An assessment of the Extent of Medication Wastage among Families in Jordan

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ABSTRACT

Medication wastage is defined as any drug product that is never fully consumed. This study is the first study in Jordan that evaluates and estimates medication wastage, and cost. A validated questionnaire was used to collect data from a sample of 435 households selected randomly from different areas in the north of Jordan. Of the total of 2835 medication items found in the 435 selected houses, 65.3% were in use, and 34.7% were not in use. Some medicines (5.8%) were expired. The total cost of all medications in the selected households was calculated as 9593 JD (1 JD = US$ 0.71) with an average cost of 22.1 JD per family. The total cost of unused medications in Jordan was estimated at 6,326,000 JD and the total cost of expired medications in Jordan was estimated at 1,267,000 JD**.** A comprehensive evaluation of the current national drug policies is warranted.

Keywords: Cost, Jordan, Medication wastage.

INTRODUCTION

Medication wastage can be defined as any drug product, either dispensed by a prescription or purchased over-the-counter (OTC) that is never fully consumed.[1] The appropriate use of essential medicines is necessary for prevention, treatment and alleviation of the leading causes of death and disability.[2] Medication wastage is considered as an unnecessary burden on any already economically restrained health care system[1] that can be caused by poor compliance,[3] unnecessary prescribing,[4] or the lawlessness of sales of prescribed medications.[5]

This increasing burden on health care and pharmaceutical consumption is common in both developed and developing countries.[6,7,8] In Great Britain, it was shown that about 50% of patients are noncompliant with the dosing regimens of their prescription.[8] In Canada, medication noncompliance costs approximately 8$ billion per year.[6] In the United States, the cost of wasted medication for adults aged 65 years and older would reach $1 billion annually.[9]

In developing countries, many people are deprived of basic primary health care, this would increase the importance of medication wastage problem.[10] In Saudi Arabia and other Gulf countries, mean medication wastage is estimated to be 19.2% and 25% respectively on the basis of medication costs.[6]

This study aimed to evaluate and estimate medication wastage and its cost, and lack of awareness toward medication storage and uses. It highlights the impact of this problem on the national economy; a guidance for potential future assessments and interventions.

MATERIALS AND METHODS

This study was conducted in the north of Jordan; particularly in Irbid governorate in the period from April 2007 and until August 2007. Out of the total of 2556 blocks in Irbid governorate (Department of Statistics (DOS)), 28 blocks from rural areas and 22 blocks from urban areas were randomly selected using a multi-stage sampling technique. On average there were 45 households per block. Ten households were randomly selected from each block using systematic random

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sampling technique.

Of the 500 selected households, 17 households were not willing to participate in the study, 18 households showed lack of cooperation, and 30 households were empty on two consecutive visits. A total of 435 households were eventually interviewed. The overall response rate of the study was 87.0% (81.8% in urban areas and 91.0% in rural areas).

A team of three 5th year pharmacy students were trained by the principal investigators to conduct the survey. Clearly written and oral methodologies were discussed with the team on how to encourage the families to accept the interview and bring all their medications for inspection. Team members used to inspect medications closely, and expired medications or those that did not have a clear expiry date were separated from others before all medications were returned to the family.

A modified questionnaire from a western Nepal study was utilized.[11] Pilot-testing in 20 families was done and the necessary adjustments were made to improve the clarity of the questions. The questionnaire included twenty-nine questions divided into two parts: The first part addressed demographic and socioeconomic characteristics; including the age of interviewees, residency status, family size, level of education of parents, person who is in charge of keeping medicines, presence and type of health insurance, occupation of the respondent person (head in the family), number of employed family members, whether any family member had a medical or paramedical profession, presence of chronic diseases in the family, storage of medications, and the size (square meters) of the household.

The second part sought information about the name and strength of each medicine, dosage form, amount of drug found in the household, amount of drug in use at the time of the study, amount of drug not in use, amount of drug expired and not expired, amount of drug which did not have a clear expiry date, and the price of each drug unit dose. Drug classification according to the body systems was also accomplished. Medications were recorded as the drug product. A drug product was measured by counting the drug entities, considering each dosage form and strength as a different drug product.

