STUDY EVALUATING MEDICATION USE PRACTICES AND EXTENT OF DRUG WASTAGE AMONG FEMALE STUDENTS AT UNIVERSITI SAINS MALAYSIA

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UNIVERSITI SAINS MALAYSIA

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by

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DEDICATION

This research work is dedicated to my darling husband Elfadil, my lovely son Mohamed, my beloved mother Aisha, my father soul, my brothers and sisters who constantly give me moral support, faith, love and joy that energizes me to pursue and accomplish my goals. Thanks for your love, sacrifices and Dawat.

Sohair

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LIST OF ABBREVIATION

CNS	Central Nervous System
ENT	Ear, Nose & Throat
GDP	Gross Domestic Product
GIT	Gastrointestinal Tract
GlobinMed	Global Information Hub on Integrated Medicine
GNDP	Ghana National Drugs Programme
GNP	Gross National Product
HAI	Health Action International Asia Pacific
IPU	Irish Pharmaceutical Union
MIMS	Malaysia Index of Medical Specialities
NCPIE	National Council on Patient Information and Education
OTC	Over the Counter
P H	Penang Hospital
PSW	Pharmacy Society of Wisconsin
RCP	Retail Community Pharmacy
RM	Malaysian Ringgit
RPSGB	Royal Pharmaceutical Society of Great Britain
SD	Standard Deviation
SPSS	Statistical Package for Social Sciences
USM	Universiti Sains Malaysia
UK	United Kingdom
US	United State
US$	United States' Dollar
WHO	World Health Organization

Kajian Penilaian Praktis Penggunaan Ubat- Ubatan Dan Setakat Mana Pembaziran Ubat-Ubatan Dalam Kalangan Pelajar Perempuan Di Universiti Sains Malaysia

ABSTRAK

Pembaziran ubat merupakan satu bebanan ke atas sistem perkhidmatan kesihatan di Universiti Sains Malaysia. Ia bukan sahaja meruncingkan kos kewangan tetapi juga menyumbang kepada penambahan risiko kesihatan. Oleh yang demikian, penggunaan ubat serta preskripsi yang sesuai adalah perlu bagi mengurangkan kos dan risiko yang berkaitan. Bekalan ubat yang meluas dan pemerolehannya secara mudah di kesemua klinik USM serta kelaziman sikap dan perilaku negatif di kalangan pengguna (cth: perubatan kendiri) mungkin menyumbang kepada penambahan risiko pembaziran ubat. Kajian ini bertujuan mengkuantifikasi pembaziran ubat di USM serta mengenal pasti faktor-faktor yang mengakibatkan pembaziran sedemikian. Kajian ini melibatkan satu tinjauan rentas komuniti siswa/pelajar wanita USM. Tinjauan ini telah dilaksanakan dari Februari sehingga Jun 2005 di kampus induk USM. Sejumlah 535 pemaklumbalas wanita disasarkan secara rawak untuk satu tinjauan berasaskan soal-selidik. Data yang diperolehi dianalisis dengan menggunakan perisian SPSS dan Excel. Min±SD umur pelajar wanita yang belum berkahwin adalah 22.1±3.3 manakala min±SD umur pelajar wanita pasca siswazah yang telah berkahwin adalah 35.4±5.8. Kesemua pelajar wanita berkenaan melaporkan bahawa mereka memiliki sekurang-kurangnya 2 ubatan yang tidak digunakan di bilik masing-masing.

Secara keseluruhan, min ±SD bilangan ubat bagi seorang pelajar wanita dan satu keluarga pelajar pasca siswazah adalah masing-masing 3.6±2.8 dan 4.0±3.5. Kelas ubat terapeutik yang biasa disimpan di bilik pelajar wanita yang belum berkahwin terdiri dari vitamin & galian/mineral (24.8%), ubat GIT serta analgesik dan antipiritik (17%) manakala kelas terapeutik yang disimpan di bilik pelajar pasca siswazah berkeluarga terdiri daripada vitamin & galian/mineral (21.6%), analgesik dan antipiritik (18.1%) dan ubat GIT (14.6%). Jumlah peratusan produk ubat separa guna, tidak diguna atau yang telah luput yang ditemui pada kalangan pelajar wanita adalah masing-masing 1435 (83.2%), 249 (14.5%) dan 40 (2.3%) manakala jumlah peratusan ubat berkenaan dalam kalangan pelajar wanita pasca siswazah berkahwin adalah masing-masing 139 (69.8%), 59 (29.7%) dan 1 (0.5%). Berasaskan data ini, jumlah pembaziran ubat dalam kalangan dua kumpulan pelajar tersebut masing-masing dianggarkan sebanyak 1724 ubatan dan 199 ubat-ubatan. Bila dianalisa dari sudut jumlah kos ubat, didapati bahawa peratusan pembaziran ubat dalam kalangan 2 kumpulan tersebut masing-masing adalah 47.41% dan 63.20%. Umumnya, perilaku dan sikap pelajar wanita berhubung pembaziran ubat merangkumi tabiat penyimpanan ubat dalam persekitaran yang kurang sesuai, pembelian ubat secara tanpa preskripsi (OTC), penghentian pengubatan, pengubatan berulang dan perkongsian ubat dengan rakan sebaya. Kajian mendapati bahawa pelajar wanita USM yang belum berkahwin menyimpan ubat yang tidak digunakan bernilai RM11,515.40 manakala pelajar wanita pasca siswazah yang telah berkahwin menyimpan ubat yang tidak digunakan bernilai RM1,290.40. Kajian mencadangkan agar pendidikan dan program kesedaran

