products and their lowest-priced generic equivalents are also often high (Jolene Beitz, March 2006).

Malaysia conducted a survey in four geographical regions in West Malaysia using WHO methodology in 2006. 28 medicines from the core list and 20 were added as supplementary drugs with the total of 48 drugs were studied. In private pharmacies, innovator brand (IB) prices were 16 times higher than the IRPs, while generics were 6.6 times higher. In dispensing doctor clinics, the figures were 15 times higher for innovator brands and 7.5 for generics. Availability in public sector was low even for medicines on the National Essential Drugs List. Moreover, people have to pay about a week's wages in the private sector to treat the peptic ulcer and hypertension (Babar, 2006).

A survey was done in the six low and middle-income countries to assess the availability and price of 32 medicines.75% of these 32 medicines were available in the public sectors except in Brazil where 28% were available. MPR varied from 0.09 for losartan in Sri lanka to 30.44 for aspirin in Brazil. The cost of the innovator brand was three times more than generic medicines in Malawi and Sri Lanka. The cost of the one month of combination treatment of the coronary heart disease was ranges from 1.5 days' wages in Sri Lanka to 18.4 days' wages in Malawi (Mendis & co-workers, 2007).

CHAPTER III

RESEARCH METHODOLOGY

3.1 Study design

A sector-based cross-sectional analytical study was done to measure the medicine prices, availability and affordability of selected medicines.

3.2 Study area

This study was done in Mandalay District, Myanmar. Mandalay District consists of 7 townships which are as follows: Patheingyi Township, Aungmyaythazan Township, Chanayethazan Township, Mahaaungmyay Township, Chanmyathazi Township, Pyigyitagon Township, and Amarapura Township.

3.3 Target population

The target population was medicine outlets located in Mandalay District.

3.4 Sampling technique

Sampling method that described in WHO/HAI manual was used.

- Identification of areas in which to conduct the survey
- Identification of the sectors to include in the survey
- Developing the list of medicines to be surveyed

1. Area identification- Among townships located in Mandalay District, six townships were selected. The inclusion criteria were:

- Township located in downtown area (metropolitan area)
- Township with a population of about 100,000-250,000
- Township could be reached within one day's travel from main urban center (Mandalay general hospital) using the most appropriate means of transportation.

An exclusion criterion was:

- Township that was the farthest from the main urban center.

2. Sector identification-After selecting the areas, the next step was to decide which sectors to study. Each sector should represent a different source of medicine prices and availability to be assessed and compared. In each area, a sample of medicine outlets was examined from each of:

a) Public sector – it consisted central or regional medical stores, cost sharing drug stores from public hospitals and township health department dispensing sections if presented.
b) Private sector – it contained registered retail private pharmacies and drug stores.
c) Other sector- it included health facilities run by private pharmacies in private hospital and public hospital, dispensing doctors.

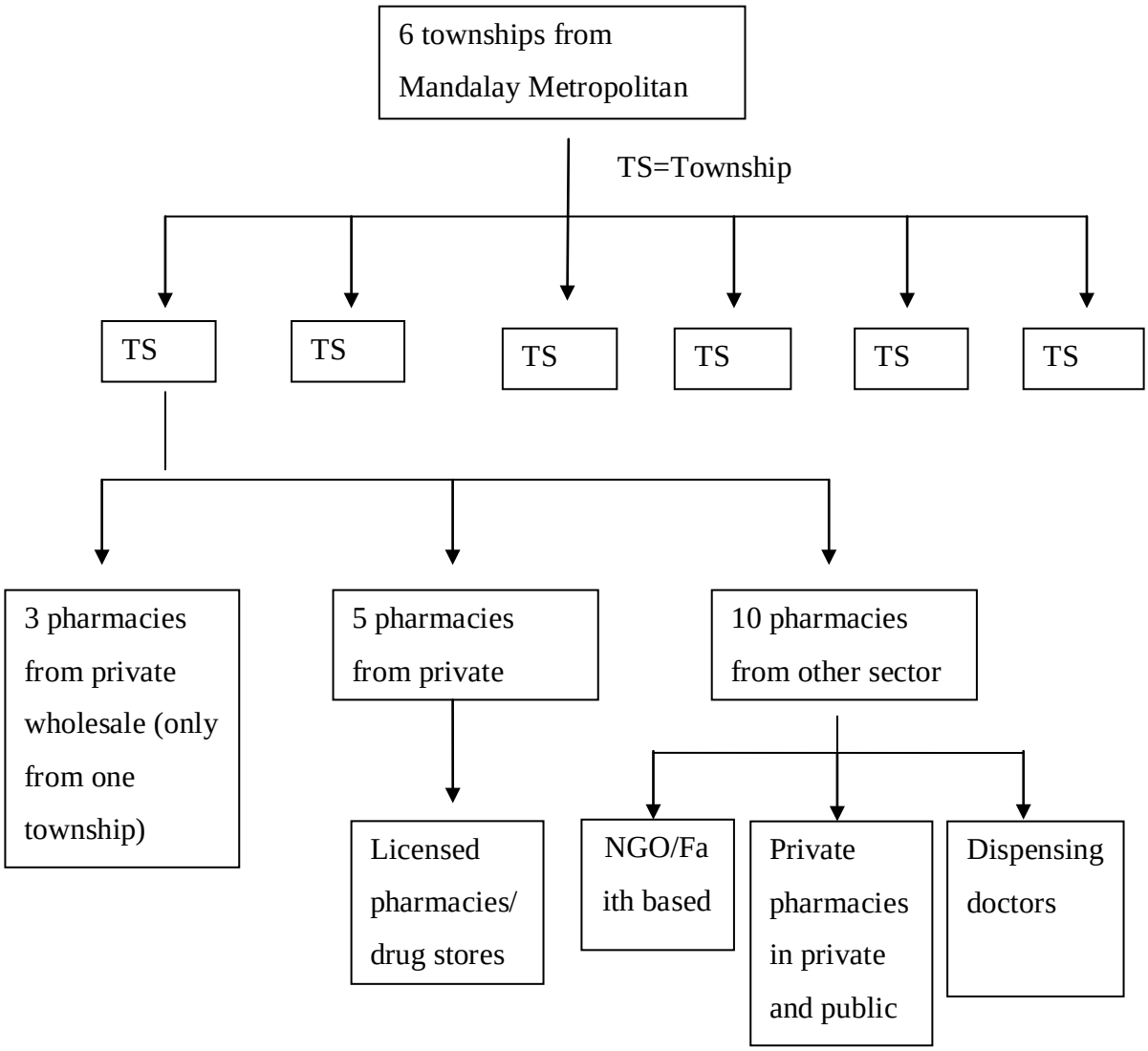
3. Developing the list of medicines to be surveyed

- 30 medicines were surveyed. (Inclusion of more medicines would have made the study unfeasible.) The 30 medicines came from 2 different sources. One was global core list and the other was regional core list (WHO, Measuring medicine prices, availability, affordability and price components 2nd edition, 2008).
- A global core list of 14 medicines that were included in all medicine price surveys to enable international comparisons.
- A regional core list of 16 medicines that accounted for regional differences in medicine usage but still allowed for comparisons across countries within the same region.
- Each survey medicine had a specific dosage form and strength. For each medicine, data were collected on the same dosage form and strength in all medicine outlets so that results were comparable. In addition, each medicine had a recommended pack size, which generally corresponds to a standard course of treatment. Where a medicine was available in multiple pack sizes data were collected on the recommend pack size. If this was not available, I chose on the next larger pack size.

3.5 Sample and sample size

- In each area, main public hospital and its cost sharing drug store were chosen.
- Other four medicine outlets from public sector within three hours' travel distance from the main hospital were randomly selected and if there are fewer than five medicine outlets from public sector in the whole survey area, all medicine outlets were chosen.
- The list of licensed pharmacies/ drug stores registered in each study area was obtained from relevant township health department. After that 5private medicine outlets were randomly selected from the list.
- The list of dispensing doctors, private pharmacies in private hospital and public hospital were also obtained from township health department and 10 medicine outlets were randomly selected from the list.
- However, in reality, to assessed the public sector needs the ethic from the survey country. My study got the ethic from the Chulalongkorn University, Bangkok. Thus, public sector was not included in assessing the price and availability. Therefore, private wholesale sector was surveyed in order to attain the proposed sample size. That was 120 drug stores: by selecting 5 medicine outlets each from public and private retail sectors and 10 medicine outlets from other sector in each survey area (20 medicine outlets), a total of 30 medicine outlets from public sector, 30 medicine outlets from private retail sector and 60 medicine outlets from other sectors were gained from 6 study area (120 medicine outlets). However, the actual sample size was 93 by selecting the 5 medicine outlets from the private retail sector, 10 medicine outlets from the other sectors in each survey area (15), a total of 30 medicine outlets from private retail sector and 60 medicine outlets from other sectors were gained from 6 study area (90 medicine outlets). And 3 private wholesale from the main township because it was presented only in this township.

Figure 3: Sampling design



3.6 Measurement tools

Standardized data collection form (provided by WHO) was used to collect data on the retail prices and availability of medicines from medicine outlets. This form contains 2 rows and 10 columns for each drug as follows:

The **first row** is for recording information on the originator brand. Since originator brands were identified centrally prior to data collection, the Medicine Price Data Collection Form already contains the originator brand name for each of the survey medicines.

The **second row** is for collecting information on the lowest-priced generic equivalent to the originator brand in Row-1. The data collectors were identify this product in each medicine outlet surveyed and entered the following information onto the form.

Column A: Name of medicine, dosage form and strength. The information was collected for the dosage form listed in Column A.

Column B: Medicine Type. This was used to distinguish between the three product types (originator brand, the highest-priced generic equivalent and the lowest-priced generic equivalent).

Column C: Brand or product name (s). This contains the names of individual products. It is important to identify the originator brand name used in our country correctly for each of the survey medicines.

Column D: Manufacturer. The data collector needs to complete Row-2 in each individual outlet with the name of the manufacturer of the highest-priced generic equivalent and the lowest-priced generic equivalent found.

Column E: Available “yes” or “no”. The data collector recorded the originator brand; and lowest-priced generic equivalent were available **only if they actually saw a pack of the medicine**.

Column F: Pack size recommended. In order to facilitate comparisons between products, sectors and countries, a “recommended pack size” had been selected for each medicine.

Column G: Pack size found. The data collectors in the field completed this column. If several pack sizes were available for the same product, data collectors would select the recommended pack size or the next larger pack size.

Column H: Price of pack found. The data collectors in the field completed this column.

Column I: Unit price. Unit price refers to the price per individual tablet, capsule, milliliter (for injections, liquids, etc.), gram (for creams, etc) or dose (for inhalers). This column was completed by dividing the price of the pack found by the pack size.

Column J: Comments.

3.7 Data collection procedure

3.7.1 Identifying sectors for price comparisons

At these sectors, at least three of the following four medicine prices were **planned** to assess and procure medicines.

- Medicine procurement prices: prices that the government and other purchasers pay to procure medicines.
- Public sector patient prices: if patients in public health facilities are charged for medicines, these prices may be considered a second sector.
- Private sector retail prices: prices that patients pay in private pharmacies and
- Other sector patient prices: if patients in other sector are charged for medicines, these prices may be considered a fourth sector

In reality, public sector could not be assessed and private wholesale sector was assessed instead of public sector. However, private wholesale sector was only present in one township and has few numbers. Sample size was not attained up to the actual sample size due to time constraints, few numbers of wholesalers and difficult to make appointment with the owners from those stores. Not all the private wholesales were included.

3.7.2 Selection of medicines for inclusion in the survey

Many different medicines are registered and available in Myanmar. According to Myanmar national essential medicines list, which is only, applies in the public sector contains 208 drugs (Use of the WHO certification scheme on the quality of pharmaceutical products moving in international commerece, 1995). However in the private sectors, several thousand medicines may be available.

In order to make the study manageable and to enable comparability, Global and regional core list of medicines had been selected as the basis for data collection and analysis. Global and regional core medicines are standardized across WHO/HAI surveys to enable international comparisons of medicine prices, availability and

affordability. The medicines on the global and regional core list had been selected because they meet the following criteria:

- **Global/ regional burden of disease and prevalence patterns:** used to treat common conditions, both acute and chronic, that cause significant morbidity and mortality, including cardiovascular disease, diabetes, respiratory diseases, various infections and mental illness.
- **Evidence- based:** recommended, usually as first line course of treatment, in global, regional and national treatment guideline.
- **Availability:** they are available in standard formulations and are widely used in many countries and regions.
- **Importance:** majority of them are included in the WHO Model List of Essential Medicines (WHOEML).

Regional core medicine lists (available in the workbook part I, on the CD-Rom, & on the HAI website; http://www.haiweb.org/medicineprices/manul/document.html assessed 13May 2012) had been developed as a complement to the global core list to address regional differences in the usage of medicines. Thus, medicines not included in the global and regional core list of WHO/ HAI were not being included in the survey.

The list of 30 medicines was presented in **Appendix D**. For each medicine, the core list contains one dosage form, one strength, medicine list, and their drug actions.

3.7.3 Data collection

- Training of data collectors

All personnel involved in data collection were trained proper to ensure the reliable and accurate completion of the data collection and a pilot test were conducted prior to actual data collection.

- Collecting data on the prices and availability of medicines

Data collection took place in six townships of the Mandalay division. Medicine outlets from the private and other sector were surveyed. Data were collected by asking

the medicine price in pharmacies from the owners, managers, staffs and officer in charge. For each medicine, up to three products were monitored, namely: innovator brand, highest-priced generic equivalent and the lowest-priced generic equivalent. (Because the availability of innovator brand was extremely poor according to the pilot test result and unable to compare the price, therefore, highest priced generics were measured in addition to innovator brand and lowest priced generic in actual data collection in order to manageable the study and comparisons). Therefore, one row for highest priced generics was added in WHO data collection form. (**Appendix E**).

Originator brand products are standard for the country and do not vary from outlet to outlet. They were identified centrally before data collection. Lowest-priced generic equivalents and highest-priced generic equivalents were defined as the generically equivalent products with the lowest and highest unit price available at each medicine outlet on the day of the survey. They were determined by data collectors by calculating the unit price. Therefore, the specific highest and lowest priced generics can vary from outlet to outlet according to which generic products were available at the specific outlets.

Data collection were also measure the availability of the selected medicines whether the medicines included in the core list may or may not be presented in each health facility and pharmacy included in the sample. And price was collected for only the drugs which are present and physically seen on the stock.

3. 8 Data entry and analysis

3.8.1 Data entry

- Data were entered by using **Excel and Statistical package of social science software, SPSS 17.0 version**. (Licensed for Chulalongkorn University).
- Data were entered twice to minimize errors.

Two main types of data analysis were done.

- Price and availability comparisons within individual sectors (Within sector analysis)

- Price and availability comparisons among sectors (cross-sector comparisons)

  Analysis of classes of medicines in each sector (by two-way ANOVAs)

  Treatment affordability

Within sector analysis of medicine prices and availability

For each sector surveyed, availability and prices were examined for individual medicines as well as for the sector as a whole. For individual medicine, data analysis included comparisons between originator brand and generically equivalent products (highest and lowest priced generics) and also included the following;

- Percent availability: percentage of outlets where an individual medicine product was found. This only referred to the day of data collection at each particular facility and might not reflect average monthly or yearly availability of medicines at individual facilities.
- Median price of each medicine in local currency.
- Median price ratio (MPR) in relation to international standard prices.
- Variations in price across medicine outlets, including 25^{th} and 75^{th} percentiles and maximum and minimum values.
- Mean percent availability across a basket of medicines.
- Comparison of MPR for highest priced and lowest priced generics (Matched pair analysis) (originator brand was neglected in comparison against generics, because of few numbers of originator brands name drugs).

Median Price - Because means (average) could be skewed by outliers (extreme values), median values were used in price analysis as a better representation of the midpoint value.

Median Price Ratio (MPR) - The MPR is the ratio of the local price divided by an international reference price converted into the same currency. Medicine prices found during the survey were not expressed as currency units, but rather as ratios relative to a standard set of international reference prices to facilitate international and national comparisons.

$$\text{MPR} = \frac{\text{Median local unit price in kyats/US\$}}{\text{International reference unit price in kyats/ US\$}}$$

MPR is an expression of how much greater or less the local medicine price is than the international reference price. An MPR of 15 will mean that the local medicine price is fifteen times that of the international reference price. The international reference prices used for this survey were taken from the 2010 Management Sciences for Health (MSH) International Drug Price Indicator Guide (http://erc..msh.org/) because they are updated frequently, are always available and are relatively stable (Management Sciences for Health, 2010).

Cross-sector comparisons

Medicine availability and prices were compared between the different sectors for which price data were collected in the study such as private retail sector patient prices vs. drug store in private hospital sector patient prices, private retail sector availability vs. drug store in private hospital sector availability etc. It was made for individual medicines and classes of medicines in each sector. Two-way analysis of variance was also used to test for sector-class interactions.

Treatment affordability

The affordability of treating key health problems using standardized treatment regimes were calculated by using the median (local unit) prices collected during survey. Standardized treatment regimes are shown in **appendix F.** The treatment guidelines were obtained from the British National Formulary (BNF).The treatment cost for an episode of illness was compared to the daily wage of the lowest paid unskilled government worker to determine the number of days' wages needed to pay for the cost of treatment. Treatments that cost more than one day's wages of the lowest paid unskilled government worker are considered as unaffordable for poor

people (WHO, Measuring medicine prices, availability, affordability and price components 2nd edition, 2008).

3.9 Ethical consideration

The research proposal was submitted to Ethical Committee of Chulalongkorn University before collecting data. According to the approval of Ethical Committee of Chulalongkorn University, this study was done. Before interviewing, the subjects were explained on the purpose of study as well as any potential harm or risk that the study may cause. They were assured of confidentiality, and they were also told that they can withdraw from the study at any time. Then, let them sign on the consent form and take the permission from the interviewees (officer in charge and owner).

3.10 Limitation

This study was pharmaceutical sector based cross-sectional study so that it cannot evaluate changes over time. This survey was not considering the quality of drug in compare the price. Non-availability and lower availability of some drugs may not be meaningful. The reason was, those drugs which were found in different strengths form what were specified into the medicine price data collection form were not recorded.

3.11 Expected benefit and applications

- This study made easy to understand the need for some kind of price regulation and policy coordination.
- The study provided powerful tools for advocacy.
- The study increased drug supply and control prices.
- The study increase the consumer awareness

CHAPTER IV

RESULTS

This chapter is divided into two parts. The first part gives the information from "within sector analysis" and the second part gives the data from "cross-sector analysis". The study was originally planned to surveyed 3 sectors such as public sector, private sector and other sector. However, in reality public sector cannot assessed and it was replaced by private wholesale sector. Other sector included dispensing doctors, private drug stores in public hospitals and private hospitals. However, the price in which store cannot be the same in reality. Therefore, they were analyzed separately and the total numbers of sector become 5.

Part I: Individual sectors in the within sector analysis

1. Other sector 1: Dispensing doctors (DD)
2. Other sector 1: Private drug store in public hospital (PH)
3. Other sector 3: Drug store in private hospital (PP)
4. Private retail sector (PR)
5. Private wholesale sector (PW)

The following analyses were done for each sector.

Availability of individual medicine as well as for the sector as a whole: Availability was calculated as the percentage of medicine outlets where a medicine was located on the day of the survey.

Price of individual medicine to compare international reference prices as well as for the sector as a whole: the comparison was presented as the median price ratio (MPR) of the local price with the International Reference Prices (IRPs) of the Management Sciences for Health (MSH). International reference price was change to local unit kyats. (Exchange rate of 1 US$=815 kyats). For instance, MPR of 3 would indicate that the local price is three times higher than the international reference price. MPR of greater than 5 might indicate particularly expensive that could not be available or achieved.