The study was approved by the ethical committee of Jordan University of Science and Technology (JUST). A consent form was signed by the person who was interviewed in the household. All the collected data have been used only for the purpose of this study.

Data were analyzed using the Statistical Package for Social Sciences (SPSS, Inc., Chicago, III, Version 15). Frequencies, percentages, and means were used to describe data. The total cost of all medications, medications not in use, and expired medications were calculated. The estimate of the total costs of medications (all, not in use, and expired) and its 95% confidence intervals were calculated using the following formula:

$$x' = \left[\frac{N}{n}\right](x) \quad (1) \qquad x = \sum_{i=1}^{n} x_i \quad (2)$$

$$x' \pm z_{1-\alpha/2}(N)\sqrt{\frac{N-n}{N}}\left(\frac{S_x}{\sqrt{n}}\right) \quad (3)$$

In these equations (1,2,3) n is the number of households in the sample, N is the number of households in the population, S_x is the sample standard deviation, and $z_{(1-\alpha/2)}$ is the 100(1- α/2) percentile of the standard normal distribution. X is the total cost in the sample and x' is the estimate of the population total cost.

Factors associated with the number of medications found in households were analyzed using the General Linear Model (GLM) procedure. A *p*-value of less than 0.05 was considered statistically significant.

RESULTS

Demographic and Socio-economic Characteristics

The demographic and socio-economic characteristics of the families enrolled in this study are summarized in Table 1 and Table 2 respectively.

Table 1. Demographics of the selected families in the North of Jordan

Variable	n (%)	Variable	n (%)
Age of interviewees, mean (±SD) (in years)	36.4 (±11.9)	**Father's education level**	
Family size, mean (±SD)	5.8 (±2.4)	≤ High school	175 (40.2)
Respondent's person "head in the family"		> High school	260 (59.8)
Father	380 (87.3)	**Mother's education level**	
Mother	39 (9.0)	≤ High school	228 (52.5)
Others	16 (3.7)	> High school	207 (47.5)
Having siblings with medically related jobs		**Person who keeps medicines**	
Yes	95 (21.8)	Father	56 (12.9)
No	340 (78.2)	Mother	347 (79.8)
		Others	32 (7.3)

Table 2. Socio-economic characteristics of the selected families in the North of Jordan

Variable	n (%)
Type of health insurance	
No insurance	38 (8.7)
Ministry of health insurance	170 (39.1)
Royal medical services (military) insurance	201 (46.1)
Others	26 (6.0)
Residency	
Rural area	255 (58.6)
Urban area	180 (41.4)
Household	
Rented	111 (25.0)
Owned	324 (75.0)
Size of household (m)^2	
≥ 300	20 (4.6)
100- 299	372 (85.5)
< 100	43 (9.9)

The mean (±SD) family size was 5.8 (±2.4) members. Approximately 59.8% of fathers and 47.5% of mothers had an education level of more than high school. In 79.8% of the families, mothers were in charge of medications (person who keeps medicines). About 58.6% of the interviewed households were in rural areas and 41.4% were in urban areas.

Medications:

Storage, prescription patterns, and dosage forms. The distribution of medicines found in the 435 houses in the north of Jordan is shown in Table 3.

Table 3. Storage of medications and drug prescription patterns found in 435 households in the North of Jordan

Variable	n (%)
Usage of medications	
In use	1852 (65.3)
Not in use	983 (34.7)
Expiry of medication	
Expired	174 (6.1)
Not expired	2661 (93.9)
Storage of medications	
Refrigerator	412 (94.7)
Kitchen	175 (40.2)
Dining room	201 (46.2)
Bedroom	201 (46.2)
First aid box	5 (1.2)
Drug prescription pattern	
Doctor's prescription	2010 (70.9)
Self-prescription	703 (24.8)
Not known	13 (0.5)
Free sample	109 (3.8)