dilaksanakan dalam kalangan pelajar universiti bagi mengurangkan pembaziran ubat dan risiko berhubung penyalahgunaan ubat.

Kata kunci: pembaziran ubat, kos ubat, ubat tanpa preskripsi, perilaku sosial, pengubatan kendiri, tinjauan, pelajar wanita, kampus induk, Universiti Sains Malaysia.

Study Evaluating Medication Use Practices and Extent of Drug Wastage among Female Students at Universiti Sains Malaysis

ABSTRACT

Medication wastage is a major burden on the health care system in Universiti Sains Malaysia (USM). It is not only aggravates the financial cost to the health system but also contributes to increased health risk. Thus, appropriate medication use and prescribing is needed to decrease costs and the attendant risks. The wide availability of medicines and their easy accessibility in all USM related clinics coupled with the prevalence of inappropriate attitudes and behaviours by consumers (e.g. self-medication) may contribute to the increased risk of drug wastage. This study seeks to quantify drug wastage in USM and to identify the factors that lead to such wastage. The study involved a cross-sectional survey of the USM female students' community. The survey was conducted from February to June 2005 at the USM main campus. A total of 535 respondents were targeted for a questionnaire-based survey on randomly sampled female students. Data was analyzed using the Social Package for Social Sciences (SPSS) & Excel software. The mean±SD of age of single female and married postgraduate female students were 22.1±3.3 and 35.4±5.8, respectively. All female students reported having at least 2 medicines unused in their rooms. Overall, the mean±SD number of medicines per a single female student and per a postgraduate student' family were 3.6±2.8 and 4.0±3.5' respectively. The most common therapeutic classes of medications kept with both groups of students were vitamins & minerals (24.8%), GIT drugs (17.3%) and analgesic & antipyretics (17.0%) with single

female students and were vitamins & minerals (21.6%), analgesic & antipyretics (18.1%) and GIT drugs (14.6%) with married postgraduate female students, respectively. The total number and percentage (%) of partially used, totally unused or expired drug products among single female students were 1435 (83.2%), 249 (14.5%) and 40 (2.3%), respectively while they were 139 (69.8%), 59 (29.7%) and 1 (0.5%) among married postgraduate female students, respectively. Based on these data, total medication wastage was estimated to be (1724 drugs) and (199 drugs) among the two groups of students, respectively. When analyzed on the basis of total medication cost, medication wastage was 47.41% and 63.20% among the 2 groups, respectively. Generally, female students' behaviors and attitudes associated with drug wastage included medicines stored in improper conditions, different forms of self-medication practices like purchasing of OTC medicines, medicine discontinuation, repeated medication, and students sharing medicine with their friends. The study found that single female students in the USM main campus kept a total of RM11,515.4 worth of medication that were not consumed while married postgraduate female students kept a total of RM1,290.40 worth of unconsumed medication. The study proposes that education and awareness programs should be implemented among university students in order to reduce medication wastage and the risks associated with misuse of medications.

Keywords: drug wastage, drug cost, OTC medicine, Social-behavior, self-medication, survey, female students, main campus, Universiti Sains Malaysia.

CHAPTER 1

INTRODUCTION

1.1 Introduction

The increase in the quantities and varieties of pharmaceuticals worldwide often leads to inappropriate use. This phenomenon often associated with health risk and economic burden to government since increase in the number of drugs available has incredible complicated the choice of appropriate drug for particular indication (Lee, 1991; Dong et al., 1999).

A sizeable percentage of total health care costs is caused by expenditures on drug prescriptions. The increase in the cost of drugs is often linked to factors such as higher medical service utilization rates, irrational drug use as well as consumer behavioural aspects that lead to wastage. Thus, improving drug use would have important financial and public health benefits by reducing the cost of treatment (Tepper and Lied, 2004; Fairman, 2000; Morgan, 2002).

Globally more than 50% of all medicines are prescribed, dispensed or sold inappropriately, while 50% of patients fail to take them correctly (WHO, 2002c). The rational use of medicine is defined as “patients receiving medications appropriate to their clinical needs in doses that meet their own individual requirements, for an adequate period of time and at the lowest cost to them and their community” (WHO, 1987). Irrational drug use is a major public health problem worldwide, with extensive economic implications (Ambwani and Mathur, 2007).