Before interpreting the findings one thing should be borne in mind, that is, in all the sectors procurement is by individual outlet from preferred stockiest/ distributors (wholesalers). Therefore, price of same product could vary because of the type of procurement agent, distribution route, differences in retail margins, or rounding off of tax components.

Comparisons of median price ratios (MPRs) for highest priced generic (HPG) and lowest priced generic (LPG) (Match pair analysis): Matched pair analysis was measured on the products which were found together in each sector. It means that only the products both highest priced and lowest priced generics found at the same times that were included in the analysis. Originator product was not considered because only small numbers of drugs were found for this category.

Part II: Cross-sector analysis

Medicine availability and prices were compared between the different sectors. Cross-sector comparisons were made for individual medicines, as well as for summary results (basket of medicines).

1. **Medicine availability** comparisons within the categories of brand name drugs, highest-priced generics and lowest-priced generics; among sectors.
2. **Medicine price comparisons among sectors**. This section considered only drugs that were available in all sectors, within the categories of brand-name drugs, highest-priced generics, and lowest-priced generics.
3. **Two-way analysis of variance for absolute and proportional price differences** between highest- and lowest-priced generics, assessing main effects of sector and drug class, and sector-drug class interaction.
4. **Affordability treatment calculations**. This section considered only the 14 drugs on the global core list. Affordability of a standard treatment course was calculated for each drug that was available for at least one sector, for brand-name drugs and for highest- and lowest-priced generics.

Affordability was calculated based on the daily wages of unskilled government workers. One day’s wages or less (for a course of treatment) is generally

considered affordable (WHO, Measuring medicine prices, availability, affordability and price components 2nd edition, 2008).

In all, 30 medicines were surveyed in the 20 Dispensing doctors, 10 drug stores in the public hospitals, 30 drug stores in the private hospitals, 30 in the private retail drug stores and 3 from the private whole sales. Total number of outlets in this study was 93 in 5 sectors.

Table 1 shows the distribution of the national essential medicine list. 26 of the 30 medicines studied were on the essential drug list of Union of Myanmar. 2 are from the complementary list and 2 are not on the list. Complementary means good to use but it is not essential.

Table 1: Distribution of the national essential medicine list (n=30) for each sector

	Frequency	**Percent**
Essential list	26	86.7
Complementary list	2	6.7
Not on the list	2	6.7
Total	30	100

Table 2 describes the classification of drugs. 30 drugs were classified into 9 groups. 3 drugs were included in analgesic, 2 for each of antacid, antiparasite, antifungal and respiratory tract infection; 6 were included in antibiotics and another 6 were included in cardiovascular group; and the last 4 were in psychotropic groups.

Table 2: Classification of the Drugs (n=30)

Drug Classes	**Name of the Drugs**	**Total number**
Analgesic	Diclofenac	3

	Ibuprofen	
	Paracetamol	
Antacid	Omeprazole	2
	Ranitidine	
Antibiotic	Amoxicillin capsule	
	Amoxicillin syrup	
	Ceftriaxone	6
	Ciprofloxacin	
	Doxycycline	
	Gentamycin	
Antifungal	Clotrimazole topical cream	2
	Cotrimoxazole suspenison	
Antiparasite	Diethylcarbamazine	2
	Metronidazole	
Cardiovascular	Amlodipine	
	Atenolol	
	Atrovastatin	6
	Captopril	
	Enalapril	
	Simvastatin	
Diabetes	Glibenclamide	3

	Gliclazide	
	Metformin	
Psychotropic	Amitriptylene	
	Diazepam	
	Fluoxetine	4
	Phenytoin	
Respiratory	Belcomethasone	
	Salbutamol	2

PART I: WITHIN SECTOR ANALYSIS

In each sector, availability and prices were examined for individual medicines as well as for the sector as a whole. For individual medicine, data analysis includes comparison between product types.

4.1 Dispensing doctor sector patient prices and availability

4.1.1 Percent availability and mean percent availability of the drugs

The table 3 shows the availability of the medicines in dispensing doctor; and 20 outlets were surveyed. The availability of the basket of 30 medicines was low; 1.8%, 28.5% and 32.5% for innovator brand, highest priced generic and lowest priced generic respectively. Generally, the lowest priced generic was more available than the other two categories. However, highest-priced generic had better availability in some individual drugs like amlodipine, amoxicillin cap, atenolol, ceftriaxone, clotrimazole cream, diclofenac, enalapril, gliclazide, ibuprofen, metformin, omeprazole and paracetamol. Out of the 30 medicines surveyed, only 2 innovator brands (amlodipine and salbutamol) were found in this sector. Suprisingly, the lowest priced generic

availability of the ceftriaxone, diethylcarbamazine, glibenclamide and simvastatin were very low only 5 % . Moreover, the availability of captopril, diazepam, fluoxetine and phenytoin were nil in all 3 categories. (Appendix C, table 27)

Table 3: Percent of stores in which drugs were available, by price category: Dispensing doctor sector (DD)

	Other sector 1: DD, n=20 stores		
	IB	HPG	LPG
Mean percent availability across the basket of 30 medicines	1.8	28.5	32.5
Std. Deviation	8.4	30.6	25.4

DD= Dispensing Doctor, IB=innovator brand, HPG=highest priced generic, LPG=lowest priced generic.

4.1.2 Patient prices for the medicines as compared to the international reference prices

The table 4 shows the price (MPR) in dispensing doctors sector along with corresponding measures of dispersion.

In Dispensing doctors' section, patient prices for the lowest priced generics were 3.1 times the international reference price (n=26). The prices charged to patients for the lowest priced generic medicines ranged from 1.1 times the international reference price for Ciprofloxacin to 12.3 times the international reference price for Diethylcarbamazine. (Because diethylcarbamazine was found in only one store among the 20 dispensing doctors.).

For highest priced generics, patient prices were found to be 9.5 times the international reference price (n=20). The prices charged to patients for the highest priced generic medicines ranged from 1.4 times the international reference price for Ranitidine to 32.5times the international reference price for Glibenclamide.

For innovator brands, patient prices were found to be 12.8 times the international reference price (n=2). The prices charged to patients for the innovator brand medicines ranged from 3.6 times the international reference price for Amlodipine to 22.0 times the international reference price for Salbutamol. (Figure 6 and 7, Appendix C)

Table 4: Number of times more expensive: Dispensing doctor's patient prices for medicines compared to international reference prices

Prices (MPR)	**Innovator Brand (MPR)**	**Highest generic (MPR)**	**Lowest generic (MPR)**
NO. of medicines included	2	20	26
Median MPR	12.8	9.5	3.1
Minimum MPR	3.6	1.4	1.1
Maximum MPR	22.0	32.5	12.3

n=20 facilities, 30 medicines

4.1.3 Comparison of MPRs for HPG and LPG, when both products occurred in Dispending doctor sector, DD (Matched pair analysis)

The table 5 shows the difference in price between highest priced and lowest priced generics in DD. Only medicines with prices found for both types in pair were analysed. In all, 20 drugs were compared and generally, highest priced generics were 3.3 times higher than the lowest one. Maximum difference was seen in ibuprofen, highest priced generic was 10 times than the lowest priced generic. The HPG was more than 3 times as expensive as the LPG for several drugs such as amlodipine, amoxicillin cap, atenolol, ciprofloxacin, clotrimazole cream, diclofenac, enalpril, gentamycin, glibenclamide, ibuprofen and paracetamol. (Appendix C, table 28)

Table 5: Comparisons between highest priced and lowest priced generics, both products occur in Dispending doctor sector

	Highest generic (MPR)	**Lowest generic (MPR)**	**No. of times more expensive (MPR)**
No. of medicines included	20	20	
Median MPR	9.5	2.9	3.3
25th percentile	3.8	1.8	
75th percentile	12.4	3.8	

4.2 Private drug store in public hospital patient prices and availability

4.2.1 Percent availability and mean percent availability of the drugs

From table 6, mean percent availability of all surveyed medicines was 42.0% for lowest priced generics, 31.7% for highest priced generics and only 1.0% for innovator brands. Poor (<25.0%) availability was encountered for the LPG version of only 6

medicines, namely amitriptylene, clotrimazole cream, cotrimoxazole susp, glilazide, ibuprofen and metronidazole. Surprisingly, 7 out of 30 drugs were not found in any category. These 7 drugs were belcomethasone, captopril, diethylcarbamazine, diazepm, fluoxetine, phenytoin and simvastatin. 100 % availability was seen in highest priced generic of diclofenac and lowest priced generic of doxycycline. (Appendix C, table 29)

Table 6: Percent of stores in which drugs were available, by price category: private drug store in public hospital

	Other sector 1: PH, n=10 stores		
	IB	HPG	LPG
Mean percent availability across the basket of 30 medicines	1.0	31.7	42.0
Std. deviation	4.0	33.5	34.9

PH=private drug store in public hospital, IB= Innovator brand/ originator brand, HPG= Highest priced generic, LPG= Lowest priced generic.

4.2.2 Patient prices for the medicines as compared to the international reference prices

Table 7 shows the patient prices at private drug store in public hospital. The patient prices for the lowest priced generics were found to be 2.4 (n=23) times the international reference price. The prices charged to patients for the lowest priced generic medicines ranged from 0.7 times the international reference price for omeprazole to 6.1 times the international reference price for glibenclamide.

For highest priced generics, patient prices were 8.2 (n=19) times the international reference price. The prices charged to patients for the highest priced generic medicines ranged from 1.3 times the international reference price for ranitidine to 34.1 times the international reference price for atorvastatin.

For innovator brands, patient prices were found to be 19.4 (n=2) times the international reference price. The prices charged to patients for the innovator brand medicines ranged from 3.6 times the international reference price for salbutamol to 35.3 times the international reference price for atorvastatin. (Appendix C, figure: 8 and 9)

Table 7: Number of times more expensive: other sector1: Private drug store in public hospital patient prices for medicines compared to international reference prices

Prices (MPR)	**Innovator Brand (MPR)**	**Highest generic (MPR)**	**Lowest generic (MPR)**
NO. of medicines included	2	19	23
Median MPR	19.4	8.2	2.4
Minimum MPR	3.6	1.3	0.7
Maximum MPR	35.3	34.1	6.1

n=10 facilities, 30 medicines

4.2.3 Comparison of MPRs for HPG and LPG, when both products occured in private drug store in public hospital (Matched pair analysis)

The table 8 shows the price difference between highest priced and lowest priced generics in other sector1: PH. Generally, lowest priced generic were differ 3.8 times than highest priced generic.. Highest price generics of diclofenac, atorvastatin,

amoxicillin capsule and ibuprofen were 8 times, 7 times 6 times and 6 times more expensive than their respective lowest generics. (Appendix C, table 30)

Table 8: Comparisons between highest priced and lowest priced generics, found both products in private drug store in public hospital

	Highest generic (MPR)	**Lowest generic (MPR)**	**No. of times more expensive (MPR)**
No. of medicines included	19	19	
Median MPR	8.3	2.2	3.8
25th percentile	3.3	1.6	
75th percentile	11.9	3.0	

4.3 Drug store in private hospital patient prices and availability

4.3.1 Percent availability and mean percent availability of the drugs

Table 9 show the mean percent availability of the drugs. The availability of overall 30 basket medicines was 51.6 % for lowest priced generics, 49.4% for highest priced generic and 3.5% for innovator brands product. In some instances, such as with amlodipine capsule or tablet, amoxicillin capsule, amoxicillin suspension, atenolol tablet, ceftriaxone injection, ciprofloxacin capsule, diazepam tablet, diclofenac capsule, enalapril capsule, ibuprofen, metformin capsule,omeprazole capsule and paracetamol suspension, the highest priced generic had better availability than lowest priced generic. Non-availability of some drugs was found, namely, captopril, diethylcarbamazine, fluoxetine and phenytoin in all 3 categories. Highest priced generic of diclofenac and paracetamol were found as 100.0% availability. (Appendix C, table 31)

Table9: Percent of stores in which drugs were available, by price category: drug store in private hospital

	Other sector 2: PP, n=30 stores		
	IB	HPG	LPG
Mean percent availability across the basket of 30 medicines	3.5	49.4	51.6
Std. deviations	12.2	39.1	32.9

PP= Drug stores in the private hospital, IB= Innovator brand/ originator brand, HPG= Highest priced generic, LPG= Lowest priced generic

4.3.2 Patient prices for the medicines as compared to the international reference prices

Table 10 shows the patient prices for the medicines in PP. patient prices for the lowest priced generics were found to be 2.6 times the international reference price. The price charged to patients for the lowest priced generic medicines ranged from 0.7 times the international reference price for ranitidine to 8.3 times the international reference price for diazepam.

For highest priced generics, patient prices were found to be 8.4 times the international reference price. The price charged to patients for the highest priced generic medicines ranged from 1.5 times the international reference price for ranitidine to 29.2 times the international reference price for diazepam.

For innovator brand name drugs, patient prices were found to be 26.7 times the international reference price. The price charged to patients for the innovator brand medicines ranged from 4.0 times the international reference price for salbutamol to 55.1 times the international reference price for atorvastatin. (Appendix C, figure 10, 11)

Table 10: Number of times more expensive: other sector2: Drug store in Private hospital patient prices for medicines compared to international reference prices

Prices (MPR)	Innovator Brand (MPR)	Highest generic (MPR)	Lowest generic (MPR)
No. of medicines included	3	22	26
Median MPR	26.7	8.4	2.6
Minimum MPR	4.0	1.5	0.7
Maximum MPR	55.1	29.2	8.3

n=30 facilities, 30 medicines

4.3.3 Comparison of MPRs for HPG and LPG, when both products occurred in drug store in private hospital (Matched pair analysis)

Table 11 describes the price differences between highest priced and lowest priced generics in other sector2: PP. 22 drugs were measured in other sector2: PP. Overall, lowest priced generic was 3.5 times cheaper than the highest priced generic (being 25^{th} and 75^{th} percentile of 2.2 and 4.7). Majorities go around 2-4 times than lowest

priced generics. Only a few drugs had at least 7 times more than their lowest generics and ibuprogen had 10 times difference. (Appendix C, table 32)

Table 11: Comparisons between highest priced and lowest priced generic, found both products in drug store in private hospital

	Highest generic (MPR)	**Lowest generic (MPR)**	**No. of times more expensive**
No. of medicines included	22	22	
Median MPR	8.4	2.4	3.5
25th percentile	5.7	1.7	
75th percentile	14.6	3.4	

4.4 Private retail sector patient prices and availability

4.4.1 Percent availability and mean percent availability of the drugs

According to table 12, mean percent availability in private retail sectors is 66.3for lowest priced generic, 51.7 for highest price generic and 3.2 for innovator brand products. Surprisingly, 100.0% availability was seen in lowest priced and highest priced of amoxicillin capsule, paracetamol and lowest priced of atenolol, diclofenac, doxycycline and ranitidine. Some medicines were widely available in private retail sector while others were not found and had low availability. Availabilities were nil for captopril, diazepam, diethylcarbamazine, fluoxetine and phenytoin. Poor availabilities (<25%) were found in highest priced generics of glibenclamide, metronidazole, simvastatin and lowest priced generic of beclomethasone. (Appendix C, table 33)

Table 12: Percent of stores in which drugs were available, by price category: Private retail sector

	Private retail, n=30 stores		
	IB	HPG	LPG
Mean percent availability across the basket of 30 medicines	3.2	51.7	66.3
Std. deviation	10.0	38.3	38.3

IB= Innovator brand/ originator brand, HPG= Highest priced generic, LPG= Lowest priced generic.

4.4.2 Patient prices for the medicines as compared to the international reference prices

Table 13 show the summary price result in private retail sector, patient prices for the lowest priced generics were found to be 2.0 (n=25) times the international reference price. The prices charged to patients for the lowest priced generic medicines ranged from 0.6 times the international reference price for omeprazole to 4.8 times the international reference price for glibenclamide.

For highest priced generics, patient prices were found to be 7.5 (n=23) times the international reference price. The prices charged to patients for the highest priced generic medicines ranged from 1.4 times the international reference price for ranitidine to 32.5 times the international reference price for glibenclamide.

For Innovator brands, patient prices were found to be 18.8 (n=3) times the international reference price. The prices charged to patients for the innovator brand medicines ranged from 3.0 times the international reference price for salbutamol to 34.9 times the international reference price for atrovastatin. (Appendix C, figure 12, 13)

Table 13: Number of times more expensive: Private retail sector patient prices for medicines compared to international reference prices

Prices (MPR)	Innovator Brand (MPR)	Highest generic (MPR)	Lowest generic (MPR)
NO. of medicines included	3	23	25
Median MPR	18.8	7.5	2.0
Minimum MPR	3.0	1.4	0.6
Maximum MPR	34.9	32.5	4.8

n= 30 facilities, 30 medicines

4.4.3 Comparison of MPRs for HPG and LPG, when both products occurred in private retail sector (Matched pair analysis)

The table 14 gives the information about the price difference in the private retail sectors. Median MPR of lowest priced generics for 23 medicines was 2.1 and 7.5 for highest priced generics. Overall highest priced was 3.6 times more expensive than the lowest priced generic. There was a wide difference in ibuprofen about 8.0 times,

amlodipine, glibenclamide and diclofenac are round about 6 times and amoxicillin capsule is about 5 times than their lowest generics. (Appendix C, table 34)

Table14 : Comparisons between highest price and lowest price generic, found both products in private retail sector

	Highest generic (MPR)	**Lowest generic (MPR)**	**No. of times more expensive**
No. of medicines included	23	23	
Median MPR	7.5	2.1	3.6
25th percentile	3.2	1.3	
75th percentile	8.4	2.6	

4.5 Private wholesale sector patient prices and availability

4.5.1 Percent availability and mean percent availability of the drugs

Table 15 shows the mean percent availability of drugs in private wholesale sector. The availability of the basket of 30 medicines was 2.2%, 57.8% and 63.3% for innovator brand, highest priced generic and lowest priced generic respectively. Only one drug (33.3%) was found in both categories of clotrimazole cream, highest priced of ibuprofen, metronidazole and simvastatin and lowest priced of glibenclamide. Moreover, amitriptylene, captopril, belcomethasone, diazepam, diethylcarbamazine, fluoxentine, phenytoin were not found. However, amlodipine, amoxicilline cap, amoxicillin susp, atenolol, atorvastatin, ciprofloxacin, diclofenac, doxycycline, enalpril, gliclazide, omeprazole, paracetamol, ranitidine and sabutamol were found 100% in HPG and LPG. (Appendix C, table 35)

Table 15: Percent of stores in which drugs were available, by price category: Private wholesale sector

	Private wholesale, n=3 store		
	IB	HPG	LPG
Mean percent availability across the basket of 30 medicines	2.2	57.8	63.3
Std. deviation	12.2	45.4	43.2

IB=innovator brand, HPG=highest priced generic, LPG=lowest priced generic

4.5.2 Patient prices for medicines as compared to the international reference prices

Table 16 shows the patient prices in private wholesale sector, patient prices for the lowest priced generics were found to be 1.6 (n=22) times the international reference price. The prices charged to patients for the lowest priced generic medicines ranged from 0.5 times the international reference price for omeprazole to 4.3 times the international reference price for glibenclamide.

For highest priced generics, patient prices were found to be 3.7 (n=20) times the international reference price. The prices charged to patients for the highest priced generic medicines ranged from 1.5 times the international reference price for gliclazid to 15.7 times the international reference price for diclofenac.

