RESEARCH ARTICLE

OPEN ACCESS

Journal of Pharmacy Practice and Community Medicine.2018, 4(2):107-112• http://dx.doi.org/10.5530/jppcm.2018.2.24

e-ISSN: 2455-3255

Cost Analysis of Drug-related Problems in Saudi Arabia: Patients' and Healthcare Providers' Perspective

Yousef Ahmed Alomi[*1], Awatif Saad Al-Shaibani[2], Ghadeer Alfaisal[2], Njood Mohmmed Alasmi[2]

[1]The Past General Manager of General Administration of Pharmaceutical Care and Head, National Clinical pharmacy, pharmacy practice and Pharmacy R and D Administration, Ministry of Health, Riyadh, KSA.

[2]Clinical Pharmacy Staff, Ministry of Health, P.O.BOX 100, Riyadh 11392, Riyadh, KSA.

Received: 23 February 2018;

Accepted: 11 May 2018

***Correspondence to:**

Dr. Yousef Ahmed Alomi,

The Past General Manager of General Administration of Pharmaceutical Care Past Head, National Clinical pharmacy, and pharmacy practice Past Head, Pharmacy R & D Administration Ministry of Health, P.O.BOX 100, Riyadh 11392, Riyadh, SAUDI ARABIA.

Email: yalomi@gmail.com

Abstract

Purpose: To explore the cost analysis of drug-related problems in Saudi Arabia from patient and healthcare provider's perceptive. **Methods:** It is a 4-months cross-sectional survey of drug-related problem information in Saudi Arabia. The survey consisted of two-part demographic information, and second part consisted of thirteen questions focusing on general knowledge of drug-related problems, their occurrence, and costs. The questions divided into three domains. It included domain 1: Primary or essential information about knowledge and perception of drug-related problems, domain 2: The cost analysis of drug-related problems, domain 3: Clinical outcome of drug-related problems. The questions about the cost of drug-related problems, health insurance coverage and the economic outcome of those issues including pharmacy visit, ambulatory care clinic visit, an emergency visit, hospital admission, critical care admission, drug-induced death. The American Society of Health-System Pharmacist definitions of drug-related problems used. The survey distributed through social media by using what's App to almost two thousand public and healthcare professionals overall Kingdom of Saudi Arabia. It analyzed domain two the cost analysis of drug-related problems through survey monkey system. **Results:** The total responders were one hundred and one. Of those 155 (77.9%) were patients while 44 (22.1%) were healthcare professionals. The gender distribution was female 180 (89.6%), and the male was 21 (10.4%). It is statistically non-significant ($p< 0.5$) in the in the female and males between Patient and healthcare professionals. The most age was (18-44) represented the eighty-eight percent of responders. The highest estimated cost of patients suffered from drug-related problems was adverse drug reactions (3,525.42 USD) and drug non-compliance (2,594.26 USD) followed by indications without medication (2483.83 USD). The most frequencies of type drug-related problems per patients were drug noncompliance (4.15 fold) and medication without indications 3.75 fold) followed by drug interaction (3.7 fold) and indication without medications (3.52 fold). The highest estimated average cost of drug-related problems for patients was adverse drug reaction (1733.33 USD) and medication errors (762.67 USD) followed by drug noncompliance (624.44 USD) and drug interaction (593.33 USD). The total estimated average cost of related problems annually was (122 Billion USD) within range (60 Billion USD) and (184 Billion USD) in Saudi Arabia. It included the cost of non-compliance was (36 Billion USD), the cost of adverse drug reaction was (31 Billion USD), and the cost of indication without medications problem was (24 Billion USD). **Conclusion:** The drug-related problems were a very high-cost burden on health care system in Saudi Arabia. Targeting to improve role of pharmacist and prevent drug-related misadventures is highly recommended through Saudi Health Care Vision 2030.

Key words: Cost analysis, Drug-related problems, Patients, Healthcare providers, Perspective, Saudi Arabia.