This study focuses on two of the most common problems of inappropriate drug use by consumers namely unused medications and wastage and consumers' behaviours that lead to this wastage.

The major health risk associated with the behaviour of inappropriate or irrational pharmaceutical drugs use by consumers is drug induced illness which can be avoided by better patient care. The mechanisms that lead to drug induced illness are errors in dispensing or administration of drugs or poor compliance by the patient resulting in under use, over use, misuse or complete cessation of the therapy that render patient complete cure (Avorn, 2001). Besides, self-medication practices that can lead to occurrence of adverse drug reactions, including drugs interactions or even accidental drug poisoning. Another health risk which is associated with inappropriate drug use, is the occurrence of increasing microbial resistance to anti-microbial medicines, contributing to higher morbidity and mortality a problem wide spread in the world (Khor, 2005). There is a vicious cycle that operates in inappropriate drug use since resources that could have been used directly for disease prevention and control are diverted and used instead to "treat" the consequences of this misuse.

Drug wastage is due to sub-consumption of medicine when consumers do not finish the medications prescribed by their doctors. Many reasons for wasted medications like perception by subjects that a medical condition had resolved or that a medication was ineffective (Morgan, 2001). This behaviour can lead to delay in treatment, disease progression, treatment of ensuing complications, and include exacerbation or prolongation of illness, uncontrolled chronic disease, hospitalization, disability, and death (Sorensen et al., 2005;

Ambwani and Mathur, 2007; Anonymous, 1992), besides, the increase in the cost of treatment. Moreover, it can lead to drug expiration and if the drug is reused again by patient without awareness of its expiration date, this can result in accidental drug poisoning or even death (Abramowicz, 2002). In addition, wasted medicines if not handled properly during disposal they will affect the environment and medications that go to a landfill may leach to the groundwater system (Coughlin and Woods, 2007).

1.2 Background

Drug wastage poses a significant health problem. It endangers human life and health, results in the non-optimal utilization of resources and causes considerable loss of money. This study contributes to identify the factors that affect on drug wastage at Universiti Sains Malaysia (USM) main campus and to examine the behaviours of the students (i.e. consumers) that contribute to such wastage. Finally, the study also suggests strategies that encourage the appropriate use of drugs, thus minimizing wastage through behaviour modifications. The study purports to act as a guide for policy makers who are concerned with the promotion of appropriate drug use.

1.2.1 The concept of drug wastage and rational drug use

Drug wastage is defined as “any drug product, either dispensed by prescription or purchased over the counter (OTC), that is never fully consumed” (Abou-Auda, 2003). This definition explicitly pertains to partially or totally unused drugs as well as expired medicines. As noted earlier, the definition on the rational drug use implicitly infers that doctors should prescribe the right

drug, the correct dose at an affordable price with clear information and instructions about the drug to the patient or his/her guardian. Thus, by default, this implies that the irrational or non-rational use involves the prescription of medications in a way that is not compliant with the rational mode.

1.2.2 Problem Statment

Medication wastage is major burden on the fiscally restrained health care system in USM. Thus, appropriate medication use and prescription is needed to decrease costs attributable to such waste. The wide availability and accessibility of medications and their prescription in all USM related clinics may contribute to increased risk of drug wastage.

The USM Health Centre and its panel clinics provide out-patient treatment to over 20,000 students, staff and dependents. These health facilities are manpowered by local doctors, screening nurses, patients registrars and the relevant auxiliary staff. Services provided include out-patient treatment and dental care at the USM Health Centre. In addition, this centre refers serious cases like surgery, eye problems, antenatal and maternity care to Penang Hospital (PH). Recurrent costs are funded primarily by payments from student's fees for services, including drugs. Generally, students are required to make a RM 30.00 per semester payment for undergraduate students and RM80.00 per semester payment for postgraduate students. In contrast, dependents of students are charged RM80.00 per member per year. These charges confer the student concerned on unlimited access to treatment at the out patient department. The pharmacies at the Health Centre and panel clinics dispense all types of medications at adequate rate to patients seeking treatment at those

clinics. This places a heavy financial burden on the USM health system with annual increase of students' intake. Thus, the prevalence of drug misuse and wastage if not contained will further aggravate the financial situation to the health system (WHO, 2006). Cognizant of this fact, this study was conducted in 2005. The study involved a cross-sectional survey of USM students' community aimed at the assessment of extent of medication wastage by students, identifying the types of unused medicines and examine students' behaviours that leads to this wastage.