For innovator brands, patient prices were found to be 2.9 (n=1) times the international reference price. (Appendix C, figure 14, 15)

Table16: Number of times more expensive: Private wholesale sector patient prices for medicines compared to international reference prices

Prices (MPR)	Innovator Brand (MPR)	Highest generic (MPR)	Lowest generic (MPR)
NO. of medicines included	1	20	22
Median MPR	2.9	3.7	1.6
Minimum MPR		1.5	0.5
Maximum MPR		15.7	4.3

n=3 facilities, 30 medicines

4.5.3 Comparison of MPRs for HPG and LPG, when both product occurred in private wholesale (Matched pair analysis)

In private wholesale sectors, only 19 drugs were included in matched pair analysis. Table 17 shows Median MPR of lowest priced generic was 1.3 whereas highest price generic was 3.2. Their difference was 2.5 times. Great difference was seen in only diclofenac drugs which was about 12 times difference. (Appendix C, table 36)

Table 17 :Comparisons between highest priced and lowest priced generic, found both product in private wholesale, n=3 stores

	Highest generic (MPR)	**Lowest generic (MPR)**	**No. of times more expensive**
No. of medicines included	19	19	
Median MPR	3.2	1.3	2.5
25th percentile	2.7	0.8	
75th percentile	6.5	1.9	

PART II: INTER-SECTORAL COMPARISONS (CROSS-SECTOR ANALYSIS)

Cross-sector comparisons include the comparisons of medicine availability and prices among the sectors. Further, two-way analyses of variance (ANOVA) for absolute and proportional price differences between highest and lowest priced generics was conducted. These ANOVAs yielded p-values for main effects of sector (5 sectors) and drug class (9 drug classes), and for sector-class interaction. Affordability is also considered in this section.

4.6 Comparisons of medicine availability between sectors

Medicine availability was compared between the sectors where the same medicines were found in these sectors. (Note: data are the same from the within sector analysis. Therefore, null availability of the drugs in all the sectors was not displayed here.)

4.6.1 cross-sector comparisons of innovator brands availability

Table 18 shows the comparisons of the medicine (innovator brand) availability across the sector. Overall, availability of the innovator brand was extremely low in all the sectors. Among them, the availabilities in other sector2: PP was 3.5% and followed by private retail sector which was about 3.2%. However, the availability of amlodipine and atorvastatin in private retail sector was better than the other sector2:PP. Only three kinds of drugs were found, namely; amlodipine, atorvastatin and salbutamol. Out of these 3 drugs, availability of salbutamol was acceptable in other sector2: PP and private wholesale.

Table 18: Percent availability of innovator brands name drug by sectors

	Other sector1: DD (n=20)	**Other sector1: PH (n=10)**	**Other sector 2 (n=30)**	**Private retail (n=30)**	**Private wholesale (n=3)**
Mean percent availability across the basket of 30 medicines	1.8	1.0	3.5	3.2	2.2
amlodipine	10.0	0.0	23.3	30.0	0.0
atorvastatin	0.0	20.0	23.3	26.7	0.0
salbutamol	45.0	10.0	60.0	40.0	66.7

4.6.2 cross-sector comparisons of highest-priced generic drugs availability

Table19 gives the information about the highest priced generic drug availability across the sectors. Generally, availability in the other sector 2, private retail and private wholesale is greater than the other sector1. In private wholesale sector, the

availability was 57.8% whereas 51.7% and 49.44% respectively in private retail sector and other sector2: PP. Only two types of percent were amazingly found in private whole sale sectors, some were found 100.0% and some were found 33.3%. Mostly, the availabilities of individual drugs in other sector2 and private retail sectors were good, however, the availabilities of simvastatin, metronidazole and glibenclamide in private retail sector and metronidazole in other sector 2 was extremely low.

Table 19: Percent availability of highest priced generic name drug by sectors

	Other sector1: DD (n=20)	**Other sector1: PH (n=10)**	**Other sector 2 (n=30)**	**Private retail (n=30)**	**Private wholesale (n=3)**
Mean percent availability across the basket of 30 medicines	28.5	31.7	49.4	51.7	57.8
amlodipine	60.0	50.0	93.3	93.3	100.0
amoxicillin cap	80.0	80.0	93.3	100.0	100.0
amoxicillin susp	10.0	20.0	66.7	86.7	100.0
atenolol	60.0	70.0	96.7	93.3	100.0
atorvastatin	40.0	30.0	66.7	63.3	100.0
ceftriaxone	25.0	80.0	86.7	63.3	100.0
ciprofloxacin	35.0	90.0	93.3	96.7	100.0
clotrimazole cream	45.0	20.0	46.7	66.7	33.3
cotrimoxazole	0.0	0.0	23.3	50.0	0.0

susp					
diazepam	0.0	0.0	73.3	0.0	0.0
diclofenac	70.0	100.0	100.0	93.3	100.0
doxycycline	5.0	10.0	53.3	63.3	100.0
enalapril	75.0	60.0	90.0	96.7	100.0
gentamycin	10.0	10.0	30.0	50.0	0.0
glibenclamide	5.0	0.0	0.0	10.0	0.0
gliclazide	50.0	40.0	50.0	53.3	100.0
ibuprofen	45.0	30.0	43.3	53.3	33.3
metformin	85.0	40.0	90.0	86.7	100.0
metronidazole	0.0	0.0	3.3	13.3	33.3
omeprazole	75.0	80.0	96.7	86.7	100.0
paracetamol	65.0	80.0	100.0	100.0	100.0
ranitidine	5.0	20.0	30.0	73.3	100.0
salbutamol	10.0	40.0	56.7	50.0	100.0
simvastatin	0.0	0.0	0.0	6.7	33.3

4.6.3 cross-sector comparisons of lowest-priced generic drugs availability

The table 20 compares the availabilities of lowest priced generics drugs across the sectors. Mean percent availability of 30 baskets of medicines was 66.2%, 63.3%, 51.5%, 42.0% and 32.5% in private retail sector, private whole sale sector, other sector2, other sector1: PH and other sector1: DD respectively. However, the individual amitriptylene capsule availability in other sector1: DD and ceftriaxone

injection in other sector1: PH had better than the rest and which was about 80% and 90% respectively.

Table 20 :Percent availability of lowest priced generic name drug by sectors

	Other sector1: DD (n=20)	**Other sector1: PH (n=10)**	**Other sector 2 (n=30)**	**Private retail (n=30)**	**Private wholesale (n=3)**
Mean percent availability across the basket of 30 medicines	32.5	42.0	51.5	66.2	63.3
amitriptylene	80.0	10.0	66.7	26.7	0.0
amlodipine	45.0	90.0	90.0	96.7	100.0
amoxicillin cap	45.0	90.0	66.7	100.0	100.0
amoxicillin susp	55.0	40.0	63.3	93.3	100.0
atenolol	50.0	40.0	33.3	100.0	100.0
atorvastatin	50.0	60.0	93.3	96.7	100.0
beclomethasone	10.0	0.0	6.7	3.3	0.0
ceftriaxone	5.0	90.0	83.3	66.7	66.7
ciprofloxacin	60.0	60.0	40.0	96.7	100.0
clotrimazole cream	35.0	10.0	46.7	73.3	33.3
cotrimoxazole susp	60.0	20.0	63.3	86.7	66.7

diazepam	0.0	0.0	60.0	0.0	0.0
diclofenac	30.0	90.0	46.7	100.0	100.0
diethylcarbamazine	5.0	0.0	0.0	0.0	0.0
doxycycline	70.0	100.0	93.3	100.0	100.0
enalapril	30.0	80.0	80.0	93.3	100.0
gentamycin	30.0	40.0	76.7	90.0	66.7
glibenclamide	5.0	50.0	26.7	60.0	33.3
gliclazide	35.0	20.0	80.0	76.7	100.0
ibuprofen	35.0	20.0	30.0	73.3	100.0
metformin	25.0	70.0	46.7	96.7	66.7
metronidazole	15.0	10.0	16.7	66.7	66.7
omeprazole	25.0	60.0	60.0	90.0	100.0
paracetamol	55.0	70.0	93.3	100.0	100.0
ranitidine	90.0	80.0	96.7	100.0	100.0
salbutamol	25.0	60.0	83.3	70.0	100.0
simvastatin	5.0	0.0	3.3	30.0	0.0

4.7 Price comparisons

Price comparisons were made only when drugs were found to be commonly available in all sectors.

4.7.1 Cross-sector comparison of MPRs of originator brands among the sectors

The table 21 presents the comparisons of the originator brand prices among the sectors. Overall, only one innovator brand was found commonly in all the sectors. It was salbutamol. The prices of the salbutamol were uniform aroud (3-4 times the IRPs) among the sectors. The price of the salbutamol was highest in the other sector 2 which was about 4 times IRPs then other sector1: DD and PH in which the price was about 3.6 times and 3.5 times IRPs respectively and 3.0 times and 2.9 times in private retail and private wholesale sector respectively.

Table 21: MPRs of originator brands/innovators brands name drugs by sectors

	Other sector1: DD	**Other sector1: PH**	**Other sector 2**	**Private retail**	**Private whole sale**
No. of medicines included	1	1	1	1	1
salbutamol	3.6	3.5	4.0	3.0	2.9

4.7.2 Cross-sector comparison of MPRs of highest priced generic among the sectors

Table 22 shows the price of highest generic drug in all the sectors where the drugs were found commonly. Therefore, 18 drugs were observed to compare their prices. Generally, the price in private retail sector was lower than the other sector 1: DD, PH and other sector 2. However, the price in private whole sale sector was cheaper than the price in private retail sector. Nevertheless, one thing should be born in mind is that private wholesale is not the place where the ordinary people come to buy for a single treatment. However, the price in private whole sale was nearly 2 times cheaper than the price in other sector1:DD. For atorvastatin capsule, the price in other sector 1: PH

was 4 times more expensive than the private retail and other sector2. However, there was not much price difference in ranitidine in any sector.

Table 22: MPRs of highest priced generic name drugs by sectors

	Other sector1: DD (n=20)	Other sector1: PH (n=10)	Other sector 2 (n=30)	Private retail (n=30)	Private wholesale (n=3)
No. of medicines included	18	18	18	18	18
Median MPR	9.4	8.3	8.4	7.2	3.7
amlodipine	9.4	7.3	7.5	6.4	2.7
amoxicillin cap	11.7	10.3	14.4	7.7	1.6
amoxicillin susp	9.5	10.2	10.4	6.6	5.6
atenolol	10.6	10.4	10.5	8.4	3.0
atorvastatin	9.3	34.1	7.6	7.6	6.5
ceftriaxone	3.6	5.0	10.6	3.6	3.1
ciprofloxacin	6.0	4.3	5.4	4.5	4.2
clotrimazole cream	18.2	14.9	17.2	11.4	4.4
diclofenac	22.0	19.3	21.3	18.6	15.7
doxycycline	7.6	2.6	4.0	3.2	2.9
enalapril	10.2	8.2	8.6	7.8	7.1
gliclazide	1.7	1.5	1.6	1.4	1.5
ibuprofen	18.9	12.4	17.0	12.8	4.7

metformin	8.6	8.3	8.2	7.7	7.1
omeprazole	3.1	3.2	3.2	2.8	2.6
paracetamol	14.9	11.9	13.1	10.5	8.8
ranitidine	1.3	1.3	1.5	1.4	2.1
salbutamol	3.8	3.3	4.0	2.9	2.9

4.7.3 Cross-sector comparison of MPRs of lowest priced generic among the sectors

The table 23 shows the price of the lowest priced generic drug in terms of MPR to compare among the sectors. 22 drugs were included to compare each other. Median MPR of other sector 1: DD was 2.8, other sector 1: PH and other sector 2: PP was 2.4, private retail sector was 2.1 and private wholesale was 1.6 times than the international reference price.

Table 23: MPRs of lowest priced generic name drugs by sectors

	Other sector1: DD (n=20)	**Other sector1: PH (n=10)**	**Other sector 2 (n=30)**	**Private retail (n=30)**	**Private wholesale (n=3)**
No. of medicines included	22	22	22	22	22
Median MPR	2.8	2.4	2.4	2.1	1.6
amlodipine	3.1	1.9	2.0	1.0	0.8
amoxicillin cap	2.5	1.7	1.7	1.5	1.3
amoxicillin susp	4.1	3.0	4.3	2.9	2.7
atenolol	3.1	2.6	2.3	1.9	1.7

atorvastatin	4.7	4.7	5.0	2.6	2.4
ceftriaxone	1.5	3.6	3.5	1.3	1.0
ciprofloxacin	1.1	1.0	1.1	1.0	0.8
clotrimazole cream	3.2	3.9	4.0	3.4	3.9
cotrimoxazole susp	2.8	2.6	2.9	2.2	1.9
diclofenac	4.3	2.4	2.4	2.9	1.3
doxycycline	2.6	2.3	3.0	2.1	1.6
enalapril	2.7	2.5	2.3	2.4	1.9
gentamycin	3.0	1.6	2.5	2.0	2.2
glibenclamide	5.3	6.1	5.9	4.8	4.3
gliclazide	1.4	1.1	1.2	1.0	0.7
ibuprofen	1.8	2.0	1.7	1.6	1.6
metformin	6.4	2.0	1.8	1.8	1.3
metronidazole	1.9	5.1	2.2	2.6	1.2
omeprazole	2.5	0.7	0.7	0.6	0.5
paracetamol	3.8	3.3	3.4	3.0	1.7
ranitidine	1.2	0.9	0.7	0.9	0.6
salbutamol	2.5	2.2	2.6	2.1	2.1

4.8 Two-way analysis of variance (two-way ANOVA) of sector and drug class

Two-way ANOVA was conducted for absolute and proportional difference between prices for HPGs and LPGs, by sector and drug class (total 5 sectors and 9 drug classes). This analysis gave tests of significance for main effects of sector and drug class, and for sector-drug class interaction.

4.8.1 Two-way ANOVA for absolute price difference

Table 24 shows the sector, drug class and sector-drug class interaction. The dependent variable was absolute difference between the highest priced generic and lowest priced generic. The p-value for sector was 0.767, indicating that overall, absolute price differences did not differ significantly among sectors. In contrast, p-values for drug class and sector-class interaction were 0.004 and 0.001 respectively. This indicated that there were significant differences in absolute price differences among drug classes, and that these differences were not uniform among sectors and drug classes (non-parallelism of effects).

Table 24: Two-way ANOVA for absolute price difference between HPG and LPG, by sector and drug class

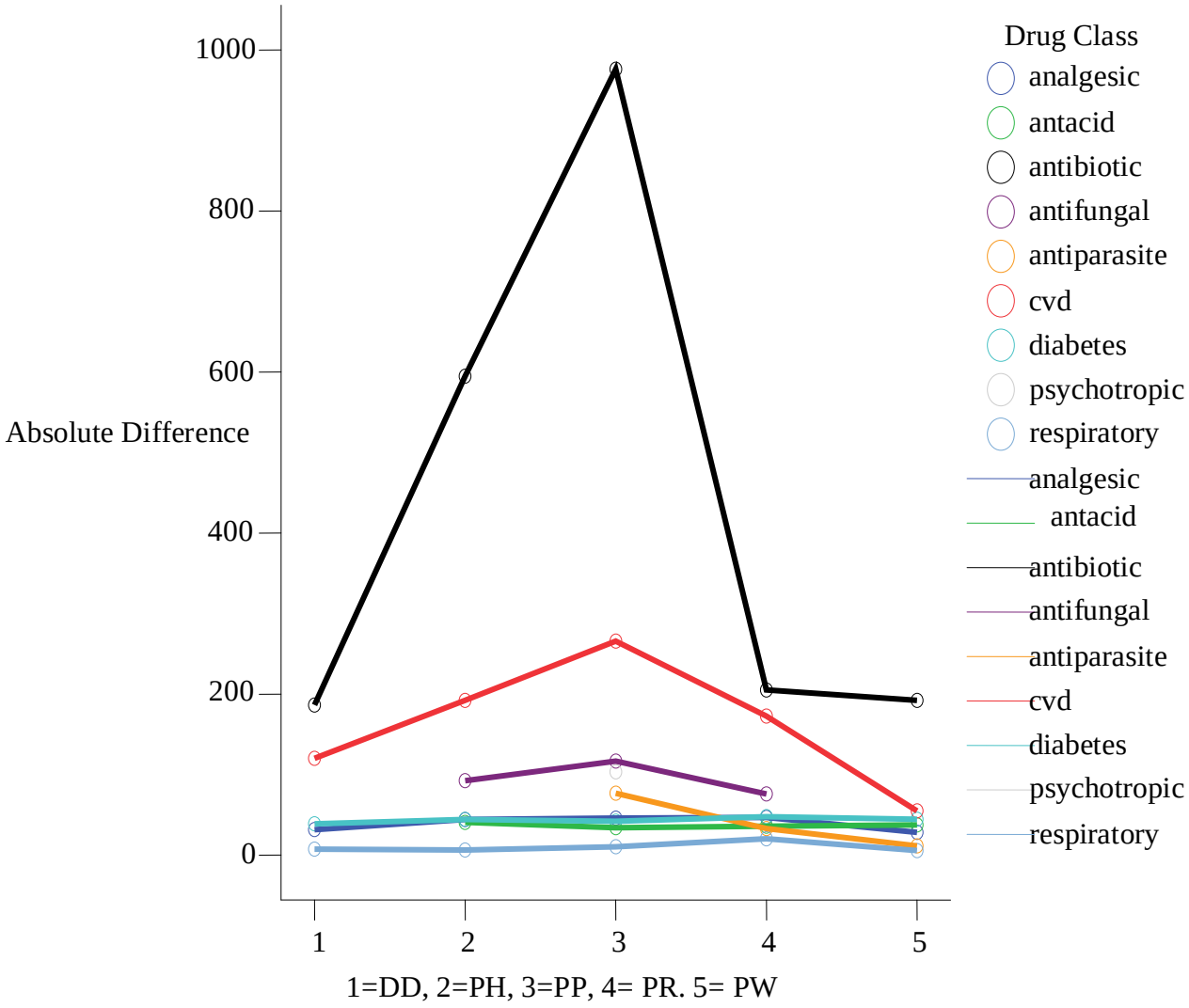
Source	Type III Sum of Squares	df	Mean Square	F	P-value
Corrected Model	69354184.69	35	1981548.14	5.28	0.001
Intercept	1119083.94	1	1119083.94	2.98	0.084
sector	686640.86	4	171660.21	0.46	0.767
Drug class	8579947.03	8	1072493.37	2.86	0.004
sector * drug class	22481110.65	23	977439.59	2.60	0.001
Error	323783717.6	862	375619.16		
Total	437031594.3	898			
Corrected Total	393137902.3	897			

a R Squared = .176 (Adjusted R Squared = .143)

df= degree of freedom,

Means of absolute price differences are plotted, by sector and drug class, in figure 4. For all drug classes but antibiotics, lines are reasonably parallel across sectors. (When antibiotics were omitted from the ANOVA, the sector-class interaction became non-significant.) Absolute price differences for antibiotics were considerably higher in sectors PH and PP than in the other sectors. The figure also shows that absolute price differences (and therefore proportional price differences) were missing in one or more sectors for antacid, antifungal, antiparasitic and psychotropic drugs. For example, there was a price difference for psychotropic drugs only in sector PP.

Figure 4: Means of absolute price differences between highest- and lowest-priced generic drugs, by sector and drug class.



4.8.2 sector-drug class interaction by proportional difference

Table 25 shows the sector, drug class and sector*class interaction. The dependent variable was proportional difference between the highest priced generic and lowest priced generic. The proportional difference is the absolute price difference divided by the price of the highest priced generic drug. As with the ANOVA for absolute price

difference, the main effect of sector was not significant, whereas the main effect of drug class and the sector-class interaction were significant.