INTRODUCTION

All patient may visit ambulatory care clinics or hospital admission due the disease need full non-drug and drug therapy with follow up the disease management and complications of illness or medications.[1] The complication of drug therapy or drug-related problems maybe progress or regress of the patient clinical outcome or healthcare cost. Several international studies conducted and explored the cost drug-related morbidly and mortality. The costs of illness are rising through several years and remain the high economic burden on the healthcare system. The cost of drug-related problems was $76 billion in 1995, $177 billion in 2001 and around $300 billion in 2013in the United States of America.[2-4] Most of the investigations calculated the cost with the cost of illness model, and there is no study involved patient or healthcare cost perspective. Also, it is hard to find local studies or Gulf or Middle East investigations about the cost of drug-related problems with healthcare professionals or patients perspectives.[5] The objective of the study to explore cost of drug-related problems with healthcare providers and patient perspective in Kingdom of Saudi Arabia

METHOD

It is a 4-months cross-sectional survey of drug-related problem information in Saudi Arabia. The survey consisted of two-part demographic information, and second part consisted of 13 questions focusing on general knowledge of drug-related problems, their occurrence, and costs. The questions divided into three domains. It included domain 1: Primary or essential information about

knowledge and perception of drug-related problems, domain 2: The cost analysis of drug-related problems, domain 3: Clinical outcome of drug-related problems. The questions about the cost of drug-related problems, health insurance coverage and the economic outcome of those issues including pharmacy visit, ambulatory care clinic visit, an emergency visit, hospital admission, critical care admission, drug-induced death. American Society of Health-System Pharmacist definitions of drug-related problems used.[1,6-8] The 5-point Likert response scale system used. The questions were open and closed-ended. The survey distributed through social media around Saudi Arabia. The survey distributed through social media by using what's App to almost two thousand public and healthcare professionals overall Kingdom of Saudi Arabia. A messages reminders sent to healthcare professional after two weeks, and additional messages reminders sent to healthcare professional after four weeks. The survey made an electronic format, and it analyzed domain two the cost analysis of drug-related problems through survey monkey system

RESULTS

The total responders were one hundred and one. Of those 155 (77.9%) were patients while 44 (22.1%) were healthcare professionals. Of those, the Saudi nationality was 188 (93.5%), and non-Saudi was 13 (6.5%). It is statistically significant in Saudi and non-Saudi between there patient and healthcare professionals. The patients were high in the Saudi nationality while with healthcare professionals higher in the non-Saudi nationality. The gender distribution was female 180 (89.6%), and the male was 21 (10.4%). It is statistically non-significant ($p< 0.5$) in the in the female and males between Patient and healthcare professionals. The most age was (18-44) represented the eighty-eight percent of responders. There is no statistically significant between all age categories between patient and healthcare professionals except in the age (18-29) years. The complete most healthcare professionals were pharmacist 34 (65.38%), and nurses were six (11.54%) followed by others 5 (9.62%), dentist 4 (7.69%) and 3 (5.77%) physicians. The most responders' qualifications had the Bachelor Degree 137(68.2%). Followed by High school 30 (14.9%) and Master degree 18 (9.0%). There is no statistically significant difference in the academic qualifications between patient and healthcare professionals ($p< 0.5$) as explored in Table 1. The highest estimated cost of patients suffered from drug-related problems was adverse drug reactions (3,525.42 USD) and drug non-compliance (2,594.26 USD) followed by indications without medication (2483.83 USD). While the highest estimated cost of healthcare professional suffered from drug-related problems was drug non-compliance (922.57USD) and indications without medication (781.06 USD) followed by adverse drug reactions (581.05 USD). The most frequencies of type drug-related problems per patients were drug noncompliance (4.15 fold) and medication without indications 3.75 fold) followed by drug interaction (3.7 fold) and indication without medications (3.52 fold). The most frequencies of type drug-related problems per healthcare provider were medication without indications (3.46 fold) and drug noncompliance (3.14 fold) followed by indication without medications (2.88 fold) and drug interaction (2.25 fold) as explored in Table 2. The highest estimated average cost of drug-related problems for patients was adverse drug reaction (1733.33 USD) and medication errors (762.67USD) followed by drug noncompliance (624.44 USD) and drug interaction (593.33 USD). The highest estimated average cost of drug-related problems for healthcare professionals was Adverse drug reaction (320 USD) and drug noncompliance (293.33 USD) followed by Indications without medication (271.11 USD) and drug poisoning (246.67USD). The total estimated cost of drug-related problems with patients was (888,433.24 USD) and (63,728.53 USD) with healthcare professionals as explored in Table 3. The total estimated average cost of related problems annually was (122 Billion USD) within range (60 Billion USD) and (184 Billion USD) in Saudi Arabia. It included the cost of non-compliance was (36 Billion USD), the cost of adverse drug reaction was (31 Billion USD), and the cost of indication without medications problem was (24 Billion USD). The cost medication without indication problem was (15 Billion USD), the cost medication errors were (6.3 Billion USD), the cost of drug interactions problem was (6.1 Billion USD), and the cost of drug poisoning was (1.29 Billion USD) as explored in Table 4.