1.2.3 Economic impact of drug expenditure in developed and developing countries

Many countries in both the developed and developing world are affected by drug wastage that emerges as the result of availability of greater quantities and varieties of pharmaceuticals in these countries followed by irrational use. Homedes and Ugalde (2001) reported that the pharmaceuticals market all over the world expanding rapidly. Global drug expenditure in 1985 was estimated at US$100 billion, having doubled over the previous decade; by 1992 the world market was estimated at US$226 billion or about US$40 per capita, and it is estimated that it will reach US$400 billion by 2002 or US$60 per capita. In USA, the annual prescription drug expenditure growth rate was 19.7% in 1999, 18.3% in 2000, 17.8% in 2001 and 16.9% in 2002 and is expected to rise to approximately 19% in 2003. In fact, the US$154.5 billion retail drug expenditure in 2001 is expected to exceed US$ 300 billion in 2005 (Covington, 2003). It is clear from these figures that prescription drug expenditure double every four to four and a half years and this trend is projected to continue. Moreover, other

related data show that for the 1985-2001 period, medicaid fiscal expenditures for prescribed drugs increased from US$2.3 to US$24.7 billion, approximately a 10 fold increase (Tepper and Lied, 2004). In UK, total expenditure on drugs in 2002 was US$6.8 billion, with drug wastage accounting for loss as amounting for approximately US$37.6 million yearly (Jesson et al., 2005). In Canada, medication use and its costs have increased over the last few years. In 1995, spending on pharmaceuticals reached US$9.1 billion while from 1992 to 1995 the number of prescriptions increased by 19 million. As the average age of the population increases, the number of prescription per patient will also inevitably increase (Boivin, 1997).

In developing countries, 25-65% of total health expenditure is spent on pharmaceuticals. However, government health budgets are insufficient to purchase enough medicines and poor people often cannot afford to buy them on their own (HAI, 2005). For instance, drug expenditure account for 30% of health resources in Thailand (Pongcharoensuk et al., 2004). In Nepal, a study conducted by Hotchkiss et al (1998) reported the percentage of health care expenditures that is spent on pharmaceuticals is relatively high; about 86% in urban areas and 74% in rural areas. In South Africa, 25% of health expenditure is on drugs and US$1.5 billion was spent on pharmaceuticals in 1996 (Orrell and Kishuna, 1997). Irrational drug use reflected in drug wastage has been reported as one of the most important causes of increase health care costs and pharmaceuticals consumption.

1.2.4 Pharmaceutical expenditure in Malaysia

Malaysia is a case of a developing country in Asia which has a population of 25.35 million in 2005. Gross National Income (GNP) per capita was US$4.70, in 2005, while gross domestic product (GDI) per capita was US$10.61 in 2004. Total health expenditure per capita is US$374 per year (4.5% of the GDP) which is < 5% of GDP as drug spending per capita is US$27, about 12% of public health expenditure while the national drug budget totalled RM571 million in 2003 and RM808 million in 2004 (Aljunid, 2005).

The Malaysian healthcare system has improved rapidly since the 1980s because government has attempted to improve standards of healthcare through a variety of proactive measures. Among these, are the incentives given to local manufacturers to produce pharmaceutical products. Therefore, the pharmaceutical industry has been developed rapidly and both drug availability and accessibility is clearly obvious as reported by Malaysian Industrial Development Authority Journal (2007) and by Pharma & Health Care Insight Journal (2006). The annual increase of pharmacy outlets improved the physical accessibility of medicines and the use of medicines is widespread, including modern and traditional medicines and in the public health sector, as 100% prescribed medicines are dispensed, hence, drug misuse by the public will lead to drug wastage and poisoning in addition to increase of the health expenditure.

The health sector in Malaysia has often found itself with a budget that has increased substantially. In fact, the average increase in total public health expenditure is 6.1% for every 1% of population growth. Despite this, there has been few deterioration in the quantity and effectiveness of publicly provided health services and drug availability as reported by the World Bank (2006). As a

result, expenditure on drugs has escalated to such an extent that it has surpassed health expenditure in specific areas within the country. Increasing pharmaceuticals production, followed by increased drug availability in the public health sector and community pharmacies, in addition to the low awareness level pertaining to drugs and drug use among the public have contributed to the current crisis of medication wastage, which is one of the factors that contribute to the problem of increasing health costs.

1.3 Literature review

Previous studies and treatments worldwide that illustrate the risk factors associated with drug wastage are very rare. Thus, the global incidence of medication wastage is relatively unknown. Due to this, literature on this aspect is rather limited. The majority of the literatures are on drug misuse (irrational & inappropriate use) and are descriptive studies. Basically, they explore different issues related to the pattern, prevalence and etiology of drug use all over the world. Moreover, the knowledge of such issues is very essential for understanding drug wastage and community behaviours that lead to such wastage. Essentially, there are few studies that examine the issue of medication wastage:

In the United Kingdom, the cost of drugs discarded each year in the hospitals was estimated to be in the excess of one million pounds (Hart and Marshall, 1976). The total cost of destroyed medication, drug wastage in 17 Massachusetts long-term care, was US$129,854.23 (Paone et al., 1996). In fact, another study found that nearly 600 million prescription medicines are dispensed nationally each year, based on figures released in 2001 and 2002,

and over 4 tonnes of unwanted medicine with average cost of about 10 pounds for each drug. Therefore, each year wasted medicines in the health sector cost the National Health Service over 90 million pounds while such wastage was attributed to over ordering and the non-optimal use of medication (Tameside and Glossop PCT, 2004). Another local study in UK which was conducted by Breame (2003) revealed that the amount of wastage was valued at 928.0 pounds. The study concluded that this figure should be doubled to accurately ascertain the total drugs wastage figure after taking into account other factors such as returns to community pharmacies and drugs placed in domestic rubbish or flushed down toilets. Based on these assumptions, the figure was revised to 2 million pounds a year. Oldknow (2003) noted that it is estimated 80% of the wasted medications returned were obtained via prescriptions.

In Sweden, researchers who collected returned drugs from pharmacies for one year calculated a mean of 17.3 tonnes per month of wastage. The proportion of dispensed medicines that are returned to pharmacies has been found to be 2.3- 4.6% of the total volume dispensed (Ekedahl, 2006).

In Ireland, a study reported that a survey of community pharmacies showed that there was excessive wastage of medicines. In fact, 2 tonnes of medicines were returned unused many of which were complete unopened packs as was reported by Irish Pharmaceutical Union (2003).

Medication wastage and non-compliance are also major problems facing health care system in Canada where the cost of wastage totalled $113,381,687 and 63% of the population had disposed their medication (Boivin, 1997).

In developing countries where drug expenditure is very high and many people are unable to obtain primary health care, the wastage of medicines is

serious. For instance, a study in Saudi Arabia and other Gulf countries found that mean medication wastage was estimated to be 25.8% & 41.3% respectively, in terms of the amount of drug products and 19.2% & 25.0% respectively, in terms of medication costs. The study also found that a total of 12,463 drug products were prescribed for 1554 families, with an average of 18.0 drug products per family. The average prescription amount was 1.53 per individual in Saudi Arabia and 1.01 per individual in other Gulf countries (Abou-Auda, 2003).

In Iran, the average number of drug products which were found in households in the Isfahan region was 23.0. A total of 11,766 drug products were prescribed to 512 families studied, which corresponds to 5.3 per individual and real wastage was estimated to be 38.8% of the total amount prescribed. Over the counter (OTC) drugs constituted 27.0% of medication found in the families in Isfahan. In fact, the total value of all medicines wasted in all Isfahanian households was estimated to be 15 billion Rials (approximately US$1.8 million) (Zargarzadeh et al., 2005).

The annual nation-wide data on drug wastage pattern is scarce and incomplete in Malaysia. This can be attributed to the existence of scarce systematic data on drug utilization after prescription. There is a preliminary study investigating drug wastage in community conducted by Ibrahim et al (1997) in which a total of 451 types of drugs were collected from 101 households and most of these drugs obtained from clinics 58.0%.

Apart from this, many other factors contribute to medication wastage. They include excessive and irrational prescribing, consumers' attitudes and behaviours towards prescribed medicines like poor compliance to prescriptions,

storage of medicine and other patterns of self-medication practice (Grand et al., 1999; Hardon et al., 2004; Abou-Auda, 2003; Abahussain et al., 2005). Self-medication practice, which means the obtaining and consuming of drugs without the advice of a physician either for diagnosis, prescription or surveillance of treatment, it is also includes acquiring medicines without a prescription (OTC), sharing medicines with relatives or friends or using left-over medicine stored at residential place. Many studies have shown that self-medication practices are more common in women of a younger age and among students as well (Shankar et al., 2002; Sawalha, 2007). Self-medication is potentially associated with many adverse effects and can lead to many problems including incorrect self-diagnosis and inadequate treatment of a disease that can result in disease progression and its complications while incomplete treatment courses and indiscriminate drug use have contributed to the emergence and spread of antimicrobial resistance (WHO, 2001).

Patient's non-compliance behaviour is attributed to many factors such as taking too much medication, fear of adverse effects, cultural perceptions of drugs, vague dispenser instructions and inadequate labelling (Bayliss et al., 2001; Nugent et al., 2006). Non-compliance has adverse consequences for patient, being strongly associated with poor outcomes of therapy, antimicrobial resistance, disease complications and economic burden reflected in medication wastage (Wertheimer and Santella, 2003).

Stocking of medicines at consumers residential places and purchasing of prescription only-drugs directly from Retail Community Pharmacies for purpose of storage for future use, are the major factors behind self-medication practices among medicines consumers (Al-Tenaij et al., 2006; Aljinovic-Vucic et al., 2005;

Eng et al., 2003). This carries the risk of exposing medicine to expiration, sharing medicine with friends, taking medicine that have been originally prescribed for different problem or even accidental drug poisoning (Yousif, 2002). As such, the authorities are seeking ways to reduce the amount of unnecessary drug consumption. These, include clamping down on the irrational use of drugs and influencing public behaviour towards drug use. During reviewing many literatures, existing interventions aiming at improving drug use from a medical as well as a consumer perspective are few.