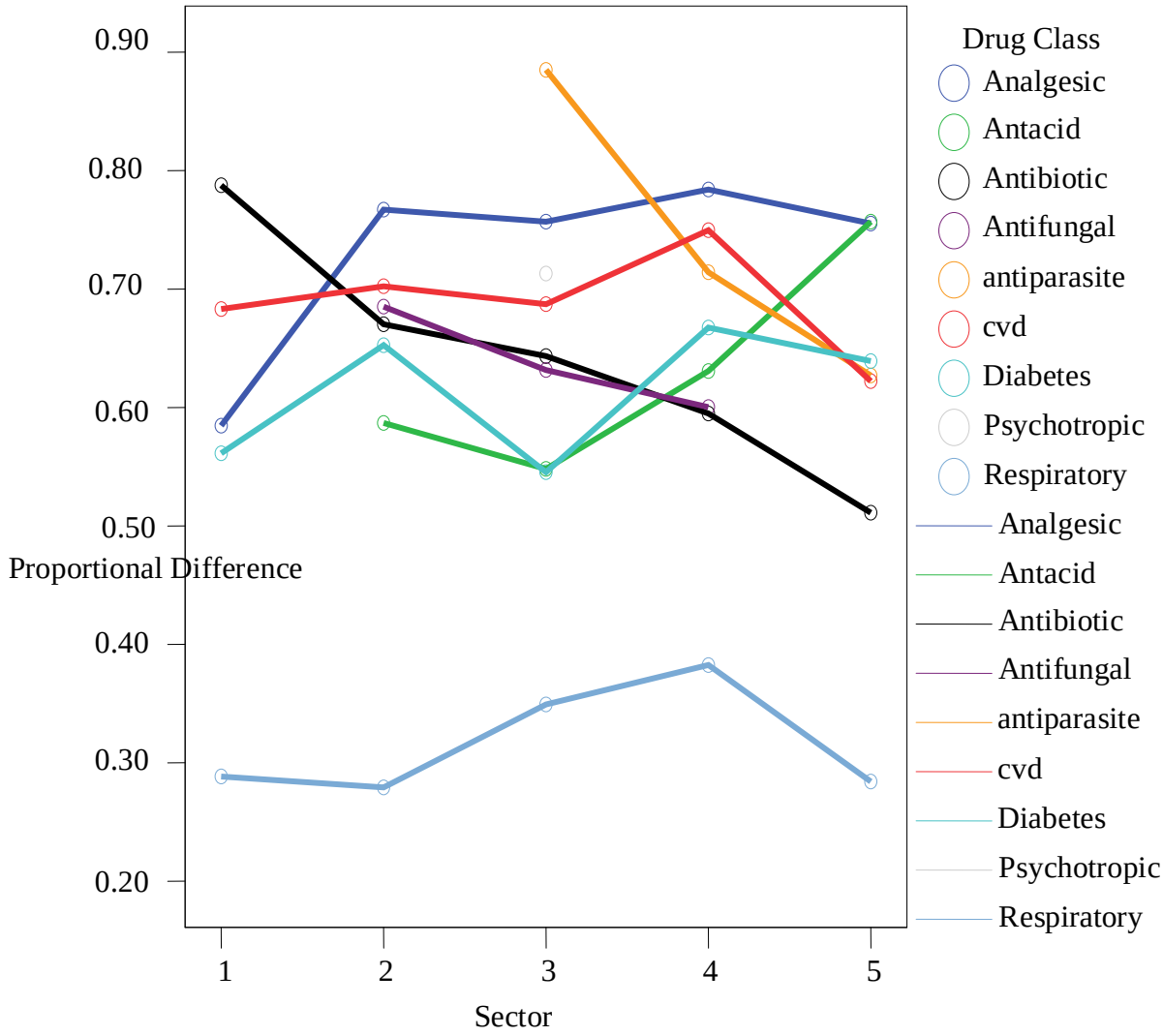
Table 25: Two-way ANOVA for proportional price difference between HPG and LPG, by sector and drug class

Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	8.86	35	0.25	6.4	0.001
Intercept	46.22	1	46.22	1168.5	0.001
sector	0.05	4	0.012	0.29	0.882
Drug class	2.99	8	0.37	9.44	0.001
sector * drug class	1.43	23	0.062	1.57	0.044
Error	34.10	862	0.04		
Total	427.91	898			
Corrected Total	42.96	897			
a	R Squared = .206 (Adjusted R Squared = .174)				

df= degree of freedom

Means of proportional price differences are plotted, by sector and drug class, in figure 5. Ove rall sectors, the average proportional difference for respiratory drugs was about 35%. This was considerably lower than corresponding differences for other drug classes, which ranged from about 55% to 90%.

Figure 5: Means of proportional price differences between highest- and lowest-priced generic drugs, by sector and drug class (note: the y-scale begins at 0.20, not zero).



The association between sector-drug class combinations with highest priced generic and lowest priced generics were also analyzed. But these analyses are not shown in here because they indicated that no significance in sector and significance in drug class and sector-drug class interactions.

4.9 Affordability treatment calculation

Medicines in the private wholesale sector are sold to retail drug outlets. These medicines are not available directly to the public. Therefore, the private wholesale

sector was not included in calculations of affordability. Moreover, only 13 drugs out of 14 global lists are considered here. The reason is that captopril was not found in any sector. From this table, not only the affordable price by individual sector, but also can compare across the sector.

Acute conditions treatment for HPG **Amoxicillin** (250 mg capsule 3 times per day) for adult respiratory infection required 3.8 days' wages when purchased from private retail drug stores, 7.1 days' wages from other sector 2, 5.1 days' wages from the other sector1: PH and 5.8 days' wages from the other sector 1: DD. The cost of lowest priced generic of amoxicillin capsule was 1.3 day's wages in other sector1: DD and approximately 0.8 days' wages required in other 3 sectors. HPG **Atenolol** (50 mg daily) cost about 2 and 2 ½ days' wages for one month treatment, while its LPG cost about 0.5-0.7 day's wages in all sectors to treat hypertension. Patients had to pay 2 days' wages to buy HPG **Ceftriaxone** (1g injection) in DD and Private Retail sectors, while LPG cost approximately one day wage in these two sectors. However, patients had to pay approximately 6 days' wages and 3 days' wages for HPG in other sector 2 and other sector1: PH respectively while LPG cost approximately 2 days' wages in both sector. To buy HPG **Ciprofloxacin** (500 mg daily), the patients had to pay approximately 1½ to 2 days wages in all the sectors while as LPG costs approximately ½ day wages in all the sectors. A one month treatment of HPG **Diclofenac** (50mg daily) for arthritis required about 4-4.5 days wages, while LPG cost 0.5-1 day wages in all the sectors. HPG **Glibenclamide** (5 mg daily) cost 5.4 day's wages for one month treatment when purchased at other sector1: DD and private retail sector. Whereas LPG requires approximately 1 day wage in all sector to treat diabetes. A one month treatment of HPG **Omeprazole** (20mg daily) for peptic ulcer required approximately 2 days' wages while LPG needs approximately 0.5 days to 2 days' wages in all sector. To buy HPG **Paracetamol suspension** (24 mg/ml daily), the patient had to pay 2.9days' wages in DD section and approximately 2 days' wages in the rest sectors. Purchasing LPG Paracetamol suspension cost about approximately 0.5 days' wages in all the sectors to treat pain/ inflammation. Patients had to pay 5.2 days' salary to buy HPG **Salbutamol** in the DD section, 5.6 days' wages in private hospital, 4.1 days' salary in private retail, and 4.6 days' salary in

other sector1: PH, while for LPG they have to spend approximately 3 to 3.5 days' salary. Patients had to pay approximately same days' wages as like HPG to buy the innovator brand salbutamol. Moreover, to treat the depression, patients had to spend 0.9 day wage in private retail sector and approximately 3 days wages in other sectors for lowest priced **amitriptylene**. To purchase lowest priced **cotrimoxazole** suspension for pediatric respiratory infection, needed less than one day wages in all sector and 1.4 days wages for highest priced one in other sector 2: PP and 0.7 day's wage in private retail sector. In additions, 1 condition was found only in one sector. To purchase the **diazepam** (5 mgt daily for 7 days) o treat anxiety, patients had to work 0.3 days for lowest priced generic and 1.0 days for highest priced generic drugs in other sector 2. Similarly, to purchase **simvastatin** for hypercholesterolaemia, patients had to spend 3 days salary for lowest priced and 8 day's salary for highest priced generic in private retail sector. However, patients had to spend approximately 9 days' wages to buy the lowest priced generic in other sector 1: DD and other sector 2: PP.

Table 26: Median number of day's wages of the lowest paid unskilled government worker needed to purchase a standard course of treatment, by sector

Conditions	Type of price	Other sector1: DD	Other sector1: PH	Other sector2: PP	Private Retail
Depression **Amitirptylene** 25 mg Capusle/tablet, 3 per day for 30 days	LPG	2.7	2.5	2.8	0.9
Adult respiratory	HPG	5.8	5.1	7.1	3.8

infection Amoxicillin 250 mg Caspule/tablet, 3 per day for 7 days	LPG	1.3	0.9	0.8	0.8
Hypertension Atenolol 50 mg Capsule/tablet,1 per day for 30 days	HPG	2.5	2.4	2.4	1.9
	LPG	0.7	0.6	0.5	0.5
Adult respiratory infection Ceftriaxone 1g/vial injection, 1 injection	HPG	2.0	2.8	6.0	2.0
	LPG	0.8	2.0	2.0	0.7
Adult respiratory infection Ciprofloxacin 500 mg Capsule/tablet, 2 per day for 7 days	HPG	2.1	1.5	1.9	1.6
	LPG	0.4	0.4	0.4	0.4
Pediatric respiratory infection Co-	HPG	NA*	NA*	1.4	0.7

trimoxazole 8+40mg/ml, 5ml, 2 per day for 7 days	LPG	0.7	0.5	0.7	0.5
Anxirty Diazepam 5 mg Capsule/tablet, 1 per day for 7 days	HPG	NA*	NA*	1.0	NA*
	LPG	NA*	NA*	0.3	NA*
Arthritis Diclofenac 50 mg Capsule/tablet, 2 per day for 30 days	HPG	4.6	4.1	4.5	3.9
	LPG	0.9	0.5	0.5	0.6
Diabetes Glibenclamide 5 mg Capsule/tablet, 2 per day for 30 days	HPG	5.4	NA*	NA*	5.4
	LPG	0.9	1.0	1.0	0.8
Ulcer Omeprazole 20 mg Capsule/tablet, 1 per	HPG	2.3	2.3	2.3	2.1
	LPG	1.9	0.5	0.5	0.4

day for 30 days					
Pain/Inflammation Paracetamol suspension 24 mg/ml Millilitre, 15 ml per day for 3 days	HPG	2.9	2.3	2.5	2.0
	LPG	0.7	0.6	0.6	0.6
Asthma Salbutamol 0.1 mg/dose inhaler, 1 inhaler of 200 doses	IB	5.0	4.8	5.5	4.2
	HPG	5.2	4.6	5.6	4.1
	LPG	3.5	3.1	3.6	2.9
Hypercholesterolaemia Simvastatin 20 mg Capsule/tablet, 1 per 30 days	HPG	NA	NA	NA	8.3
	LPG	8.5	9	NA	3.0

DD= Dispensing Doctor, PH= Drug store in public hospital, PP= Drug Store in Private Hospital, IB= Innovator brand, HP= Highest priced generic, LP= lowest priced generic. * NA: Not available in the designated sector.

CHAPTER V

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussion

The main purposes of this study was to identify the price that people pay for key medicines, to analyze variations in prices and availability of the same medicines in different sectors, to explore the difference in prices and availability of originator brands, generically equivalent medicines, to identify price variations between product types within the same sector, to describe price differences in different types of medicines (e.g.; cardiovascular drugs, respiratory drug ,psychotropic drug), to compare patient prices among sectors, to compare national prices and standard international reference prices of selected important medicines, and to analyze affordability of selected medicine for ordinary people in Myanmar.

The WHO/ HAI survey methodology allows for the measurement of medicine prices and availability in a standardized way. The global list and regional list with specified dosage forms and strengths allows more reliable international comparison. Not only the strengths but also WHO methodology has several limitations. The methodology does not account quality across products, and also availability and prices are determined for the specific list of survey medicines and dosage forms and strength. It does not consider the alternate dosage forms of these products or therapeutic alternatives.

Availability data refers only to the day of data collection at each facility and might not indicate average availability of medicines over time. Many factors can affect availability, for example the timing of survey and specific medicines included in the survey. Medicines on a global or regional list may not be in widespread use locally or local prescribers and consumers may prefer another strength or form. Therefore, the availability of the medicines in a survey may not be reliable representation of a survey's area situation. However, extreme availabilities (for example, 0% or greater than 80%) probably tell us something meaningful.

One important thing in price collecting, highest priced and lowest priced were determined by the data collectors at the drug stores and it was not fix. However, most of the name of the highest and lowest priced generic were the same in all the stores so that the data was reliable.

The daily wage of the lowest-paid government worker was used to estimate treatment affordability. At the time of the survey, the lowest paid unskilled government workers earn 1000 kyats/ day in Myanmar. Nevertheless, some of the people earn less than this amount. Further, the need for other non-discretionary expenditures (e.g., food or housing), seasonal fluctuations in income, the number of dependants who live on this wage, and the full cost of treatment, are not accounted for.

The availability of some drugs was distorted by the survey's methodology insistences on fixed dosage form and strengths. Thus, metronidazole capsule or tablet had low availability although this drug was on the stock in other strength, 200mg. Moreover, co-timoxazole actually has better availability than current result suggest, because co-trimoxazole tablet was found in many stores instead of suspension. So, patient can take tablet instead of suspension to get the co-trimoxazole.

In addition, non availability of beclomethasone inhaler and simvastatin capsule or tablet at drug store in public hospital was surprising as they were known to be distributed and on the Myanmar Essential Drug List. Therefore, non-availability at the time of survey could be due to a stock out situation, not available this strength form. Even, belcomethasone alone was not found, it was found in combinations with salbutamol, thus non-availability of beclomethasone was not meaningful.

Certain observations made during the course of the study are pertinent. Similar pictures were seen in all the sectors for availabilities in case of some drugs; like

- Captopril drug is not on the market of Myanmar.
- Psychotopics such as fluoxetine, and phenytoin, were not found in any sectors. However, these drugs can be obtained in psychiatric facilities.

- Diazepam (except in other sector2: PP) were not found in any of sectors, probably due to the stricter regulatory requirements of licensing for this type of drug.

The overall availability of surveyed generic equivalents was relatively high and that of IB was extremely low (< 4%). The reason for low availability of innovator brand was that, the price of the innovator brand was so expensive in compare to generics and most of the people in this study area were poor and they cannot afford to get these drugs and generics availabilities. Thus, the drug stores substitute the different kinds of generic instead of innovator brand after it is patented. However, the low availability of originator brand was not necessarily a cause of concern when generic equivalents are available.

100% availability was found in highest priced generic of diclofenac and lowest priced generic of doxycycline in other sector1: PH, highest priced generic of diclofenac capsule/tablet and paracetamol suspension in other sector 2: PP. Further, highest and lowest priced generic of amoxicillin capsule, paracetamol suspension, and lowest priced generic of ranitidine, doxycycline, diclofenac, and atenolol in private retail sector. Moreover, many drugs in private wholesale sectors were 100% available; however this is only upon 3 facilities in this sector.

When it comes to private drug stores in the private hospital availability, the picture was a bit difference. Some Lowest priced generic availability was excellent and some were very poor. Probably those drug stores only dispensed the most prescribe drugs by physicians who are in those hospitals. Moreover, some medicines, highest priced generic had better availability than lowest generic. So, patient had to buy highest priced generic and leading to burden to pay their drugs costs. Wide variations of availability were found in this sector.

In compare to the study done in Mongolia, they found only one innovator brand in their study area, and their generic availability (80%) was better than in my study area (MOH, A Survey of Medicine Price, 2004). However, the private sector (LPG) availability of Malaysia (43%) had lower than this study (Babar, 2006), but their

dispensing doctor availability of lowest priced generic (45%) was better than the study done in Mandalay.

Average patient prices for lowest priced generics ranged from 2.0 international reference prices (IRPs) (in private retail) to 3.1 IRPs (in other sector1: DD) when as highest priced generics ranged from 7.5 IRPs (in private retail) to 9.5 IRPs (in other sector1: DD) across the basket of medicines. However, after adjusting the drugs which were commonly found in all sectors, median MPRs of lowest priced generic ranged from 2.1 (in private retail sector) to 2.8 (in other sector1:DD) where as highest priced generics ranged from 7.2 (in private retail) to 9.4 (in other sector1: DD). It should be borne in mind that most of the people in this study area used to buy and take the drugs from the four sectors other than the private wholesale sector. Therefore, the price in which private wholesale sector has no advantage for the patients though the lowest one actually was private wholesales. Therefore, discussion mainly targeted in only four sectors to get the useful information for the patients. The reason is that private wholesale sector is not the place where individual people go and buy the drugs, this is the place where actually drug stores from the other sectors come and buy as a wholesale in order to resell those drugs. Not surprisingly, the price of median MPR of IBs in private whole was less than the price of median MPR of HPGs in that sector. It was due to the number of medicines included in the analysis. Overall, the lowest priced generic was higher than the international reference prices moderately. Only 3 innovator brand name drugs were found in all the drug stores during the survey time, namely; amlodipine, atorvastatin and salbutamol. Among 3 drugs: salbutamol was found in all the sectors. Wide range of price differences was found in atorvastain and amlodipine. Price of innovator brand atorvastatin was approximately 35 IRPs (in private retail and other sector1: PH) and 55 MPR in (other sector2) whereas lowest one is approximately 2.5 MPR (in private retail) and 5 MPR in (other sector1and 2) indicating that policy needs to control the high price difference within product and among sectors.

Although originator brand was almost nil in this study area, the price of the highest generic already cost many times to the international reference prices. Therefore, patients have to pay more for this product and this cause increased out of

pocket expenditure burden and increased financial constraints and leading to unnecessary morbidity and mortality. It may be noted that some of the highest priced generic drugs has unacceptably high price compared to International Reference Prices (6-32 times) and their availabilities was better than their respective lowest priced generic equivalent. It indicated that, price regulating police is required and need to promote to increase availability of lowest price generic drugs with quality. Also, amoxicillin capsules, a very commonly used antibiotic, has also unreasonably high price (11.7 MPR) in highest price generic version in other sector1: DDs while ceftriaxone a major reserve antibiotic had a reasonable price (3.6 IRPs). Similar picture was also seen in other sector1: PH, and private retail sector. However, in other sector 2: private drug store in private hospital, the highest priced of ceftriaxone also had unacceptable price like amoxicillin although the price of ciprofloxacillin had reasonable price.

Only the few drugs of lowest priced generics which were comparable or less than the international reference prices were found in each sector. Omeprazole capsule and ranitidine capsule in all the sectors except in other sector1: DD cost less than 1 IRPs. In other sector 1: PH, omeprazole and ranitidine were encountered 0.7 and 0.9 respectively; in other sector 2, 0.7 for omeprazole and 0.7 for ranitidine; in private retail sector, 0.6 for omeprazole and 0.9 for ranitidine and 0.5 for omeprazole capsule and 0.6 for ranitidine in private wholesale sector. Same pictures were also found in private wholesale sector of amlodipine, ceftriaxone, ciprofloxacin and gliclazide. Moreover, a few more drugs are comparable to the international reference prices which were amlodipine capsule in private retail sector, ciprofloxacin capsule in all the sectors except in wholesale sector, glicalzide capsule in other sector1: PH, other sector 2 and private retail and metronidazole in private wholesale sector. Therefore, it means that if the patients purchase these drugs from these sectors the price was reasonable and they can afford them. Nevertheless, how much the price was lower if these drugs were not available on the shelf; it was not helpful for the consumer. Therefore, the patients who purchased the ciprofloxacin capsule, gliclazide capsule and omeprazole capsule from the other sector1: PH and ciprofloxacin and omeprazole capsule from other sector2: PP and ceftriaxone injection from private wholesale had

more chance likely to buy the highest priced generic than lowest priced generic because of poor availabilities of the lowest priced generics.