DISCUSSION

The pharmacy administration at Ministry of Health established the Pharmacoeconomics program.[9] The program consisted of several elements including but not limited to the cost avoidance of clinical Pharmacy services, for instance, therapeutic drug monitoring, pharmacist running total parental nutrition, drug information services.[10-12] Also the pharmacist intervention and preventive medications errors.[13,14] In addition to drug-related problems cost calculation including medications errors, adverse drug reaction, and non-compliance which currently calculated in this study. The investigator tried to calculate the economic burden of drug-related problems with healthcare professionals and patient perceptive. The finding showed the highest estimated cost was the patients suffered from adverse drug reaction occurred with the patients and drug therapy to manage them with additional cost sequences. The cost of adverse drug reaction resembles and within range cost what reported by Marques, FB *et al*.[15] The second high cost of patient suffered from drug-related problems was the medications errors that are related poor knowledge of medications errors and absent of patients medication educations program at most hospitals. The cost of medication resembles what reported by Walsh, EK *et al*.[16] The third one was the patient need medications for such disease, but the patient not referred to hospitals for management that's lead to the disease switched from acute to chronic or complications maybe occurred. Some patient may take the medications with them self without any consultation and perhaps is appropriate for them lead to sequences and consumed of the cost. The fourth top cost of patient suffered from drug-related problems was the noncompliance because most of the patient non-adherence to the patient then the disease may develop to acute stage or disease complications appear with the patients. It may need another medication with the high-cost sequencing of drug-related problems. The patient or healthcare professional's perception of the medication error or drug is interaction and poisoning was the lowest economic burden. The cost of drug poisoning lower than what reported by Yasuyuki O *et al*., that is related to the higher healthcare cost than study site, the cost of drug poisoning not reported in the study site before.[17] The cost of drug interaction problem was resembled what reported by Moura, Cristiano M *et al*.[18] Most of the time those drug-related problems occurred and treated without patient knowledge, or the patients do not provide information because it mostly treated through hospitals and patients did not pay anything and did not calculate the cost of drug-related problems at Ministry of health hospitals. What the frequency occurred with the patient was non-compliance or over compliance with usage medications without indication that is not equal to the cost of adverse drug reaction because the knowledge of patient with adverse drug reaction is not adequate and subsequently they can avoid them. The cost of drug-related problems with patient and healthcare professionals was adverse drug reaction with big differences in the cost value. The second the higher cost of drug-related problems of perceptive was medications errors and non-compliance, and their complications of that is while the healthcare professionals had non-compliance problems and indication without medications which almost the same as non-compliance problems with one-third cost of patient perceptive. The lowest cost of healthcare because had better knowledge than patient and very easy to avoid them better than the patient. Thus, our subject of the patient had economic burden was higher than healthcare professionals. Another drug related problem medication without indication or indication without medication or non-compliance could compare with other studies because it was existed and may this the first time estimated the cost of those problems. Also, the results cost of drug-related occurred with healthcare providers difficult to compare with other studies due to not

Table 1: Demographic responder qualifications information.