1.4 Study location

Universiti Sains Malaysia (USM) is one of the three Universities in Malaysia that have been earmarked as research-intensive universities. USM is situated in the middle of Penang Island which located on the north-west coast of peninsular Malaysia. USM consists of three campuses; the Main Campus is located in the island of Penang state while the Engineering Campus is located in the mainland of Penang state. The third campus, which houses three health related programmes (Medicine, Health and Dentistry), is located in the State of Kelantan- on the east coast of Peninsular Malaysia. USM is the biggest university in terms of enrolled students in Malaysia. In 2005 about 35,000 students were enrolled in USM. These students were registered in 39 schools and 4 centres of excellence. In 2003, about 5,122 students were enrolled in various study programmes at master and doctoral levels. Almost 11.8% of them were foreign nationals from more than 40 countries. USM has facilities for students' accommodation in the form of hostels for approximately 75% of its students. These hostels known as student villages are located inside the

campus area. The total number of students in the main campus is about 23,269 students with male students accounted totally to about 8,894 students and female students amounting up to 14,375 students. The main campus community, basically, consists of students (undergraduate & postgraduates), staff (academics, administrative, supportive), dependants (the families of staff and postgraduate students) and retires (staff only after 55/56 years old).

1.4.1 The health care system in USM main campus

The main health care services are provided by the USM Health Centre. Apart from this, panel doctors (43 clinics) and panel pharmacists (16 pharmacies) also provide treatment to the USM community, while serious cases are referred to the Penang Hospital (PH). Staff and their dependents can obtain health care services at government health institutions and from a panel of private clinics while retirees can obtain similar services from governmental health institutions only. On the other hand, students and their dependents pay an annual health fee of RM80.00 for a student, RM40.00 for a child and RM80.00 for an adult dependent in order to obtain health care from both government health institutions and panel of private clinics and pharmacies. In spite of the latest update of the health policy makes restrictions to dependents of students to obtain any health services from panel clinics and pharmacies (Ibrahim, 2003).

1.4.2 Health care expenditure in USM and its economic costs

The total number of patients with specific diseases who visited the USM Health Centre during 2002 had increased by approximately 11% from 2001. The

estimated total cost of drugs in Malaysian Ringgit spent for the treatment of different pharmacological cases amount to RM360,606.82. The highest cost was attributable to the provision of cardiovascular drugs and the lowest for respiratory drugs. In the period from January 2001 to March 2003, the amount of money spent on medicines by the Health Centre and its pharmacy for students totalled RM70,931.16, while the amount spent for the staff within the same period amounted to RM 88,922.0 (Ibrahim, 2003).

There exists a pattern of escalating drug expenditure despite diminishing income in the USM Health Centre. For instance, in 2002, drug expenditure increased by 47.5%, health care fees collected from students only increased by 1.8%. In other words, USM spent more money for health services while fees collected from students were insufficient to offset such expenditure. In fact, a detailed comparison between fees collected and drug expenditures for the years 2001 and 2002 revealed on increase in expenditure of approximately 201% and 301%, respectively.

It is clear from the above data that there has been a substantial increase in drug expenditure and clinical visits during the last few years with students counting for the largest share. In fact, in real terms the amount of money claimed (expenditure) has increased by three times more than the fees collected annually. If nothing is done to rectify this pattern, expenditure is expected to escalate even more as more money is spent on treatment using expensive drugs. This would eventually lead to budgetary shortfalls as expenditure outstrips income. Based on these preliminary findings, a study was designed with the intent of using economic description to identify the extent of medication wastage in USM main campus, to elaborate students' opinions,

attitudes and behaviours that lead to such wastage and to assist in reducing the high expenditure incurred due to non-optimal drug consumption patterns by USM students. The study was designed to help policy makers in USM to stem this escalating cost. A survey was conducted and it was aimed to examine drug use behaviour patterns among USM students who, to some extent, are representative of the general public in terms of race, culture and behavioural pattern. The survey also describes the types and extent of medication wastage in USM and analyzes this wastage economically.

In the current study, the researcher follows the definition found in the literature for the terms “inappropriate and irrational”. Irrational refers to drug use by “prescribers” and inappropriate refers to drug use by “consumers” (Grand et al., 1999; Siddigi et al., 2002).

1.4.3 Medicine availability and accessibility at USM clinics

The availability and accessibility of medicines by all patients increases the probability of being involved in inappropriate drug use and drug wastage (Homedes and Ugalde, 2001). This is because each prescription written by doctors in all clinics that serve USM main campus community is dispensed completely and if the proper uses of these medications are not explained correctly and fully by the doctors and dispensers concerned, there will be drug misuse by consumers leading to medication wastage (WHO, 2006). In addition to the students are already less aware of the proper medication usage.