In Myanmar, patients' prices for both Innovator brands and highest priced generics were very expensive in DDs, PHs, PPs and PRs when compared with the International Reference Prices (IRPs). In Myanmar, Private retail sector prices were 18.8 for IBs, 7.5 for highest priced generics and 2.0 for lowest priced generics. So, the price in Myanmar was higher than the study done in India and Sri Lanka. In Indian state of West Bengal, a median MPR of 2.9 and 2.2 has been observed for IBs and LPGs, respectively in Private retail sectors (SK, D, & A, 2005). And also, in the Indian state of Rajasthan, median MPR of 2.8 and 1.8 were recorded for IBs and LPGs, respectively in Private retail sector (Kotwani, 2004). A similar situation was found in Sri Lanka, where a median MPR of 2.7 was noted for IBs and 0.8 for LPGs in Private retail sector (Wickremasinghe, 2006).

High price difference (between highest and lowest generic priced) was observed in several drugs and extensively high in ibuprofen in dispensing doctors more than 10 times, diclofenac in other sector1: PH more than 8 times, ibuprofen in other sector2: PP more than 10 times, ibuprofen in private retail sector more than 8 times. High differences on branded medicines become an issue when generic equivalents are not stocked, when innovator brands and highest priced generics are prescribed or dispensed preferentially. Wide variation in median price ratios was also found for different medicines in same products in all sectors, because of different procurement agency, different retail margin and different tax components suggesting that there are inconsistencies in procurement efficiency or mark-ups. Moreover, the price of the same product can be differing according to the manufacture company and import country. In this study area, drug price is determined by the business man and there was no price regulation system. So that the prices are not uniform in one drugs and another thus price regulation was needed.

In addition to the WHO methodology, sector-class interactions were also measured using two-ways ANOVA. Suprisingly, absolute difference for antibiotic class was considerably higher in sectors PH and PP than in the other sectors. In contrast, the

average proportional difference for respiratory class was considerably lower than the corresponding difference for other drug classes.

Although treatments for conditions such as acute respiratory tract infections (Adult), Hypertension, Diabetes, Arthritis, Ulcer and pain/ inflammations using lowest priced generics were fairly affordable in all sectors (except, ceftriaxone for adult respiratory infection in other sector1: PH and other sector 2), cost escalate when highest priced generics were used. Therefore, increased use of lowest priced generic medicines could improve affordability. While the cost of individual treatment with lowest priced generics was affordable, the cumulative cost of multiple medications (such as treating diabetes and hypertension) will be unaffordable. Although treatments seem affordable, substantial proportions of people living in Mandalay are earning less than the lowest-paid government worker. Moreover, this affordability calculation only includes medicines and does not account for other treatment costs (e.g. investigation, and diagnostics). Therefore, the true degree of affordability is likely to be overestimated. Furthermore, the measure of affordability for chronic conditions, like hypertension, diabetes, and asthma based on one month-course, and actually, treatment can take longer duration. Therefore, patients can be much less affordable to treat the long-term conditions instead of acute illness. To lighten the burden of non-communicable disease, one thing should be borne in mind to reduce the cost of chronic disease treatments. Moreover, the burden is especially great for a family if numerous ill people in the family and ill people are the only person who earn in this family. Despite the limitations, the daily wage of the lowest-paid unskilled government worker has been shown to be a reliable measure that can provide a reasonable indication of the affordability of medicines. The most expensive treatment was lowest priced generic simvastatin in other sector 1: DD and other sector 2 which was about 9 days' wages followed by highest generic amoxicillin capsule to treat adult respiratory infection when purchased in other sector2: PP followed by ceftriaxone injection to treat adult respiratory tract infection were 7.1 and 6.0 days' wages respectively. To be able to purchase lowest priced salbutamol to treat asthma, patients had to work for 2 to 3.5 days. The pictures were different among the sectors, Affordability in the private retail sector had better in compare to the others.

Therefore, in order to save time and the cost of consulting a physician, some patients in Mandalay visit retail pharmacies to purchase medicines without a prescription potentially leading to irrational use of drugs. Moreover, some patients go without the treatment that they need because of the high price and leading to unnecessary morbidity and mortality. Therefore, price regulation is needed among the sectors. If the price is fixed, patient will go and take the treatment from the doctor and it can reduce the irrational use of drugs and overused of drugs.

In compare to the result of affordability in study done in the India, state of West Bengal, there were no observed variations of affordability between acute and chronic conditions, innovator brands and generic equivalents. Only one product, ceftriaxone needs more than 5 days wages (Tripathi, 2004). Whereas my study need more than 1 day's wages in most of the treatment especially when the patients purchased highest priced generics and innovator brands.

5.2 Conclusion

The current survey on the availability, pricing and affordability of medicines in Mandalay, Myanmar has attempted to obtain reliable data on these respects, limiting itself to a select basket of global and regional medicines. It has shown that medicines that were obtained from all the sectors were not widely available. Nevertheless, it was acceptable in LPGs and HPGs of private retail sector and whole sale sector. Availability was not so much different across the sectors. For instances, 32.5% in dispensing doctors, 42.0% in drug stores at public hospital, 50.0 % in other sector 2: PP, 66.3% in private retail sector and 63.3% in private wholesale sector for lowest priced generics. The availability of highest priced generic was similar like the availability of lowest priced generic. Among the 5 sectors, other sector 1: DDs had the poorest availability and private wholesale had the largest availability followed by private retail sector. Some additional observations are as follows:

- Psychotopics such as fluoxetine, and phenytoin, were not found in all the sectors. In contrast, lowest priced generic amitriptylene was found in all the sectors except private wholesale sector.
- diazepam (except in Other sector2:PP) were not found in any of sectors

- Metronidazole capsule or tablet had also low availability although this drug was on the stock in other strength 200mg. However, low availability was only seen in other sector1: DD, other sector1: PH, and Other sector2:PP. It suggesting that, metronidazole 200 mg was better used in these sectors.
- The lower availability of originator brands is not necessarily a cause of concern provided that generic equivalents are available.

Although the price of lowest priced generic is not very high as compared to the International Reference Prices, their availability of some drugs were low and much lower than highest priced generics especially in other sector2: PP. Therefore, patients who purchased the medicines from the private hospitals had to dig deep their pockets to buy the highest priced generics. Only a few drugs namely, omeprazole and ranitidine in other sector1: PH, other sector2: PP and private retail sector and amlodipine, ceftriaxone, and gliclazide in private wholesale sectors were less than the international reference prices.

In all the sectors, this picture was generally similar. Patients pay for the highest priced generics cost more than their lowest generic equivalent with great difference. Moreover, Innovator brands and highest priced generics had much greater value than IRPs and that was more than 5. Therefore, it indicates prohibitive pricing. Among all the sectors apart from private wholesale, the price in private retail sector was lower than other 3 sectors. The availability of which was also highest among them. Although the price in other sector1: PH and other sector2 were higher than private retail sector, their availability was not much different. Thus, people who purchase the drugs from those two sectors had to pay more than the people who purchase from the private retail sectors. The availability in the other sector1: DDs was low it indicating that doctor dispense only that would be common medicines to treat the patients.

Overall affordability of the highest priced generic treatment was greater than the affordability of the treatment for the lowest priced generic. Therefore, patients were more affordable to treat the disease with the lowest price generic drugs. Nevertheless, to treat the asthma, patients had to spend approximately 3 days wages in

all the sectors for the lowest priced generic. Patients would have to pay more days' wages in other sector1 and other sector 2 in compare to private retail sectors. Patients had to pay 5-7 days' wages when they purchase amoxicillin capsule to treat the adult respiratory infection except in private retail sector when as patients need only 4 days' wages. Medicines were not affordable for many people, possibly leading to unnecessary morbidity and mortality.

From 2-way ANOVA table for absolute differences, drug class (P value = 0.004) and sector-class interaction (P value = 0.001) was significant although sector was not significant (P value = 0.764). Among the drug classes, absolute difference for antibiotic drug class was considerably higher than the other drug classes. The ANOVA for proportional price difference showed that this difference was considerably lower for respiratory medicines than other medicines. Further research is needed to explain these findings. Selective efforts to lower antibiotic prices in the study area should also be considered.

In Other sector1: DDs, the availability was very low in all three categories. Median MPR (in matched pair analysis) of lowest generic was 2.9 times the International reference price whereas highest priced generic was 9.5 times the International reference price and which was 3.3 times more expensive than the lowest priced generics. Several drugs of highest priced generic were more than 5 times the international reference price. Only 5 drugs were seen under 5 IRPs. Among them, one worth noting was seen in ibuprofen, its difference was 10.55 and the availability had also better in the highest priced generic one. It may be concluded that standard treatments, with few exceptions (e.g. omeprazole for ulcer treatment and salbutamol for asthma) are likely to be affordable in lowest priced generics.

In Other sector1: PH, a total of 10 private drug stores in public hospitals were surveyed. The availability of overall 30 drugs was low approximately 1.0% in IBs, 31.7 % in HPGs and 42.0 % in LPGs. Median MPR of IBs, HPGs and LPGs were 19.4, 8.2 and 2.4 respectively. Median brand premium in match pair analysis was 3.8. Several drugs of highest priced generic were more than 5 times the IRPs whereas only 2 drugs were greater than 5 IRPs of LPGs. Absolute difference of antibiotic class was stood out in this sector.

In other sector 2: PP, in all 30 drug stores were included in the surveyed. Overall availability of basket of 30 medicines was 3.5% for IBs, 49.4% for HPGs and 50.0% for LPGs. Median MPR of IBs, HPGs and LPGs were 26.7, 8.4 and 2.6 respectively. Absolute difference of antibiotic was stood out in this sector while others were uniformly difference. Median brand premium in match pair analysis was 3.7.

In private retail sector, the study measured 30 private retail stores for that sector. The availability of over all 30 drugs was 3.2 % for IBs, 51.7% for HPGs and 66.3% for LPGs. Median MPR of IBs, HPGs and LPGs were 18.8, 7.5 and 2.0 respectively. Many HPGs were more than 5 times and among them glibenclamide was 32.5 times than the IRPs. No one LPGs were more than 5 times the IRPs. Median brand premium in match pair analysis was 3.6.

In private wholesale sector, only 3 drug stores were measured for this sector. The basket of 30 medicines was 2.2% for IBs, 57.8% for HPGs and 63.3% for LPGs. Median MPRs of IBs, HPGs and LPGs were 2.9, 3.7 and 1.6 respectively. All the prices of LPGs were less than 5 IRPs and a few drugs of HPGs were noted more than 5 times than IRPs. Median price difference in match pair analysis was 2.5.

Limitations

There are some limitations in addition to those mentioned previously. Some of the drugs in this study, such as beclomethasone, metronidazole, ibuprofen, co-trimoxazole suspension and gentamycin were found in different strengths and different dosage forms from those specified in the medicine price data collection form. As a result, they were not recoded. Therefore, these findings may underestimate drug availability to some extent. Also, because of difficulty in making appointments, and time constraints, data were not collected from all stores in the private wholesale sector.

5.3 Recommendations

The study has not covered all therapeutic categories. Nevertheless, the results that have been obtained can serve as a reference point for future studies and point to problems that need further investigation. These results may be useful for advocates in their effort to induce policy makers to bring about lower prices. The following recommendations and policy changes are needed in order to reduce the price for the patients and increase the availability and affordability of medicines.

- Investigation should be done to know the causes of high prices in Mandalay.
- In-depth price component studies with view to regulating mark-ups are also needed.
- Ongoing price monitoring and regulating systems are also required in Mandalay.
- Regular monitoring of prices, availability and affordability at suitable intervals should be done in Mandalay and publish results (especially to patients and health care providers).
- Pro-generics policies and programmes including education for physicians, pharmacists and the public about economic benefits of generic.
- Generic prescribing policies are required. Prescribe the drug in terms of chemical name rather than trade name.
- Price regulations policies are also needed.
- A policy to make campaigns to promote generics, increase consumer awareness, and introduce incentives for pharmacists and doctors to prescribe and dispense generics.
- Market competitions should be stimulated to reduce price and increase availability.

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APPENDICES

APPENDIX A

Patient/ Participant Information Sheet

Title of research project …**Survey of Medicine Prices, Availability and Affordability in Mandalay, Myanmar**

…….

Principal researcher's name Ms. Aye Aye Khaing.……

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1. You are being invited to take part in a research project. Before you decide to participate it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and do not hesitate to ask if anything is unclear or if you would like more information.
2. This research project involves ***…"price of the drugs, whether drug stores have those drugs or whether consumer can buy it or not"***
3. Objective (s) of the project are

   3.1 To identify the prices that people pay for key medicines and analyze variations in prices and availability of the same medicines in different sectors such as public sector, private sector and other medicine outlets.

   3.2 To explore the difference in prices and availability of originator brands and generically equivalent medicines and identify price variations between products types (i.e. originator brands and generics) within the same sector.

   3.3 To describe price differences in different types of medicines (e.g.;. cardiovascular drug, central nervous system drug, respiratory drug)

3.4 To compare procurement prices and patient prices in public sector as well as to compare national prices and standard international reference prices of selected important medicines and analyzes affordability of selected medicine for poor and ordinary people.

4. Details of participant.
   - Characteristics of participants are
     Inclusion criteria:

     - ***drug stores located in six townships of Mandalay city***
     - ***Those who are willingly to participate***

     Exclusion criteria:

     - ***Drug stores which are not registered.***
     - ***Traditional drug stores***

   - Number of participants required is **120 drug stores**.
   - How to approach potential participants.
   - ***Your drug store is invited because your drug store is located in those 6 townships of Mandalay city***
   - Group allocation and number of participants in each group.
5. Specify the details of drug stores in each sector ?

   Public sector – it will consist central or regional medical stores, cost sharing drug stores from public hospitals and township health department dispensing sections if present.

   Private sector – it will contain registered retail private pharmacies and drug stores.

   Other sector- it will include health facilities run by NGOs and /or religious organizations, private pharmacies in private hospital and public hospital and dispensing doctors

Sample and sample size

- In each area, main public hospital and its cost sharing drug store will be chosen

- Other four medicine outlets from public sector within three hours' travel distance from the main hospital will be randomly selected and if there are fewer than five medicine outlets from public sector in the whole survey area, all medicine outlets will be chosen.
- The list of licensed pharmacies/ drug stores registered in each study area will be obtained from relevant township health department. After that, 5private medicine outlets will be randomly selected from the list.
- The list of NGO clinics, dispensing doctors, private pharmacies in private hospital and public hospital will also be obtained from township health department and 10 medicine outlets will randomly be selected from the list.
- By selecting 5 medicine outlets each from public and private sectors and 10 medicine outlets from other sector in each survey area (20 medicine outlets), a total of 30 medicine outlets from public sector, 30 medicine outlets from private sector and 60 medicine outlets from other sectors will be gained from 6 study area (120 medicine outlets)
- In addition, a set of back-up medicine outlet will be identified. If less than 50% of the medicines on the medicine price data collection form are available at a medicine outlet in the primary sample. Back-up outlet will be studied to get a sufficient quantity of price data for robust analysis. However, the data from the original outlet are still entered in the workbook to provide an accurate representation of availability.

6. Procedure upon participants: who, will do what, how, when, where, how much time involved as indicated in the research proposal.

The assistant researchers who are medical doctors from Mandalay city have been recruited. They already have proper 4 hours training to ensure the reliable data and accurate completion of the data collection and discussing issues in the structured face-to-face interview and technique how to approach participants.

The interview time will take about 20-30 minutes. The interview would be recorded by MP3 recorder and it will be deleted when the research project is finished. Your information will be kept confidential and the presentation of

research result will be in an overall picture only. In some cases, after the interview, you may be asked for some more information by the researcher/assistant researcher which might take a few more minutes.

7. Process of providing information which also be stated in the proposal.

7.1 Who will provide information to potential participants and how. Researcher and assistant researchers will provide information about objectives and benefits to the potential participants. Then, they will ask about the price of 30 drugs (both originator brand name and generic name), pack size, and whether that drug is in drug shops and by using medicine price data collection form provided by World Health Organization.

7.2 If potential participant is illiterate/can not write/can not speak native language, how the researcher will proceed with the process of informed consent.

My participants are drug stores, so I will ask the information from the owners of drug stores or pharmacists or managers and medical officers who have the authorities to give the information. So, they all are literate and my study is in Myanmar, thus they can speak native language.

*For **benefit** of the project, state clearly; what/how to individual/public/academy. **Do not exaggerate benefit**. **The citizens especially patients have the advantage because they will know which drug is cheap. Besides, the doctors will know which drug is more available and which is suitable for patients 'affordable prices. Moreover, this result serves as eyes opener for policy makers in making policy in price of drugs.***

Our aim is not to ask their profit, we will ask about the price to patients. However, there will be a little bit psychological risk. For example, drug store owners might be uncomfortable or inconvenient to talk about their drug price.

If study's results proved beneficial, state what kind of benefit(s) researcher will share with the control group/community.

8 *There will no compensation for participants. However, I will give souvenir from Thailand to them. It will cost around 70 bath/outlet. It is essential that good relations be established with the pharmacist/ dispenser in each facility to be surveyed, since they will have to set aside considerable time to provide information on medicine*

prices and availability. So, I will visit them personally, in advance, to seek their permission for data collection in their facility or medicine outlet. I will introduce myself then explain about the aims and objectives of research to them. Then, i will make the appointment to collect data on a date and at a tie that is convenient for those by avoiding the peak periods when he or she may be busy with patients.

9 Information will include "participation to the study is **voluntary** and participant has the **right to deny** and/or **withdraw** from the study at any time, no need to give any reason, and there will be no bad impact upon that participant." (state explicitly eg. still receive the same usual services) ***Your participation in this research project is voluntary and you have the right to refuse this participation or to withdraw at any given time with no harm on the benefit of your drug stores and there will be no adverse impact on your drug stores.***

10 Information will include "if you have any question or would like to obtain more information, the researcher can be reached at all time. If the researcher has new information regarding benefit on risk/harm, participants will be informed as soon as possible." This practice will provide an opportunity for participants to decide whether to stay/not stay with the project. (**Exception**, in case of one time interview and unable to re-contact participants.)

11 Information will include "Information related directly to your drug stores will be kept **confidential.** Results of the study will be reported as total picture. Any information which could be able to identify your drug store will not appear in the report.

12 State that if researcher does not perform upon participants as indicated in the information, the participants can report the incident to the Ethical Review Committee for Research Involving Human Research Subjects, Health Sciences Group, Chulalongkorn University (ECCU). Institute Building 2, 4th Floor, Soi Chulalongkorn 62, Phyathai Rd., Bangkok 10330, Thailand, Tel: 0-2218-8147 Fax: 0-2218-8147 E-mail: eccu@chula.ac.th

APPENDIX B

Informed Consent Form

Address……

Date …….

Code number of participant ……

I who have signed here below agree to participate in this research project

Title "Survey of Medicine Prices, Availability and Affordability in Mandalay, Myanmar"

Principle researcher's name …… Ms. Aye Aye Khaing ……

Contact address …521/3-4 Soi Sriayuthaya 2-4, Sirayuthaya Road, Prayatai Distric, Rajthavee, Bangkok 10400……

Telephone 0855485811……..