	Patients n (%)	Healthcare Professionals n (%)	Total comparisons n (%)	Total Response Count	Total Response Percent	P value*
Sex						
Female	138 (89.03%)	40 (90.91%)	178 (89.45%)	180	89.6%	> 0.05
Male	17 (10.97%)	4 (9.09%)	21(10.55%)	21	10.4%	> 0.05
Answered question	155 (77.89%)	44 (22.11%)	199	201		
Skipped question			2	0		
Nationality						
Saudi	151(97.42%)	35 (79.55%)	186 (93.47%)	188	93.5%	< 0.05
Non-Saudi	4 (2.58%)	9 (20.45%)	13 (6.53%)	13	6.5%	< 0.05
Answered question	155 (77.89%)	44 (22.11%)	199	201		
Skipped question			2	0		
Age						
<18	1 (0.65%)	0 (0.00%)	1 (0.50%)	1	0.5%	> 0.05
18 - 29	80 (51.61%)	33 (75.00%)	113 (56.78%)	113	56.2%	< 0.05
30 - 44	53 (34.19%)	9 (20.45%)	62 (31.16%)	64	31.8%	> 0.05
45 - 59	21 (13.55%)	2 (4.55%)	23 (11.56%)	23	11.4%	> 0.05
60+	0 (00.00%)	0 (00.00%)	0 (00.00%)	0	0.0%	> 0.05
Answered question	155 (77.89%)	44 (22.11%)	199	201		
Skipped question			2	0		
Healthcare providers						
Yes	0 (00.00%)	44 (100.0%)	44 (22.11%)	44	22.1%	< 0.05
Non	155 (100.0%)	0 (00.00%)	155 (77.89%)	155	77.9%	< 0.05
Answered question	155 (77.89%)	44 (22.11%)	199	199		
Skipped question			2	2		
Type of healthcare professional				Response Count	Response Percent	
Physician				3	5.77%	
Dentist				4	7.69%	
Pharmacist				34	65.38%	
Nurse				6	11.54%	
Others				5	9.62%	
Answered question				52		
Skipped question				0		
Academic Qualifications				Response Count	Response Percent	
Doctorate degree	4 (2.58%)	3 (6.82%)	7 (3.52%)	7	3.5%	> 0.05
Master degree	15 (9.68%)	2 (4.55%)	17 (8.54%)	18	9.0%	> 0.05
Bachelor Degree	104 (67.10%)	32 (72.73%)	136 (68.34%)	137	68.2%	> 0.05
Diploma	3 (1.94%)	3 (6.82%)	6 (3.02%)	6	3.0%	> 0.05
High school	26 (16.77%)	4 (9.09%)	30 (15.08%)	30	14.9%	> 0.05
Intermediate School	1(0.65%)	0 (0.00%)	1(0.50%)	1	0.5%	> 0.05
Primary School	1(0.65%)	0 (0.00%)	1(0.50%)	1	0.5%	> 0.05
Not educated	1(0.65%)	0 (0.00%)	1(0.50%)	1	0.5%	> 0.05
Answered question	155 (77.89%)	44 (22.11%)	199	201		
Skipped question			2	0		

* There is a statistically differences (p>0.05)

Table 2: Cost of drug-related problem per patients.

Answer Options	Total of Professional responders	No of professional responders had at least once DRP	Percentages of Professional responders had DRP at least once	Professional (no of event /no of patient)	Cost per Professional (no of event /no of patient)* cost of event	Total of patients responders	No of patients responders had at least once DRP	Percentages of public responders had DRP at least once	Patients (no of event /no of patient)	Cost per patients (no of event /no of patient)* cost of event
Medicationadverse reaction	44	19	43.18%	1.81	581.05	154	59	38.31%	2.03	3525.42
Medicationerrors	44	6	13.64%	1.5	246.66	154	30	19.48%	1.76	1347.38
Drug poisoning	44	4	9.09%	1	246.67	155	9	5.81%	1.66	851.85
Drugnoncompliance	44	31	70.45%	3.14	922.57	153	110	71.90%	4.15	2594.26
Medication without indications	44	13	29.55%	3.46	207.69	154	59	38.31%	3.75	2072.34
Druginteractions	44	6	13.64%	2.25	420.01	153	22	14.38%	3.7	2198.02
Indications without medication	44	21	52.27%	2.88	781.06	154	71	49.35%	3.52	2483.83
Total		100		2.64	637.29		360		5.5	2467.87

Table 3: Estimated cost of drug-related problems for patients and healthcare professional.