Other medication wastage involved drugs that could be purchased over the counter (OTC) in the private pharmacies, although this will not affect USM health expenditure directly but can have adverse effect on students’ health if not

used appropriately. Furthermore this can increase patients number in USM Health Centre which indirectly affect USM drug cost. In addition, many patients could take OTC drugs prescribed for other patients as improper self-treatment (Okumura et al., 2002). Besides, the availability of OTC medicines from near-by Retail Community Pharmacies (RCP) could be a major factor that determines the incidence of acute intoxication and drug misuse (William and Kokotailo, 2006). Thus, strategies to identify, resolve and prevent this problem must be adopted.

Currently, the health system in USM is unable to meet the growing needs for medicines due to the growing number of students and staffs and due to financial constraints. Moreover, there is increasing recognition amongst health service providers (prescribers & dispensers) and policy makers of the growing amount and cost of prescribed medicines that are not used or discarded. As such, both policy makers and health providers in USM must take a pro-active role in ensuring optimal medicine use by both prescribers and consumers. They can do so to help consumers improve their attitudes and behaviours towards drug use and at the same time maintain good health.

1.5 Rationale of the study

No complete study on the extent of medication wastage has been conducted in Malaysia including in the state of Penang.

Since USM has a large student population composed of the 3 main ethnic groups in Malaysia, any findings gained on drug use patterns and behaviour can be extrapolated to other areas within the country that manifest similar social behavioural patterns.

Secondly, this study may help in the assessment of the economic cost of drug wastage in the USM main campus. This would help to provide an estimation of the total budget needed for USM health service and to ensure the optimal allocation of financial resources.

Thirdly, in the absence of local pharmacoepidemiological data on drug wastage, studies on drug wastage patterns such as this study would be very useful in order to obtain the baseline information on the common causes for wastage and to provide a platform for further identification and intervention studies. In addition, information on medicine wastage epidemiology will enable policy makers in USM to draft new rules making it mandatory for drug providers and consumers to adhere to rational drug use procedures. This will result in behavioural modifications that will augment compliance.

Fourthly, it is hoped that this study will provide important primary information that will help in understanding the magnitude of the drug wastage problem in the university and assist in the rational planning of health and medical care facilities. Information obtained from this study will also help in the identification of target groups and types of medicines implicated in drug wastage. This information can then be used to develop interventions and educational programs. The forms of such programmes could include lectures, seminars, workshops and campaigns that can contain and eventually eliminate the problem. Through these programs, students have to be informed on the proper handling and use of prescribed and OTC medicine.

Finally, another rationale of this study is to precisely determine the common types of consumers' behaviours that may lead to inappropriate medicine use. Such behaviours may include storing medicines for future use,

inappropriate self- medication and discontinuation of medication for no specific reason. The identification of such factors related to wastage through this study will lead to prioritization of targeted groups and behaviours.

1.6 Significance of the study

The budgetary constraint confronting the USM Health Centre entails a comprehensive assessment of its internal drug policy; such a review should focus on the following aspects:

- Estimation of the type and extent of drug wastage to help the policy makers and planners to justify continued financial allocations for drug purchase.
- Providing policy makers in USM with reliable and accurate data concerning the extent and economic costs of drug wastage. This can result in the initiation of effective measures to promote the optimal utilization of medicines and a more rational use of drugs.
- Determination of students' opinions, attitudes and behaviours towards the use of medications that can be changed and improved by conducting educational and training programs on the proper handling and use of prescribed or OTC medicines.
- Estimation of future drug expenditure through determination of current drug expenditure in USM on the bases of estimated cost of wastage.
- Data obtained from this study can be used as a baseline data by other related pharmacoepidemiology studies. The change towards

standard prescription and the appropriate use of medicine may improve consumers' health, physicians and health services costs.

- This study highlights the utilisation of health services and amenities as provided to the students by USM Health Centre and the panel clinics and pharmacies. In addition, it describes students' common illnesses that necessitated drug prescribing so as to provide preliminary information to policy makers in order to enable them to discuss the appropriate measures to improve health services in USM and to allocate resources to improve these services.

1.7 Study objectives

1.7.1 General aims:

The primary aim of this study is to determine the direct economic burden of drug wastage in USM main campus and to provide the policy makers in USM and health planners with accurate information as to the type, extent and cost of wastage. Accordingly, it can assist the policy makers to better and appropriate allocation of health care resources, in order to improve primary health care service in this university.

The second aim was to determine the inappropriate medication usage by students and their attitudes and behaviours that result in such drug wastage. Moreover, to suggest to health policy makers and health professionals steps that may be necessary to improve the existing health situation and eradicate inappropriate medication usage by the students. These can give justification for continuous allocation of additional budget for health promotion and important

prospective measures like continuous consumers education in medication usage.