I have **(read or been informed)** about rationale and objective(s) of the project, what I will be engaged with in details, risk/ham and benefit of this project. The researcher has explained to me and I **clearly understand with satisfaction.**

I willingly **agree** to participate in this project and allow the researcher to ask a series of questions in face to face interview by using the standard medicine price data collection from provided by World Health Organization which include price of the drugs (both branded price and not branded price for 30drugs), whether the drug stores have those drugs or not, and the reason if these drugs are not in there.

For instance: The interview time will take about 20-30 minutes and will be done only one time.

I have **the right** to withdraw from this research project at any time as I wish with no need to give any reason. This withdrawal **will not have any negative impact upon me (e.g.: still receive the usual services).**

Researcher has guaranteed that procedure(s) acted upon me would be exactly the same as indicated in the information. Any of my personal information will be **kept confidential.** Results of the study will be reported as total picture. Any of personal information which could be able to identify me will not appear in the report.

If I am not treated as indicated in the information sheet, I can report to the Ethical Review Committee for Research Involving Human Research Subjects, Health Sciences Group, Chulalongkorn University (ECCU). Institute Building 2, 4 Floor, Soi Chulalongkorn 62, Phyat hai Rd., Bangkok 10330, Thailand, Tel: 0-2218-8147 Fax: 0-2218-8147 E-mail: eccu@chula.ac.th,

I also have received a copy of information sheet and informed consent form. Note:

If the research carries no more than minimal risk; risk is likely no more than routine care/life**,** e.g.: telephone survey/interview/research involving secondary data or anonymous specimens which names and addresses of the owner cannot be traced. The researcher can request to waive signed consent. In addition, signed consent might be waived when an unjustified threat to the subject's confidentiality, e.g.: research in drug abuses, HIV subjects, persons infected with veneral diseases, sex workers, illegal workers etc. However, the information must be given to the participant even though the written consent is waived.

Sign	Sign
……..……	……..……
(……..……)	(……..……)
Researcher	Participant

Sign ……..……

(……..……)

Witness

APPENDIX C

Result of individual medicine for availability and price

Table27: Percent of stores in which drugs were available, by price category: in Dispensing doctor sector (Individual drug)

	Other sector 1: DDs, n=20 stores		
	IB	HPG	LPG
amitriptylene	0.0	0.0	80.0
amlodipine	10.0	60.0	45.0
amoxicillin cap	0.0	80.0	45.0
amoxicillin susp	0.0	10.0	55.0
atenolol	0.0	60.0	50.0
atorvastatin	0.0	40.0	50.0
beclomethasone	0.0	0.0	10.0
captopril	0.0	0.0	0.0
ceftriaxone	0.0	25.0	5.0
ciprofloxacin	0.0	35.0	60.0
clotrimazole cream	0.0	45.0	35.0
cotrimoxazole susp	0.0	0.0	60.0
diazepam	0.0	0.0	0.0
diclofenac	0.0	70.0	30.0

diethylcarbamazine	0.0	0.0	5.0
doxycycline	0.0	5.0	70.0
enalapril	0.0	75.0	30.0
fluoxetine	0.0	0.0	0.0
gentamycin	0.0	10.0	30.0
glibenclamide	0.0	5.0	5.0
gliclazide	0.0	50.0	35.0
ibuprofen	0.0	45.0	35.0
metformin	0.0	85.0	25.0
metronidazole	0.0	0.0	15.0
omeprazole	0.0	75.0	25.0
paracetamol	0.0	65.0	55.0
phenytoin	0.0	0.0	0.0
ranitidine	0.0	5.0	90.0
salbutamol	45.0	10.0	25.0
simvastatin	0.0	0.0	5.0

DD=dispensing doctor, IB=innovator brand, HPG=highest priced generic, LPG=lowest priced generic

Figure 6: Highest priced generic of individual medicines in DD

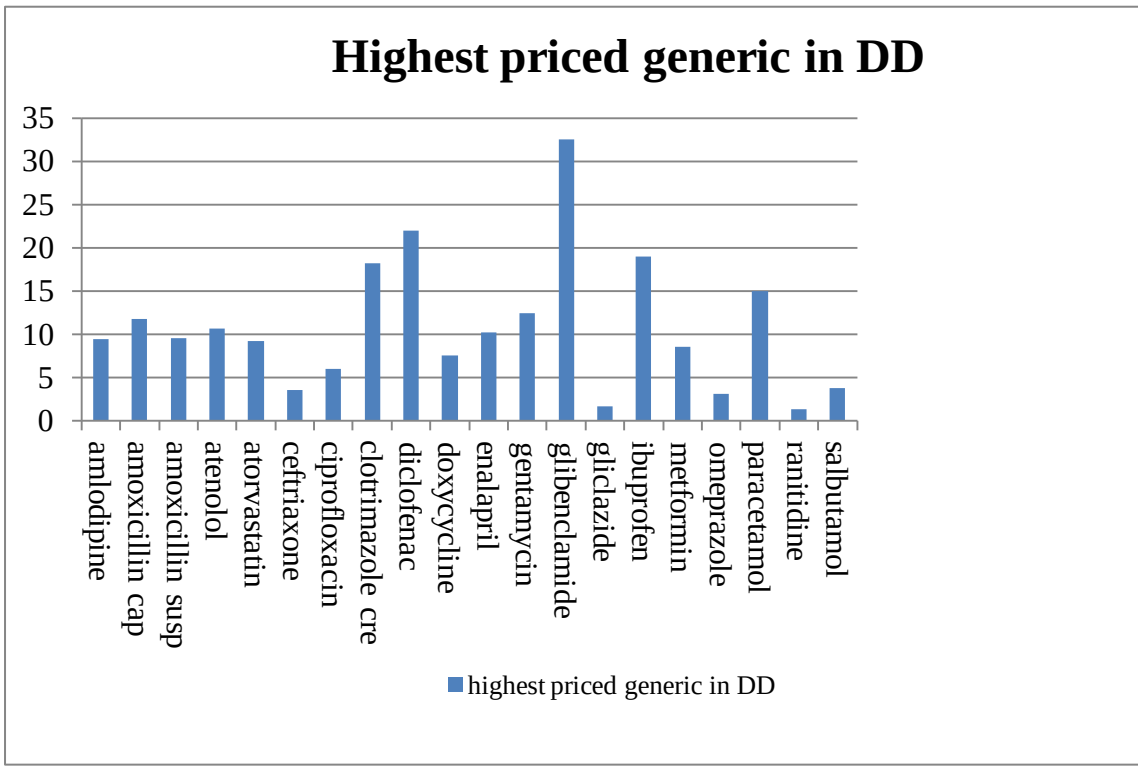

Figure 7: Lowest priced generic of individual medicine in DD

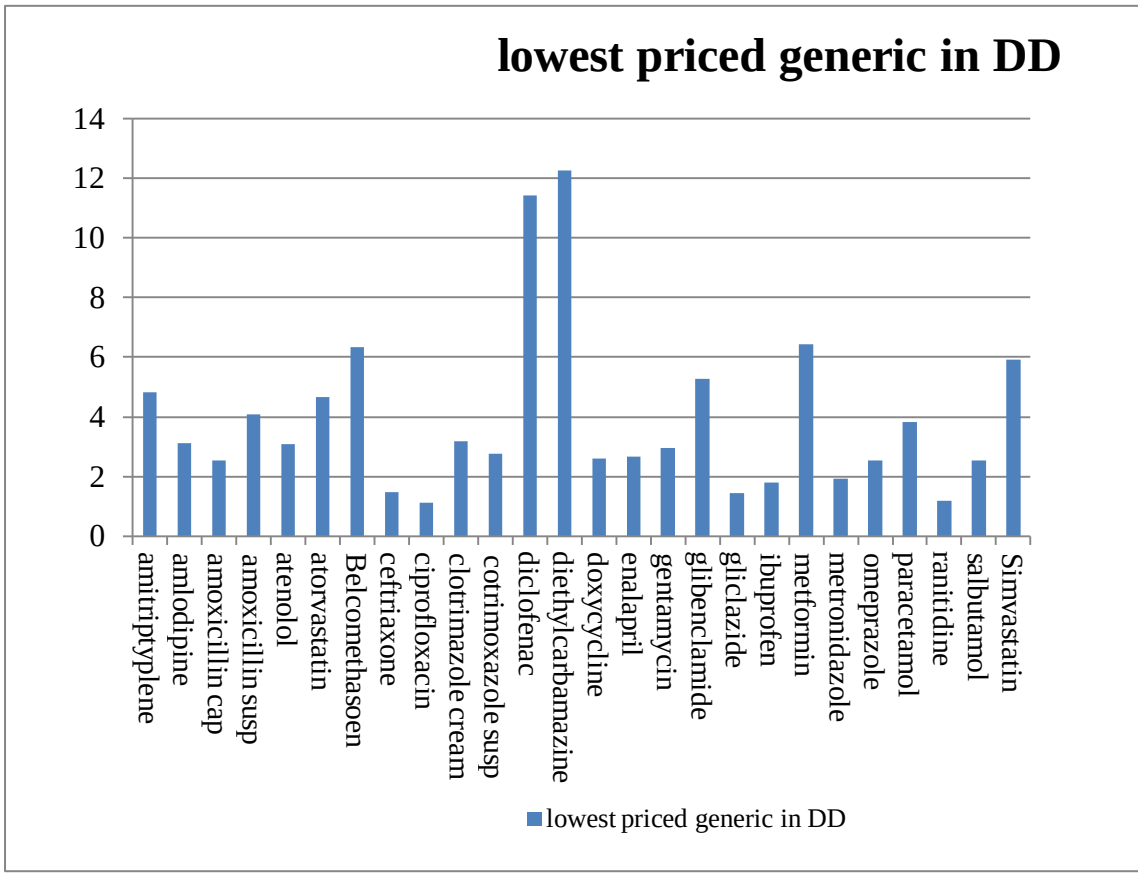

Table 28: Comparisons between highest priced and lowest priced generics, both products occur in Dispensing doctor sector (Individual medicines)

	Highest generic (MPR)	**Lowest generic (MPR)**	**No. of times more expensive (MPR)**
No. of medicines included	20	20	
amlodipine	9.4	3.1	3.0

amoxicillin cap	11.7	2.5	4.7
amoxicillin susp	9.5	4.1	2.3
atenolol	10.6	3.1	3.4
atorvastatin	9.3	4.7	2.0
ceftriaxone	3.6	1.5	2.4
ciprofloxacin	6.0	1.1	5.5
clotrimazole cream	18.2	3.2	5.7
diclofenac	22.0	4.3	5.1
doxycycline	7.6	2.6	2.9
enalapril	10.2	2.7	3.8
gentamycin	12.4	3.0	4.1
glibenclamide	32.5	5.3	6.1
gliclazide	1.7	1.4	1.2
ibuprofen	18.9	1.8	10.5
metformin	8.6	6.4	1.3
omeprazole	3.1	2.5	1.2
paracetamol	14.9	3.8	3.9
ranitidine	1.4	1.2	1.2
salbutamol	3.8	2.5	1.5

DD=dispending doctor, MPR=median price ratio

Table 29: Percent of stores in which drugs were available, by price category: Private drug store in public hospital (Individual medicine)

	Other sector 1: PH, n=10 stores		
	IB	HPG	LPG
amitriptylene	0.0	0.0	10.0
amlodipine	0.0	50.0	90.0
amoxicillin cap	0.0	80.0	90.0
amoxicillin susp	0.0	20.0	40.0
atenolol	0.0	70.0	40.0
atorvastatin	20.0	30.0	60.0
Belcomethasone	0.0	0.0	0.0
Captopril	0.0	0.0	0.0
ceftriaxone	0.0	80.0	90.0
ciprofloxacin	0.0	90.0	60.0
clotrimazole cream	0.0	20.0	10.0
cotrimoxazole susp	0.0	0.0	20.0
Diazepam	0.0	0.0	0.0
diclofenac	0.0	100.0	90.0
Diethylcarbamazine	0.0	0.0	0.0
doxycycline	0.0	10.0	100.0
enalapril	0.0	60.0	80.0

Fluoxetine	0.0	0.0	0.0
gentamycin	0.0	10.0	40.0
glibenclamide	0.0	0.0	50.0
gliclazide	0.0	40.0	20.0
ibuprofen	0.0	30.0	20.0
metformin	0.0	40.0	70.0
metronidazole	0.0	0.0	10.0
omeprazole	0.0	80.0	60.0
paracetamol	0.0	80.0	70.0
Phenytoin	0.0	0.0	0.0
ranitidine	0.0	20.0	80.0
salbutamol	10.0	40.0	60.0
Simvastatin	0.0	0.0	0.0

Ph= private drug store In public hospital, IB=innovator brand, HPG=highest priced generic, LPG=lowest priced generic

Figure 8: Highest priced generic of individual medicine in PH

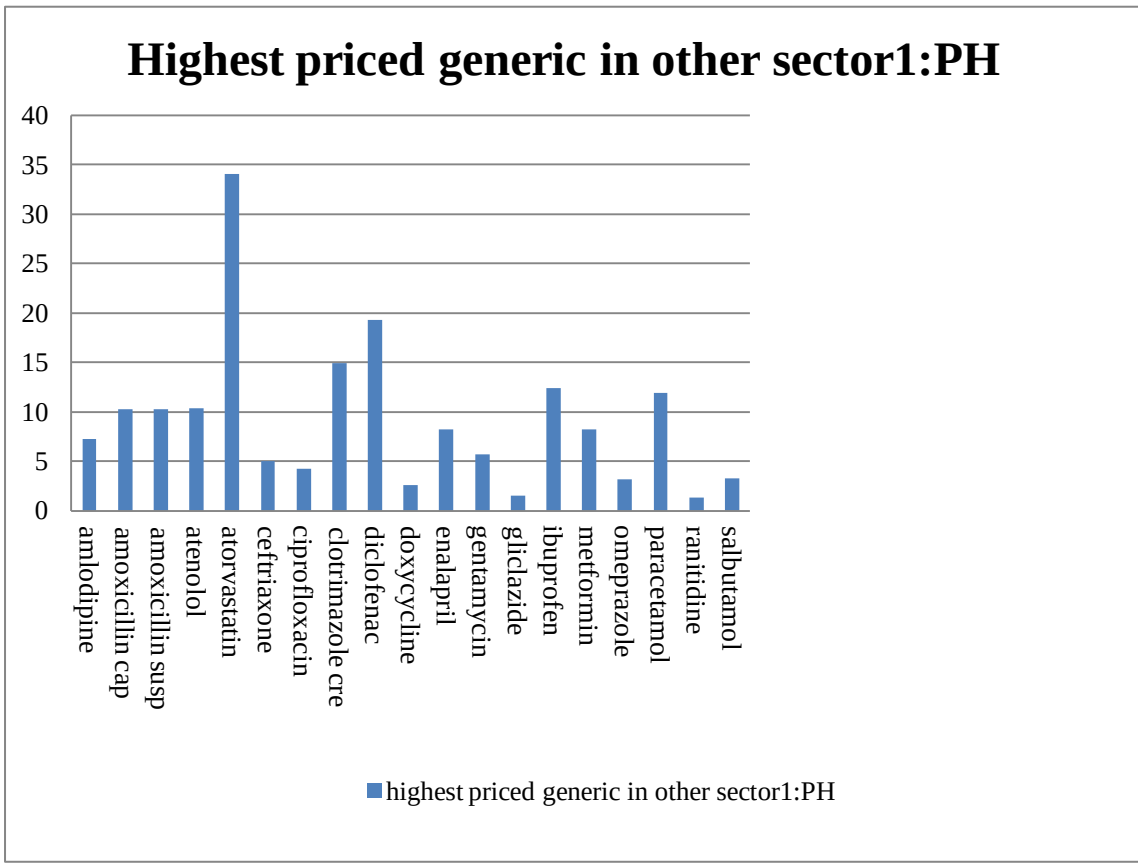

Figure 9: Lowest priced generic of individual medicine in PH

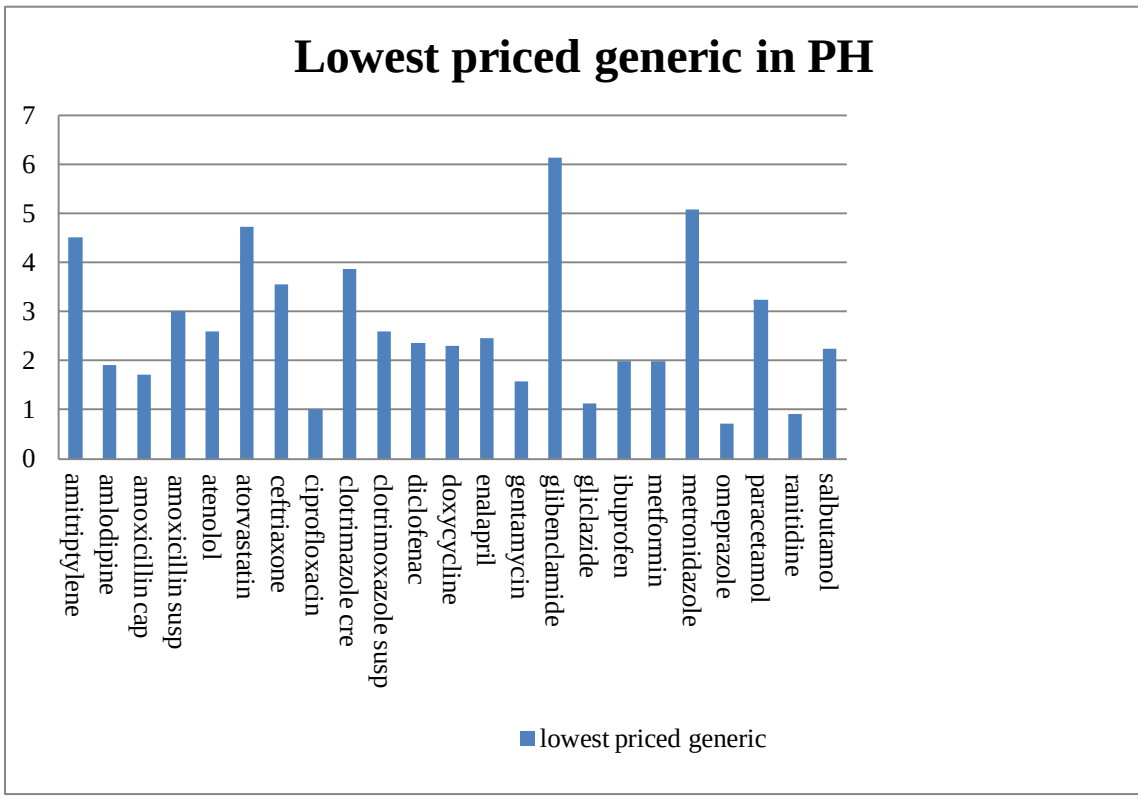

Table 30: Comparisons between highest priced and lowest priced generics, found both products in private drug store in public hospital (Individual medicine)

	Highest generic (MPR)	Lowest generic (MPR)	No. of times more expensive (MPR)
No. of medicines included	19	19	
amlodipine	7.3	1.9	3.8

amoxicillin cap	10.3	1.7	6.1
amoxicillin susp	10.2	3.0	3.4
atenolol	10.4	2.6	4.0
atorvastatin	34.1	4.7	7.3
ceftriaxone	5.0	3.6	1.4
ciprofloxacin	4.3	1.0	4.3
clotrimazole cre	14.9	3.9	3.8
diclofenac	19.3	2.4	8.0
doxycycline	2.6	2.3	1.1
enalapril	8.2	2.5	3.3
gentamycin	5.7	1.6	3.6
gliclazide	1.5	1.1	1.4
ibuprofen	12.4	2.0	6.2
metformin	8.3	2.0	4.2
omeprazole	3.2	0.7	4.6
paracetamol	11.9	3.3	3.6
ranitidine	1.3	0.9	1.4
salbutamol	3.3	2.2	1.5