No	Type of drug related problems	Average cost (professional perspectives) USD	Average cost (public perspectives) USD	Total cost (professional perspectives) USD	Percentage of total cost (professional perspectives)	Total cost (public perspectives) USD	Percentage total cost (public perspectives)
1	Medication adverse reaction	320	1733.33	11,040.00	17.32%	207,999.60	23.41%
2	Medication errors	164.44	762.67	1,479.96	2.32%	40,421.51	4.55%
3	Drug poisoning	246.67	511.11	986.68	1.55%	7,666.65	0.86%
4	Drug noncompliance	293.33	624.44	28,599.68	44.88%	285,369.08	32.12%
5	Medication without indications	60	552	2,700.00	4.24%	122,268.00	13.76%
6	Drug interactions	186.67	593.33	2,520.05	3.95%	48,356.40	5.44%
7	Indications without medication	271.11	704	16,402.16	25.74%	176,352.00	19.85%
	Total estimated cost	1,542.22	5,480.88	63,728.53		888,433.24	

Table 4: Estimated Total cost of drug-related problems for patients and healthcare professionals in Saudi Arabia.

No	Type of drug-related problems	Average cost (public perspectives) USD	Estimated Percentage of occurrences	Total no of population had drug-related problems	Total cost (USD) Minimum	Total cost (USD) Maximum	Total cost (USD) Average	Percentage cost
1	Medication adverse reaction	1733.33	38.31%	12,062,077.04	20,907,559,995.74	42,442,346,791.35	31,674,953,393.55	34.28%
2	Medication errors	762.67	19.48%	6,031,038.52	4,599,692,148.05	8,095,458,180.57	6,347,575,164.31	7.54%
3	Drug poisoning	511.11	5.81%	1,904,538.48	973,428,662.51	1,615,891,579.77	1,294,660,121.14	1.60%
4	Drug noncompliance	624.44	71.90%	22,854,461.76	14,271,240,101.41	59,225,646,420.85	36,748,443,261.13	23.40%
5	Medication without indications	552	38.31%	12,062,077.04	6,658,266,526.08	24,968,499,472.80	15,813,382,999.44	10.92%
6	Drug interactions	593.33	14.38%	4,443,923.12	2,636,712,904.79	9,755,837,747.72	6,196,275,326.26	4.32%
7	Indications without medication	704	49.35%	15,553,730.92	10,949,826,567.68	38,543,389,518.23	24,746,608,042.96	17.95%
	Estimated total estimated cost				60,996,726,906.27	184,647,069,711.30	122,821,898,308.78	
	Total KSA population	31,742,308.00						

exist yet. The estimated total minimum cost of drug-related problems was very high and almost the same cost what's reported by Bootman, J *et al*. while maximum cost resemble what's reported by Ernst, FR *et al*. with little differences due to human estimated errors from patients and healthcare perspectives.[19-21] The total estimated cost of drug-related problems the non-compliance represented the highest one due to the high percentage occurrences although the cost per vent, not the highest one. The second top total estimated cost was medication errors and this expected due high cost per event and occurrences, while indication without medication the third one due to high occurrences may be due noncompliance factors or the medication received by the patients. The estimated the cost of drug-related problems from patients perspective almost the same what reported without involved the patient perspectives. The working to established drug-related problems detections and prevention with involve the pharmacist is highly recommended in Kingdom of Saudi Arabia.

CONCLUSION

The economic burden of drug-related problems in health care services was high. Targeting of detecting, monitoring and preventing of drug-related problems though pharmacist is highly recommended at Ministry of health hospitals in Kingdom of Saudi Arabia.

ACKNOWLEDGMENT

None.

CONFLICT OF INTEREST

None.

ABBREVIATIONS

KSA: Kingdom of Saudi Arabia; ASHP: American Society of Health-System Pharmacist; MOH: Ministry of Health; USA: United States of America.