Families were found to store their medications in more than one place with the refrigerator being the most common storage place. Only 1.2% of families were found to store medications in a first aid box. More than two-thirds of medications were prescribed by doctors. When classified according to body system, central nervous system (CNS) drugs were found to be the most common (25.2%), followed by anti-infective agents (17.4%). The most common individual medications found were amoxicillin, paracetamol, metronidazole, antihistamines, hypoglycemic medications, and adult cold medications. (Table 4)

Table 4. Dosage forms of medications and drug classification according to body system found in 435 households in the North of Jordan

Variable	n (%)
Dosage forms	
Tablets	1794 (63.3)
Capsules	332 (11.7)
Syrups	250 (8.8)
Suspensions	201 (7.1)
Suppositories	117 (4.1)
Creams / ointments / gels	43 (1.5)
All forms of injections	53 (1.9)
Drops /nasal or oral puff	45 (1.6)
Drug classification according to body system	
Central nervous system agents	713 (25.2)

Variable	n (%)
Anti-infective agents	493 (17.4)
Musculoskeletal agents	381 (13.4)
Respiratory system agents	348 (12.3)
Gastro-intestinal agents	301 (10.6)
Cardio-vascular agents	216 (7.6)
Endocrine system agents	200 (7.0)
Nutrition agents	127 (4.5)
Eye, Ear, Nose and Skin agents	56 (2.0)

In the multivariate analysis, fathers' education level of less than high school, having at least one chronic illness, and having siblings of medically related jobs were significantly associated with an increased number of medications found in households. (Table 5)

Table 5.Variables that have relationship with the amount of medicines found in households.

Variable	Mean (SD), No. of medicine	P.
Father's education		<0.0005
≤ High school or dead	7.30 (2.97)	
> High school	5.99 (2.07)	
Number of Chronic illness		<0.0005
0	5.41 (1.75)	
≥ 1	7.92 (2.70)	
Insurance coverage		0.19
Yes	6.57 (2.58)	
No	6.00 (2.13)	
Area of household (m)^2		0.081
≥ 300	1.40 (0.50)	
100- 299	1.60 (0.49)	
< 100	1.70 (0.46)	
Having siblings with medically related jobs		0.002
Yes	7.23 (2.93)	
No	6.32 (2.39)	

Cost. Of the 2835 medication items found in the 435 selected houses, 65.3% were in use and 34.7% were not in use. About 5.8% of medications were expired. Table 6 shows the total cost of all medications, expired medications, and unused medications in the sample and the estimated cost in Jordan.

Table 6: The total cost of all medications, expired medications, and unused medications in the sample and the estimated cost in Jordan

	All medications	Expired medications	Unused medications
Cost (JD) per family	22.0	1.3	6.7
Total cost in the sample (JD)	9593	583	2910
Estimated total cost in Irbid Governorate in 100,000 JD (95% CI)	36.62 (33.32, 39.93)	2.22 (1. 63, 2.82)	11.11 (9.83, 12. 39)
Estimated total cost in Jordan in 100,000 JD (95% CI)	208.57 (189.73, 227.41)	12.67 (9.29, 16. 04)	63.26 (55.98, 70.55)

The total cost of all medications in the selected households was calculated as 9593 JD with an average of 22.1 JD per family. The total cost of unused medications in the selected households was 2910 JD and the total cost of expired medications was 583 JD. The total cost of unused medications in Jordan was estimated as 6,326,000 JD and the total cost of expired medications in Jordan was estimated as 1,267,000 JD.