PH=private drug store in public hospital, MPR=median price ratio

Table 31: Percent of stores in which drugs were available, by price category: drug store in private hospital (Individual medicine)

	Other sector 2: PP, n=30 stores		
	IB	HPG	LPG
amitriptylene	0.0	0.0	66.7
amlodipine	23.3	93.3	90.0
amoxicillin cap	0.0	93.3	66.7
amoxicillin susp	0.0	66.7	63.3
atenolol	0.0	96.7	33.3
atorvastatin	23.3	66.7	93.3
beclomethasone	0.0	0.0	6.7
captopril	0.0	0.0	0.0
ceftriaxone	0.0	86.7	83.3
ciprofloxacin	0.0	93.3	40.0
clotrimazole cream	0.0	46.7	46.7
cotrimoxazole susp	0.0	23.3	63.3
diazepam	0.0	73.3	60.0
diclofenac	0.0	100	46.7
diethylcarbamazine	0.0	0.0	0.0
doxycycline	0.0	53.3	93.3
enalapril	0.0	90.0	80

fluoxetine	0.0	0.0	0.0
gentamycin	0.0	30	76.7
glibenclamide	0.0	0	26.7
gliclazide	0.0	50.0	80.0
ibuprofen	0.0	43.3	30.0
metformin	0.0	90.0	46.7
metronidazole	0.0	3.3	16.7
omeprazole	0.0	96.7	60.0
paracetamol	0.0	100.0	93.3
phenytoin	0.0	0.0	0.0
ranitidine	0.0	30.0	96.7
salbutamol	60.0	56.7	83.3
simvastatin	0.0	0.0	3.3

PP=drug store in private hospital, IB=innovator brand, HPG=highest priced generic, LPG=lowest priced generic

Figure 10: Highest priced generic of individual medicine in PP

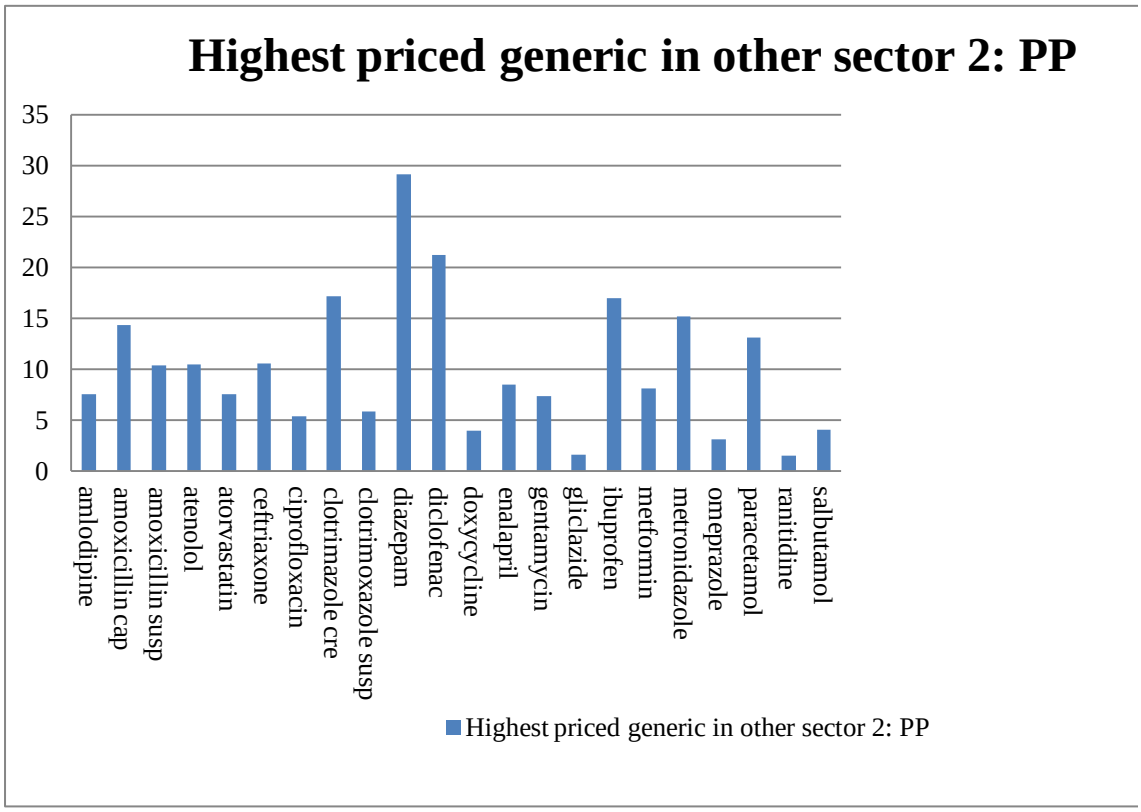

Figure 11: Lowest priced generic of individual medicine in PP

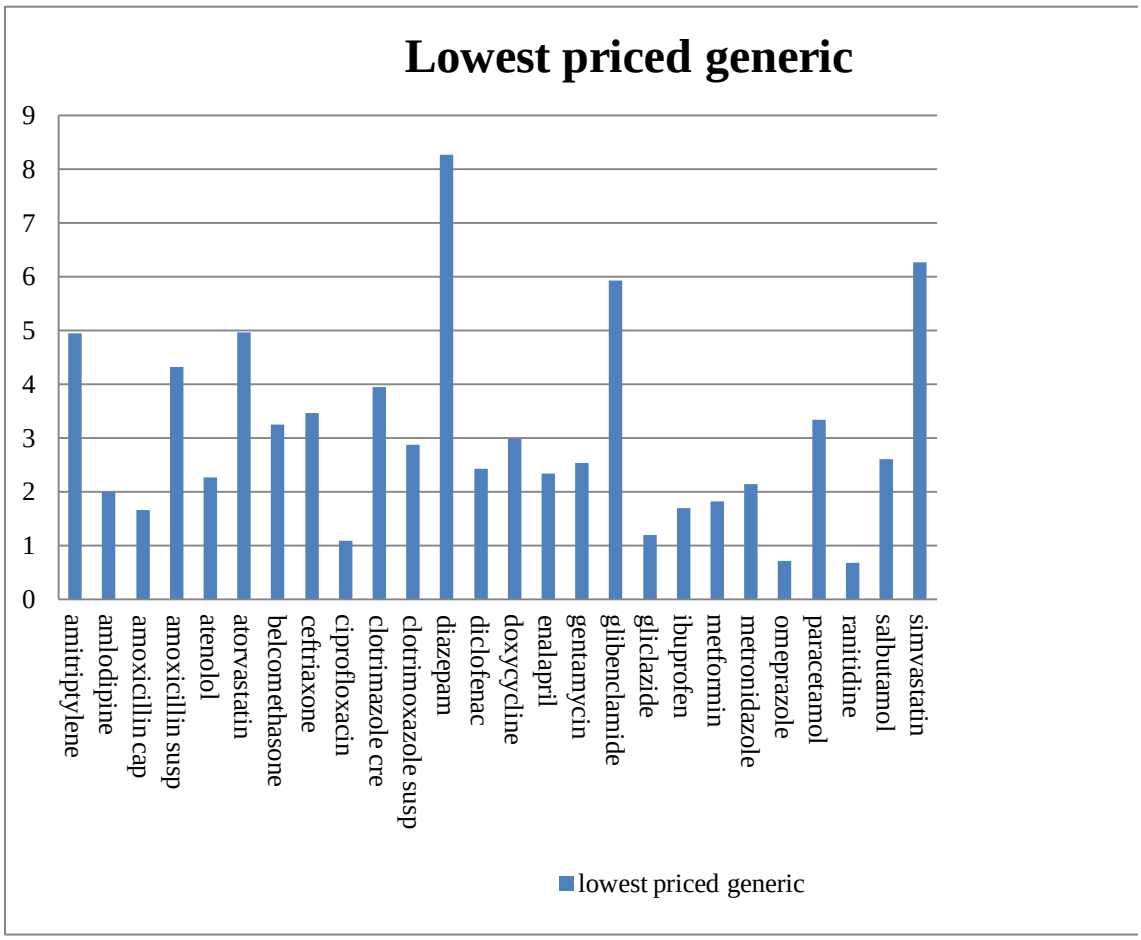

Table 32: Comparisons between highest price and lowest price generic, found both products at drug store in private hospital (Individual medicine)

	Highest generic (MPR)	**Lowest generic (MPR)**	**No. of times more expensive**
No. of medicines included	22	22	
amlodipine	7.5	2.0	3.8
amoxicillin cap	14.4	1.7	8.5
amoxicillin susp	10.4	4.3	2.4
atenolol	10.5	2.3	4.6
atorvastatin	7.6	5.0	1.5
ceftriaxone	10.6	3.5	3.0
ciprofloxacin	5.4	1.1	4.9
clotrimazole cream	17.2	4.0	4.3
cotrimoxazole susp	5.8	3.0	1.9
diazepam	29.2	8.3	3.5
diclofenac	21.3	2.4	8.9
doxycycline	4.0	3.0	1.3
enalapril	8.6	2.3	3.7
gentamycin	7.4	2.5	2.9
gliclazide	1.6	1.2	1.3

ibuprofen	17.0	1.7	10.0
metformin	8.2	1.8	4.6
metronidazole	15.3	2.2	7.0
omeprazole	3.2	0.7	4.6
paracetamol	13.1	3.4	3.9
ranitidine	1.5	0.7	2.2
salbutamol	4.0	2.6	1.5

Table 33: Percent of stores in which drugs were available, by price category: Private retail sector (Individual medicine)

	Private retail, n=30 stores		
	IB	HPG	LPG
amitriptylene	0.0	0.0	26.7
amlodipine	30.0	93.3	96.7
amoxicillin cap	0.0	100.0	100.0
amoxicillin susp	0.0	86.7	93.3
atenolol	0.0	93.3	100.0
atorvastatin	26.7	63.3	96.7
beclomethasone	0.0	0.0	3.3
captopril	0.0	0.0	0.0

ceftriaxone	0.0	63.3	66.7
ciprofloxacin	0.0	96.7	96.7
clotrimazole cream	0.0	66.7	73.3
cotrimoxazole susp	0.0	50	86.7
diazepam	0.0	0.0	0.0
diclofenac	0.0	93.3	100.0
diethylcarbamazine	0.0	0.0	0.0
doxycycline	0.0	63.3	100.0
enalapril	0.0	96.7	93.3
fluoxetine	0.0	0.0	0.0
gentamycin	0.0	50.0	90.0
glibenclamide	0.0	10.0	60.0
gliclazide	0.0	53.3	76.7
ibuprofen	0.0	53.3	73.3
metformin	0.0	86.7	96.7
metronidazole	0.0	13.3	66.7
omeprazole	0.0	86.7	90.0
paracetamol	0.0	100.0	100.0
phenytoin	0.0	0.0	0.0
ranitidine	0.0	73.3	100.0
salbutamol	40.0	50.0	70.0

simvastatin	0.0	6.7	30.0

PR=private retail, IB=innovator brand, HPG=highest priced generic, LPG=lowest priced generic

Figure 12: Highest priced generic of individual medicine in PR

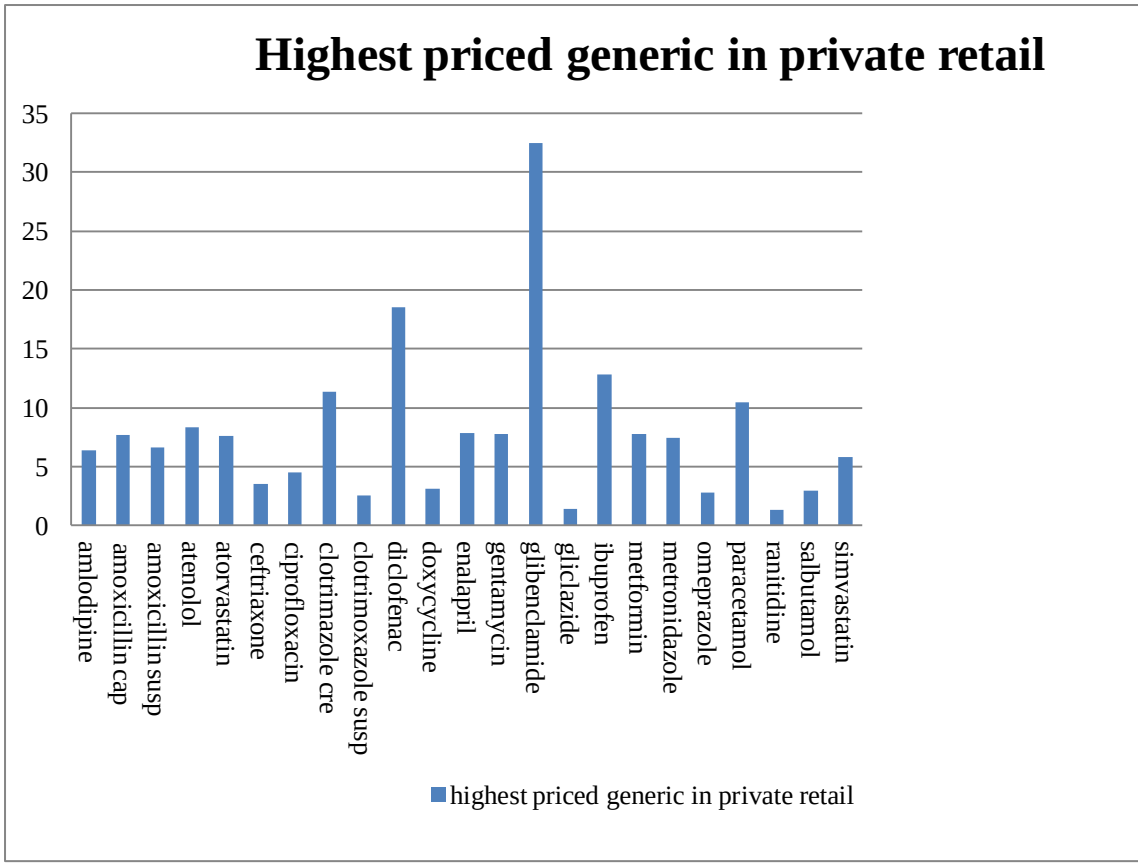

Figure 13: Lowest priced generic of individual medicine in PR

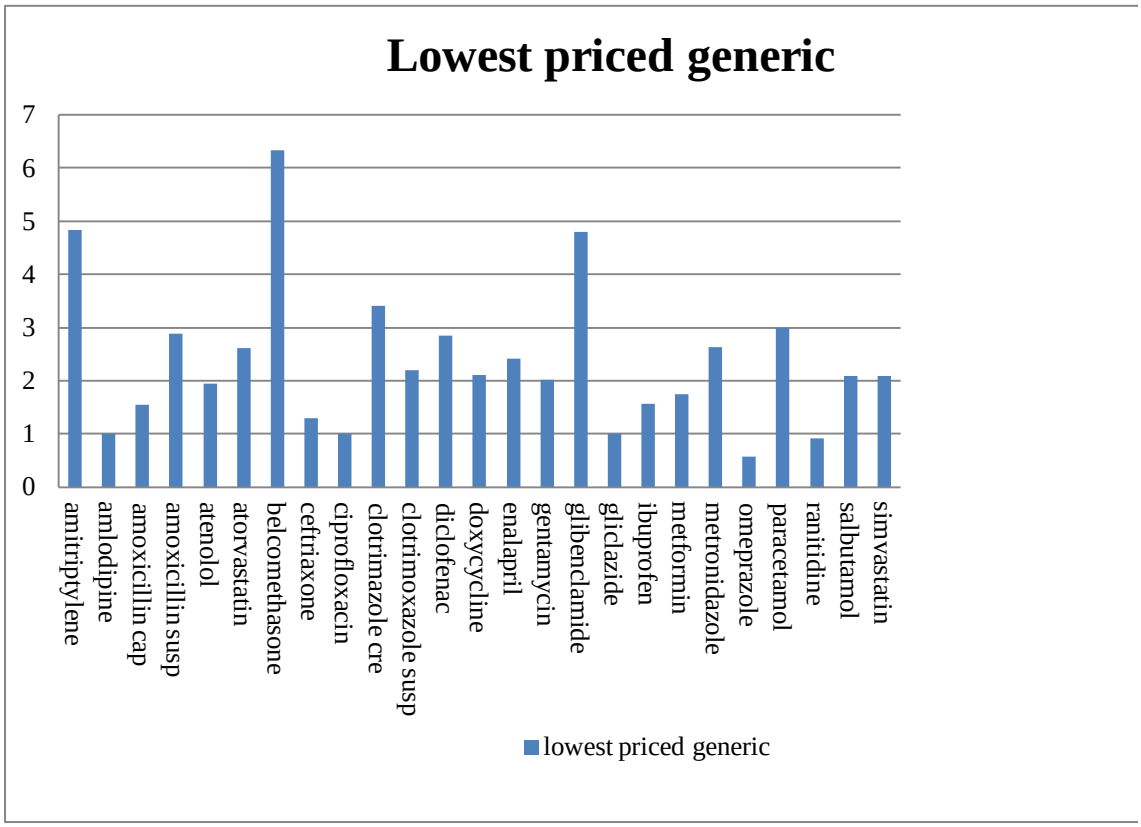

Table 34 : Comparisons between highest price and lowest price generic, found both products in private retail sector (Individual medicine)

	Highest generic (MPR)	**Lowest generic (MPR)**	**No. of times more expensive**
No. of medicines included	23	23	
amlodipine	6.4	1.0	6.4

amoxicillin cap	7.7	1.5	5.1
amoxicillin susp	6.6	2.9	2.3
atenolol	8.4	1.9	4.4
atorvastatin	7.6	2.6	2.9
ceftriaxone	3.6	1.3	2.8
ciprofloxacin	4.5	1.0	4.5
clotrimazole cre	11.4	3.4	3.4
cotrimoxazole su	2.6	2.2	1.2
diclofenac	18.6	2.9	6.4
doxycycline	3.2	2.1	1.5
enalapril	7.8	2.4	3.3
gentamycin	7.8	2.0	3.9
glibenclamide	32.5	4.8	6.8
gliclazide	1.4	1.0	1.4
ibuprofen	12.8	1.6	8.0
metformin	7.7	1.8	4.3
metronidazole	7.5	2.6	2.9
omeprazole	2.8	0.6	4.7
paracetamol	10.5	3.0	3.5
ranitidine	1.4	0.9	1.6
salbutamol	2.9	2.1	1.4

simvastatin	5.8	2.1	2.8

MPR= median price ratio

Table 35: Percent of stores in which drugs were available, by price category: private wholesale sector (Individual medicine)

	Private wholesale, n=3 stores		
	IB	HPG	LPG
Mean percent availability across the basket of 30 medicines	2.2	57.8	63.3
25th percentile		0.0	0.0
75th percentile		100.0	100.0
amitriptylene	0.0	0.0	0.0
amlodipine	0.0	100.0	100.0
amoxicillin cap	0.0	100.0	100.0
amoxicillin susp	0.0	100.0	100.0
atenolol	0.0	100.0	100.0
atorvastatin	0.0	100.0	100.0
belcomethasone	0.0	0.0	0.0
captopril	0.0	0.0	0.0
ceftriaxone	0.0	100.0	66.7
ciprofloxacin	0.0	100.0	100.0
clotrimazole cream	0.0	33.3	33.3

cotrimoxazole susp	0.0	0.0	66.7
diazepam	0.0	0.0	0.0
diclofenac	0.0	100.0	100.0
diethylcarbamazine	0.0	0.0	0.0
doxycycline	0.0	100.0	100.0
enalapril	0.0	100.0	100.0
fluoxetine	0.0	0.0	0.0
gentamycin	0.0	0.0	66.7
glibenclamide	0.0	0.0	33.3
gliclazide	0.0	100.0	100.0
ibuprofen	0.0	33.3	100.0
metformin	0.0	100.0	66.7
metronidazole	0.0	33.3	66.7
omeprazole	0.0	100.0	100.0
paracetamol	0.0	100.0	100.0
phenytoin	0.0	0.0	0.0
ranitidine	0.0	100.0	100.0
salbutamol	66.7	100.0	100.0
simvastatin	0.0	33.3	0.0