The present study can also provide preliminary findings for future cost-effectiveness studies to identify effective new interventions to service minimization of drug wastage and reduce its cost and help in improving consumers' attitudes and behaviours towards medication usage

1.7.2 Specific objective

The study was carried out to achieve the following objectives:

1) To quantify the amount, direct costs and types of medications that are found with students' population in USM main campus and the extent of drug wastage.
2) To identify and establish the students' opinions, attitudes and behavioural aspects that lead to this wastage.

CHAPTER 2

METHODOLOGY

2.1 Study design

A non experimental, descriptive and cross-sectional study design was chosen as the means to investigate the type and extent of drug wastage among students in the Universiti Sains Malaysia (USM) main campus and to identify and determine opinions, attitudes and behavioural aspects regarding drug use among the students. This study design was adopted from a research book written by Dawson and Trapp, (2001). The selection was done after an extensive review of the relevant literature indicated that such an approach will provide us with accurate and reliable information on the type and extent of medication wastage and the consumers' attitudes and behaviours towards drug usage in the USM main campus. The efficacy of the approach has been attested to by numerous researchers (Abou-Auda, 2003; Zargarzadeh et al., 2005; Eng et al., 2003) who noted that the cross-sectional design study model facilitated the collation of accurate data for analysis. The data collected basically focussed upon out-patient drug prescriptions issued by the USM Health Centre, USM panel clinics and pharmacies, the Penang Hospital and to a lesser extent those issued by other private sources.

2.1.1 Administration

2.1.1 a Instruments

A letter explaining the purpose of the study along with 8-pages of self-administered questionnaire and 2 pages of data-collection form were distributed to the selected single female students and married postgraduate female students with their respective families. Beside that plastic bags to collect unused (left-over) medicines were also distributed to them. A digital camera was also used to photograph the condition of the medicines, their labelling as well as their places of storage in order to delineate the actual condition and modes of storage.

2.1.1 b Questionnaire

The questionnaire was modified from one used in a previous cross-sectional survey of the general public (Abou-Auda, 2003). Two types of questionnaires were distributed to the respondents. The first questionnaire directed at single female respondents contained 51 questions while the second questionnaire directed to the married postgraduate female students contained 54 questions. The types of questions used in both questionnaires of varied format comprised of multiple choice questions and a few open ended questions and was divided into four sections. All addressed aspects of drug wastage and students' behaviours and attitudes. Besides this, the direct total cost and reasons of medication wastage were also enquired into.

Section A was intended to profile the demographic background of both single female students and married postgraduate female students. The students were queried on their age, race, year of education and school. For

postgraduate students with their families, in addition to, the above factors, they were questioned about number of family members, number of children, and their ages.

Section B of the questionnaire was designed to gather data on variables concerned with the utilisation of health services provided to the students by USM Health Centre and panel clinics and pharmacies, the respondents' health conditions and opinions, attitudes and behaviours towards medicine usage. The respondents were also queried on the extent of self-medication and health related expenses like expenditure incurred in buying medicines (Appendices C1 & C2).

Section C of the questionnaire addressed, with respect to each student, the degree of actual medication storage. The subjects were asked to provide additional information regarding the storage habits of their medications and were inquired about if they encountered any accidental drug poisoning.

2.1.1 c Information collected using the data collection form

Section D evaluates drug consumption and the economic implications of drug use and wastage. The data was compiled utilising a specially designed data- collection form which was modified from one used in a previous study (RPSGB, 2005). The form was designed to compile information about the types of medicine found in the respondents' premises during the study period and the reasons for their presence. The form also recorded the type of and the information on the drug packages found and details pertaining to the label. The information recorded for each medicine collected comprised of its name, code, class, strength, dosage form, source, manufacturer, original number of units

(tablets, capsules, etc) or volumes (ml), amount remaining unused (partially used), cost of unused portion, totally unused medicine, cost of totally unused medicine, reason for unused medicine, drug label, manufacturing date, expiration date, total cost of expired drugs, total number of drugs per student, total cost of drugs (original) and total cost of all unused medications (Appendix D).

2.1.2 Study approval

The study was approved by the USM School of Pharmaceutical Sciences' Postgraduate Studies Board and management of the university.

2.1.3 Pilot study

A pilot study was conducted on 30 female students comprising of 20 undergraduate students and 10 postgraduate students to determine the reliability and validity of the research instruments, i.e., the questionnaire and the data collection form. Based on the feedback obtained, minor modifications and finalization were made to the questionnaire and data collection form on completion of the pilot study in order to enhance the reliability and validity of the instruments. Examples of these changes were; some questions their order changed, ambiguous questions were altered by clear ones and confusing typographical mistakes were corrected. The respondents who participated in the pilot study were excluded from the final study's sampling frame.