REFERENCES

1. American Society of Health-System Pharmacists. ASHP guidelines on a standardized method for pharmaceutical care. American Society of Health-System Pharmacists. Am J Heal Pharm. 1996;53(14):1713-6.
2. Johnson JA, Bootman JL. Drug-related morbidity and mortality. A cost-of-illness model. Arch Intern Med. 1995;155(18):1949-56.
3. Bootman JL, Harrison DL, Cox E. The health care cost of drug-related morbidity and mortality in nursing facilities. Arch Intern Med. 1997;157(18):2089-96.
4. Ernst FR, Grizzle AJ. Drug-related morbidity and mortality: Updating the cost-of-illness model. J Am Pharm Assoc (Washington, DC 1996). 2001;41(2):192-9.
5. Alghamdy MS, Randhawa MA, Al-Wahhas MH, Al-Jumaan MA. Admissions for drug-related problems at the Emergency Department of a University Hospital in the Kingdom of Saudi Arabia. J Family Community Med. 2015;22(1):44-8.
6. ASHP. ASHP Statement on Pharmaceutical Care. Am J Hosp Pharm. 1993;50:1720-3.
7. Strand LM, Morley PC, Cipolle RJ, Ramsey R, Lamsam GD. Drug-related problems: Their structure and function. Ann Pharmacother. 1990;24(11):1093-7.
8. Pk A, Adepu R. Drug-related problems: an overview of various classification systems. Asian J Pharm Clin Res. 2014;7(4):7-10.
9. Alomi Y. National Pharmacy Administration Programs. BAOJ Pharm Sci. 2015;1(2):1-2.
10. Alomi YA, Almudaiheem HY. Clinical And Economic Outcomes Of Pharmacist Intervention During Therapeutic Drug Monitoring Program In Saudi Arabia. Value Heal. 2016;19(7):A465-6.
11. Alomi YA, Fallatah AO. Cost Avoidance Of Pharmacist Running Pediatrics Total Parenteral Nutrition Services At Ministry Of Health In Saudi Arabia. Value Heal. 2016;19(7):A461.
12. Alomi YA, Almudaiheem HY, Alarnous T, Alshurei S, Alsharafa A, Alzahrani T, *et al*. Cost-efficiency of national drug information center through the ministry of health hotline calling services (937) in Saudi Arabia: Application of Amercian model. Value Heal. 2015;18(7):A735.

13. Alomi YA, Alanazi AA, Alsallouk SA, Almadni O, Almaznai MM, Mossa K, *et al*. Pharmacist intervention of prevention medication errors at pediatrics, obstetrics, and gynecology hospital, East Province, Saudi Arabia. In: Value in Health. 2017;20(5):A39.
14. Alomi YA, Alanazi AA, Alsallouk SA, Almaznai MM, Abu-Alnaja NI, Alduhilan M, *et al*. Cost-Efficiency Of Medication Safety Program At Pediatrics, Obstetrics, And Gynecology Hospital, East Province, Saudi Arabia. Value Heal. 2016;19(7):A464.
15. Batel Marques F, Penedones A, Mendes D, Alves C. A systematic review of observational studies evaluating costs of adverse drug reactions. Clinicoecon Outcomes. 2016;8:413-26.
16. Walsh EK, Hansen CR, Sahm LJ, Kearney PM, Doherty E, Bradley CP. Economic impact of medication error: A systematic review. Pharmacoepidemiol Drug Saf. 2017;26(5):481-97.
17. Okumura Y, Shimizu S, Ishikawa KB, Matsuda S, Fushimi K, Ito H. Characteristics, procedural differences, and costs of inpatients with drug poisoning in acute care hospitals in Japan. Gen Hosp Psychiatry. 2012;34(6):681-5.
18. Moura C, Acurcio F, Belo N. Drug-drug interactions associated with length of stay and cost of hospitalization. J Pharm Pharm Sci. 2009;12(3):266-72.
19. Bootman J, Johnson JA. Drug-related morbidity and mortality: A cost-of-illness model. Arch Intern Med. 1995;155(18):1949-56.
20. Johnson JA, Bootman JL. Drug-related morbidity and mortality and the economic impact of pharmaceutical care. Am J Heal Pharm. 1997;54(5):554-8.
21. Ernst FR, Grizzle AJ. Drug-Related Morbidity and Mortality: Updating the Cost-of-Illness Model. 2001;41(2):192-9. Elsevier; Available from http://www.sciencedirect.com/science/article/pii/S1086580216312293

Cite this article as: Alomi YA, Al-Shaibani AS, Alfaisal G, Alasmi NM. Cost Analysis of Drug-related Problems in Saudi Arabia: Patients' and Healthcare Providers' Perspective. J Pharm Pract Community Med. 2018;4(2):107-12.