PW= private wholesale, IB=innovator brand, HPG=highest priced generic, LPG=lowest priced generic

Figure 14: Highest priced generic of individual medicine in PW

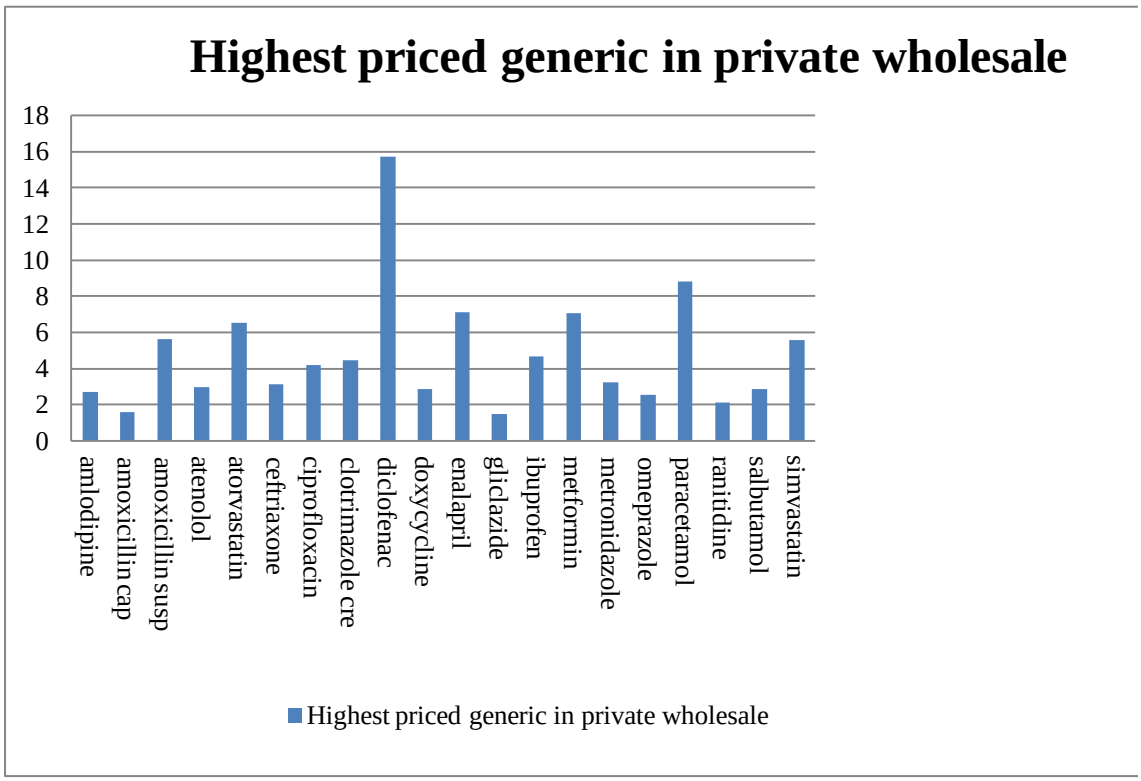

Figure 15: Lowest priced generic of individual medicine in PW

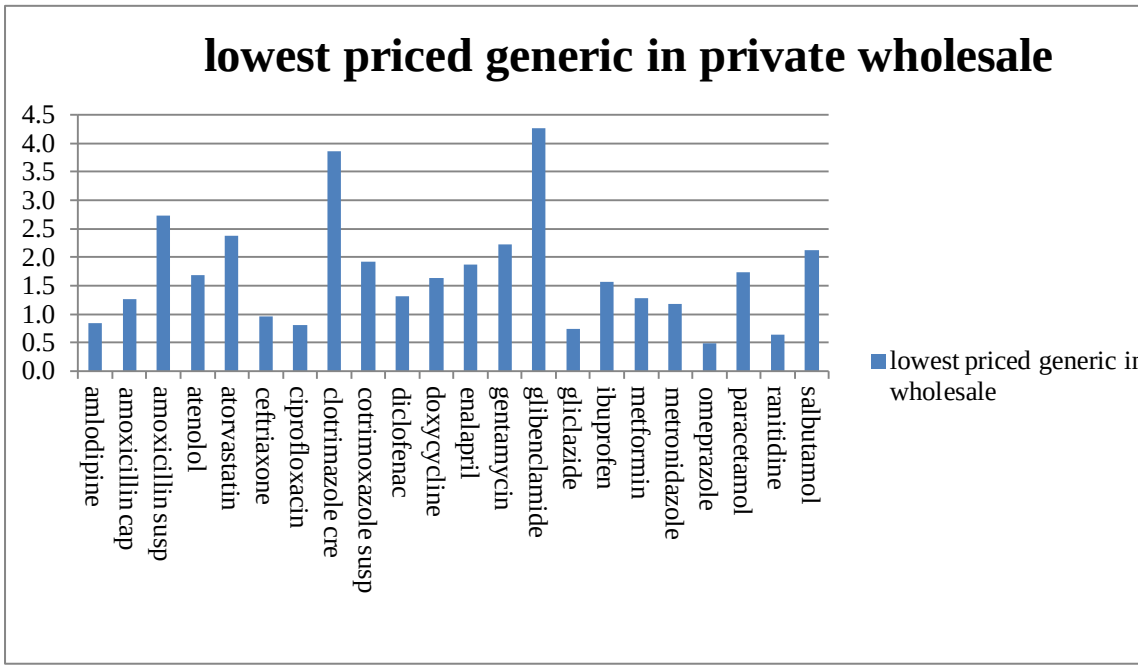

Table 36 :Comparisons between highest price and lowest price generic, found both product in private wholesale (Individual medicine)

	Highest generic (MPR)	**Lowest generic (MPR)**	**No. of times more expensive**
No. of medicines included	19	19	
amlodipine	2.7	0.8	3.4
amoxicillin cap	1.6	1.3	1.2
amoxicillin susp	5.6	2.7	2.1
atenolol	3.0	1.7	1.8
atorvastatin	6.5	2.4	2.7
ceftriaxone	3.1	1.0	3.1
ciprofloxacin	4.2	0.8	5.2
clotrimazole cre	4.4	3.9	1.1
diclofenac	15.7	1.3	12.1
doxycycline	2.9	1.6	1.8
enalapril	7.1	1.9	3.7
gliclazide	1.5	0.7	2.1
ibuprofen	4.7	1.6	2.9
metformin	7.1	1.3	5.5
metronidazole	3.2	1.2	2.7

omeprazole	2.6	0.5	5.2
paracetamol	8.8	1.7	5.2
ranitidine	2.1	0.6	3.5
salbutamol	2.9	2.1	1.4

MPR=median price ratio

APPENDIX D

Core list of medicines to be surveyed

Med. No.	Medicine Name (Name must be unique)	Medicine Strength	Dosage Form	Medicine list	Drug action
1	Amitriptyline	25 mg	cap/tab	Global	Psychotherapeutic drug
2	Amlodipine	5mg	cap/tab	Regional	Anti-anginal drug
3	Amoxicillin	500 mg	cap/tab	Global	Beta lactam medicines
4	Amoxicillin suspension	25 mg/ml	milliliter	Regional	Beta lactam medicines
5	Atenolol	50 mg	cap/tab	Global	Anti-anginal, antiarrhythmia and anti hypertensive
6	Atorvastatin	10 mg	cap/tab	Regional	Lipid lowering agents
7	Beclometasone inhaler	250 mcg/dose	dose	Regional	Anti-asthmatic & for chronic obstructive lung disease
8	Captopril	25 mg	cap/tab	Global	Anti-hypertensive, used in heart failure
9	Ceftriaxone injection	1 g/vial	vial	Global	Beta lactam medicines (antibacterial)
10	Ciprofloxacin	500 mg	cap/tab	Global	Anti-bacterials
11	Clotrimazole topical cream	1%	gram	Regional	Anti-fungal, & used in

					dermatological
12	Co-trimoxazole suspension	8+40 mg/ml	milliliter	Global	anxiolytic
13	Diazepam	5 mg	cap/tab	Global	Psychotherapeutic medicines
14	Diclofenac	50 mg	cap/tab	Global	Non-opiod analgesic & nsaims (medicine used in pillative care)
15	Diethylcarbamazine citrate	50 mg	cap/tab	Regional	Anti-filarials
16	Doxycycline	100 mg	cap/tab	Regional	Anti-malarial
17	Enalapril	5mg	cap/tab	Regional	Anti-hypertensive used in heart failure
18	Fluoxetine	20 mg	cap/tab	Regional	Used in depressive disorder
19	Gentamicin eye drops	0.3%	milliliter	Regional	Ophtalmological , anti-infective agents
20	Glibenclamide	5 mg	cap/tab	Global	Insulin and other anti-diabetic agents
21	Gliclazide	80 mg	cap/tab	Regional	Insulin and other anti-diabetic agents
22	Ibuprofen	400 mg	cap/tab	Regional	Non-opiod analdesis & nsaims (acute migraine

					attack)
23	Metformin	500 mg	cap/tab	Regional	Insulin and other anti-diabetic agents
24	Metronidazole	400 mg	cap/tab	Regional	Antiamoebic and antigiardiasis medicines
25	Omeprazole	20 mg	cap/tab	Global	Antacid and other anti-ulcer medicine
26	Paracetamol suspension	24 mg/ml	milliliter	Global	Non-opiod analgesic & nsaims (medicine used in pillative care) Non-opiod analgesic & nsaims (medicine used in pillative care)
27	Phenytoin	100 mg	cap/tab	Regional	Anti-convulsant, anti-epileptic
28	Ranitidine	150 mg	cap/tab	Regional	Antacid and other anti-ulcer medicine
29	Salbutamol inhaler	100 mcg/dose	dose	Global	Antiasthmatic and for chronic obstructive lung disease
30	Simvastatin	20 mg	cap/tab	Global	Lipid lowering agents

APPENDIX E

Medicine Price data collection form (for medicine outlets)

Use one form for each health facility and pharmacy

Date: ……. Area number:……

Name of town/village/district……..

Name of health facility/ pharmacy (optional): ……..

Distance in km form nearest town (population>50 000):

Type of health facility:

□Public-primary/secondary/tertiary care facility □Private Retail pharmacy

□Other (please specify):

Type of price in public and private not –for-profit sector:

□Procurement price □Price that patient pays

Data collectors…….

Verification

To be completed by the area supervisor at the end of the day

Signed……

Date……

Medicine Price Data Collection Form

Lowest and highest priced generic equivalent product: determined at facility

A	B	C	D	E	F	G	H	I	J
Generic name, dosage form, strength	Medicine Type	Brand or product name(s)	Manufacturer	Available yes/no	Pack size recommended	Pack size found	Price of pack found	Unit price (4 decimal places)	Comments
Amitriptyline 25 mg cap/tab	Originator brand	Tryptizol	MSD		100			per cap/tab	
	Highest-priced generic				100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Amlodipine 5mg cap/tab	Originator brand	Norvasc	Pfizer		30			per cap/tab	
	Highest-				30			per	

	priced generic							cap/tab	
	Lowest-priced generic				30			per cap/tab	
Amoxicillin capsule 500 mg cap/tab	Originator brand	Amoxil	GSK		21			per cap/tab	
	Highest-priced generic				21			per cap/tab	
	Lowest-priced generic				21			per cap/tab	
Amoxicillin suspension 25 mg/ml millilitre	Originator brand	Amoxil	GSK		100			per milliliter	
	Highest-priced generic				100			per milliliter	
	Lowest-priced generic				100			per milliliter	
Atenolol 50 mg	Originator	Tenormin	AstraZeneca		60			per	

cap/tab	brand							cap/tab	
	Highest-priced generic				60			per cap/tab	
	Lowest-priced generic				60			per cap/tab	
Atorvastatin 10 mg cap/tab	Originator brand	Lipitor	Pfizer		30			per cap/tab	
	Highest-priced generic				30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Beclometasone inhaler 250 mcg/dose dose	Originator brand	Becotide	GSK		200			per dose	
	Highest-priced generic				200			per dose	
	Lowest-priced				200			per dose	

	generic								
Captopril 25 mg cap/tab	Originator brand	Capoten	BMS		60			per cap/tab	
	Highest-priced generic				60			per cap/tab	
	Lowest-priced generic				60			per cap/tab	
Ceftriaxone injection 1 g/vial vial	Originator brand	Rocephin	Roche		1			per vial	
	Highest-priced generic				1			per vial	
	Lowest-priced generic				1			per vial	
Ciprofloxacin 500 mg cap/tab	Originator brand	Ciproxin	Bayer		10			per cap/tab	
	Highest-				10			per	

	priced generic							cap/tab	
	Lowest-priced generic				10			per cap/tab	
Clotrimazole topical cream 1% gram	Originator brand	Canesten	Bayer		20			per gram	
	Highest-priced generic				20			per gram	
	Lowest-priced generic				20			per gram	
Co-trimoxazole suspension 8+40 mg/ml millilitre	Originator brand	Bactrim	Roche		100			per milliliter	
	Highest-priced generic				100			per milliliter	
	Lowest-priced generic				100			per milliliter	
Diazepam 5 mg	Originator	Valium	Roche		100			per	

cap/tab	brand							cap/tab	
	Highest-priced generic				100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Diclofenac 50 mg cap/tab	Originator brand	Voltarol	Novartis		100			per cap/tab	
	Highest-priced generic				100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Diethylcarbamazine citrate 50 mg cap/tab	Originator brand	Hetrazan	Lederle		100			per cap/tab	
	Highest-priced generic				100			per cap/tab	
	Lowest-priced				100			per	

	generic							cap/tab	
Doxycycline 100 mg cap/tab	Originator brand	Vibramycin	Pfizer		10			per cap/tab	
	Highest-priced generic				10			per cap/tab	
	Lowest-priced generic				10			per cap/tab	
Enalapril 5mg cap/tab	Originator brand	Renitec	MSD		30			per cap/tab	
	Highest-priced generic				30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Fluoxetine 20 mg cap/tab	Originator brand	Prozac	Eli Lilly		30			per cap/tab	
	Highest-				30			per	

	priced generic							cap/tab	
	Lowest-priced generic				30			per cap/tab	
Gentamicin eye drops 0.3% millilitre	Originator brand	Garamycin	Schering-Plough		5			per milliliter	
	Highest-priced generic				5			per milliliter	
	Lowest-priced generic				5			per milliliter	
Glibenclamide 5 mg cap/tab	Originator brand	Daonil	Sanofi-Aventis		60			per cap/tab	
	Highest-priced generic				60			per cap/tab	
	Lowest-priced generic				60			per cap/tab	
Gliclazide 80	Originator	Diamicron	Servier		100			per	

mg cap/tab	brand							cap/tab	
	Highest-priced generic				100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Ibuprofen 400 mg cap/tab	Originator brand	Brufen	Knoll		30			per cap/tab	
	Highest-priced generic				30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Metformin 500 mg cap/tab	Originator brand	Glucophage	Merck		100			per cap/tab	
	Highest-priced generic				100			per cap/tab	
	Lowest-priced				100			per	

	generic							cap/tab	
Metronidazole 400 mg cap/tab	Originator brand	Flagyl	Sanofi-Aventis		14			per cap/tab	
	Highest-priced generic				14			per cap/tab	
	Lowest-priced generic				14			per cap/tab	
Omeprazole 20 mg cap/tab	Originator brand	Losec	AstraZeneca		30			per cap/tab	
	Highest-priced generic				30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Paracetamol suspension 24 mg/ml millilitre	Originator brand	Panadol	GSK		60			per milliliter	
	Highest-				60			per	

	priced generic							milliliter	
	Lowest-priced generic				60			per milliliter	
Phenytoin 100 mg cap/tab	Originator brand	Epanutin	Pfizer		100			per cap/tab	
	Highest-priced generic				100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Ranitidine 150 mg cap/tab	Originator brand	Zantac	GSK		60			per cap/tab	
	Highest-priced generic				60			per cap/tab	
	Lowest-priced generic				60			per cap/tab	
Salbutamol	Originator	Ventoline	GSK		200			per dose	

inhaler 100 mcg/dose dose	brand								
	Highest-priced generic				200			per cap/tab	
	Lowest-priced generic				200			per dose	
Simvastatin 20 mg cap/tab	Originator brand	Zocor	MSD		30			per cap/tab	
	Highest-priced generic				30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	

Appendix F

Standard treatment to calculate the affordability

No	Condition	Medicine name	Strength	Dosage form	Treatment schedule
1	Asthma	Salbutamol	0.1mg/dose	inhaler	1 inhaler of 200 doses
2	Diabetes	Glibenclamide	5mg	Cap/tab	1cap/tab *2/day*30 days=60
3	Hypertension	Atenolol	50mg	Cap/tab	1 cap/tab*30days=30
4	Hypertension	Captopril	25 mg	Cap/tab	1cap/tab* 2/day*30days=60
5	Hypercholesterolaemia	Simvastatin	20 mg	Cap/tab	1cap/tab *30days=30
6	Depression	Amitriptyline	25 mg	Cap/tab	1cap/tab*3/day*30 days=90
7	Adult respiratory infection	Ciprofloxacin	500 mg	cap/tab	1cap/tab* 2/day*7 days=14
8	Adult respiratory infection	Ceftriaxone	1g/vial	injection	1 injection
9	Adult respiratory infection	Amoxicillin	500 mg	Cap/tab	3 cap* day*7days=21
10	Pediatric respiratory infection	Co-trimoxazole	8+40 mg/ml	suspension	5ml*2/day*7days=70ml
11	Anxiety	Diazepam	5 mg	cap/tab	1 cap/tab/day*7 days=7
12	Arthritis	Diclofenac	50 mg	Cap/tab	2 cap/tab/day*30 days=60
13	Pain/inflammation	Paracetamol suspension	24mg/ml	millilitre	5ml*3/day*3days=60
14	Ulcer	Omeprazole	20 mg	cap/tab	1cap/tab*30 days=30

APPENDIX G

Budget

No.	Activities	Unit	Price(bath)	Unit(number)	Total budget (bath)
1	Pre-testing				
	Photocopy	Quest.	4/set	30*4	120
2	Data Collection				
	Copy Quest	Quest.	120/set	120*4	480
	Interviewers per day	Person	350/day	5persons* 14 days	24500
	Accommodation	person	500/day	500* 14	7000
	Transport cost	Trip/day+ air ticket	200/day+8000	200*20	12000
				Sub total	44100
3	Document printing				
	Paper +printing	Page	5/page	800pages	4000
	Copy (external + final submit)	Page	0.5/page	12*400	2400
	Stationary	Set	400/set	1	400
	Binding paper	Set	200/set	6	1200
				Subtotal	8000
				Grand total	52100

APPENDIX H

Time Schedule

Sr	Activities	Oct		November				December				January				February				March				April				May		
		3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
1	Writing Proposal																													
2	Consulting Advisor																													
3	Submit first draft																													
4	Revise first draft																													
5	Submit for Proposal exam																													
6	Proposal exam																													
7	Revise proposal																													
8	Pre-testing instrument																													
9	Revising instrument																													
10	Conducting for survey																													
11	Data collection																													
12	Data management																													
13	Data analysis																													
14	Report writng																													
15	Submit for Final defense																													
16	Thesis exam																													
17	Revision																													
18	Submit final product																													

VITAE

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