When classified according to body systems, the estimated total cost of unused and expired medications was the highest for anti-infective agents (3,243,000 JD for unused and 614,000 JD for expired) followed by gastro-intestinal agents (860,000 JD for unused and 244,000 JD for expired) and musculoskeletal drugs (725,000 JD for unused and 123000 JD for expired). (Table 7)

Table 7: The estimated total cost of unused and expired medications when classified according to body systems

Drug Class according to Body system	Estimated cost of medications (in 100,000 JD) in Jordan		
	All	Expired	Unused
Gastro-intestinal agents	35.60	2.44	8.60
Cardio-vascular agents	37.51	0.32	4.15
Respiratory system agents	13.78	0.95	3.61
Central nervous system agents	23.55	0.26	3.43
Anti-infective agents	46.55	6.14	32.43
Endocrine system agents	24.79	0.59	0.68
Musculoskeletal agents	13.89	1.23	7.25
Eye/ Ear/ Nose and Skin agents	3.56	0.45	1.90
Nutrition agents	8.96	0.15	0.75

DISCUSSION

This study was the first that evaluated irrational household drug use in Jordan. Jordanian society is a young population, mostly people aged 20 years and younger, and has a relatively high degree of cultural homogeneity. Overall, 76.4 % of the population lives in urban areas according to the Department of Statistics (2004).[12] The mean number of medications included in

each prescription was 2.3, ranging from 1.9 to 3.0 , whereas the international standard is 1.5.[13]

A total of 2835 drug products in the 435 households studied were found, with a mean (±SD) of 6.5 (±2.5) drug products per family. These medications were largely kept in the refrigerator. A study in Saudi Arabia found a total of 12,463 drug products in 1554 families, with a mean (±SD) of 8 (±4.3) drug products per family.[1] In the United Kingdom, 99% of households had more than one medication, with a mean of 10.3 drugs; most were kept in the kitchen.[14]

In this study, the drugs in the households belonged mostly to four categories: CNS agents (25.2%), anti-infective agents (17.4%), musculoskeletal agents (13.4%) and respiratory system agents (12.3%). In contrast, it has been found that respiratory system agents, CNS agents and antibiotics, were the most common medicines in Saudi Arabian households (16.8%, 16.4%, and 14.3%, respectively).[1] Our results were similar to those obtained by the Iranian study which showed that the two most common medications in Iranian households were CNS and anti-infective agents.[15] Headache is a common discomfort making to the top ten list of complaints in ambulatory medical care, In general, self-medicating for headache is highly prevalent. It has been shown in Jordan that about 24.8 % of the population use analgesics on a monthly basis.[16] This could explain the reason why CNS drugs were the most common agents found in the studied households. The use of anti-infective agents is also common in Jordan, perhaps because of the unnecessary and irrational self-medication with antibiotics. Al-Azzam et al. (2007) showed that 39.5% of antibiotic users had used antibiotics without a prescription within a one-month study period.[17]

The total price of medications found in the 435 household was approximately 9593 JD. By extrapolating the data, it was estimated that the total price of medicines in Jordan as a whole was 20,857,000 JD. Medication wastage in this study was estimated to be 34.7% of medicines found in the families. In Saudi Arabia and Gulf countries, drug wastage was estimated at 25.8% and 41.3%, respectively.[1]

This study was the first that evaluated irrational household drug uses in Jordan. It highlights the impact of medication wastage on the national economy; a guidance for potential future assessments and interventions. One of the limitations for this study was that the sample was selected only from northern Jordan, other parts of Jordan may have different medication utilization and ultimately different medication wastage. Also, different strengths of the same medications were counted as different drug products, which can lead to overestimation. In addition to that, some of the families might not bring all their medications for inspection, which could lead to wrong estimates.

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CONFLICT OF INTEREST:

None to declare.

REFERENCES

(1) Abou-Auda HS. An economic assessment of the extent of medication use and wastage among families in Saudi Arabia and Arabian Gulf Countries. *Clin Ther*. 2003; 25: 1276-92.

(2) Rational use of medicines. Available at http://www.whoindia.org/LinkFiles/GPP_Rational_Use_of_Medicines.pdf. Accessed April 11, 2011.

(3) Kiyingi KS, Lauwo JA. Drugs in the home: danger and waste. *World Health Forum*. 1993;14(4):381-4.

(4) Al-Nasser AN. Prescribing patterns in primary healthcare in Saudi Arabia. *DICP*. 1991; 25:90-93.

(5) Al-Freihi H, Ballal SG, Jaccarini A. Potential for drug misuse in the eastern province of Saudi Arabia. *Ann Saudi Med*. 1987; 7:301-5.

(6) Boivin M. The cost of medication waste. *Can Pharm J*. 1997; 130:32-39.

(7) Cameron S. Study by Alberta pharmacists indicates drug wastage a “mammoth" problem. *CMAJ*. 1996;

155:1596-98.

(8) All-Party Pharmacy Group. Concordance and Wasted Medicines. London, United Kingdom: Royal Pharmaceutical Society of Great Britain; 2002.

(9) Morgan TM. The economic impact of wasted prescription medication in an outpatient population of older adults. *J Fam Pract*. 2001; 50:779-81.

(10) Holloway KA, Gautam BR, Reeves BC. The effects of different kinds of user fee on prescribing costs in rural Nepal. *Health Policy Plan*. 2001; 16:421-27.

(11) Shankar PR, Partha P, Shenoy N. Self-medication and non-doctor prescription practices in pokhara valley, western Nepal: a questionnaire-based study. *BMC Fam Pract*. 2002; 17: 3-17.

(12) The Hashemite Kingdom of Jordan: Department of Statistics (DOS). Available at URL. http://www.dos.gov.jo/dos-home. Accessed January 15, 2007.

(13) Too much consumption of medicines threatens Iranian lives. Available at http://www.bbc.co.uk/persian/iran/story/2005. Accessed March 22, 2005.

(14) Laurence DR, Bennett PN. Topics in drug therapy, Clinical Pharmacology. ELBS, Churchill Livingstone, Singapore, 1987.

(15) Zargarzadeh AH, Tavakoli N, Hassanzadeh A. A Survey on the Extent of Medication Storage and Wastage in Urban Iranian Households. *Clin Therap*. 2005; 27: 970-78.

(16) Alzoubi KH, Mhaidat N, Azzam SA, Khader Y, Salem S, Issaifan H, Haddadin R. Prevalence of migraine and tension-type headache among adults in Jordan. *J Headache Pain*. 2009; 10(4):265-70.

(17) Al-Azzam S, Al-Husein B, Alzoubi F, Masadeh M, Al-Horani M. Self medication with antibiotics in Jordanian population. *Int J Occup Med Environ Health*. 2007; 20(4):373 – 80.

تقييم مدى هدر الأدويةِ بين العوائل في الأردن

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ملخـص

يعرف هدر الدواءِ كأي منتَج دوائي ، صرف عن طريق وصفة طبية أو دونها، لم يستهلك بالكامل. هذه الدراسةِ هي الدراسةُ الأولى في الأردن التي تُقيم وتُقدرهدر الأدويةِ وكلفتِها، سوء إستعمال الأدويةِ وقلةِ الوعي نحو الخزن وإستعمالاتِ الأدويةِ. إستفتاء مصدق كان يستَعملُ لجمع البياناتِ مِن عينة تكونت مِن 435 عائلةِ إختيرت بشكل عشوائي مِن المناطق المختلفةِ في شمال الأردن. وجرى تقييم هدر الأدويةِ وكلفتِها، سوء إستعمال الأدويةِ والوعي نحو خزن الأدويةِ. من اجمالي الأدويةِ الـ 2835 التي وجدت في البيوتِ المختارةِ الـ 435، 65.3 % كانتْ قيد الإستعمال، 34.7 % لم تكن قيد الإستعمالَ و5.8 % كانت منتهية الصلاحية. التكلفة الكلية لكُلّ الأدوية في العوائل المختارةِ حسِبتْ ك 9593 دينار (1 JD = 0.71$) بنسبة مِن 22.1 دينار للعائلة الواحدة. وقدرت التكلفة الإجمالية للأدوية غيرالمستعملةِ في الأردن ب6,326,000 JD كما قدرت التكلفة الإجمالية للأدوية منتهية الصلاحية ب 1,267,000 JD. ان التقييم الشامل لسياساتِ الدواءِ الوطنيةِ الحاليةِ ضروري للحد من هذه المشكلةِ.

الكلمات الدالة: تكلفة، الاردن، هدر الدواء.

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