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Original Research Article

Cost analysis study of price variation among the various brands of proton pump inhibitors available in Benghazi-Libya

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ABSTRACT

Background: A large proportion of patients in developing countries have to pay out of pocket for their medications. The prices of different brands of the same medications vary considerably and may vary from one community pharmacy to another. This study was undertaken to evaluate the variation in costs of proton pump inhibitors (PPI) and histamine H2-receptor antagonists available in Libya.
Methods: Prices of various brands of PPI and various formulations were collected from four community pharmacies in the city of Benghazi. Both cost ratio and percentage variation were calculated and compared for various brands of the same strength and number of tablets, capsules, injections, or syrups.
Results: The highest cost ratio and percentage price variation were found with omeprazole 20 mg, followed by omeprazole 40 mg. Other significant cost variations (>100%) were seen with pantoprazole 40 mg, Downoprazol (omeprazole + sodium bicarbonate) 40 mg, and esomeprazole 40 mg. Ampoules of omeprazole, cimetidine, and ranitidine had cost ratios of 1:1.7, 1:1.7, and 1:1.8, and cost variation ratios of 71.4, 66.7, and 75, respectively. Variations in prices of PPI and histamine H2 antagonists from the same manufacturer between different community pharmacies were common. The highest percentage cost variation (100) was seen with omeprazole 20 mg.
Conclusions: Due to political instability, the prices of all drugs are controlled by importing private companies and the owners of community pharmacies instead of governmental authorities, that leads to cost variations. Therefore, the health authorities exert strict control on pricing of medications.

Keywords: Cost analysis, Proton pump inhibitors, H2-receptor antagonists, Cost ratio, Percentage cost variation, Pharmacoeconomics

INTRODUCTION

Despite some ambitious attempts to start a local pharmaceutical industry in Libya, there is no such strategic industry in the country. All drug categories are imported from various countries around the globe. Before the year 2011, when the Arab Spring overthrew the political regime, the import of drugs for community pharmacies was the responsibility of the National Pharmaceutical Company, a governmental company run under the umbrella of the Ministry of Health. Drugs were distributed to community pharmacies to be dispensed with a profit of 20% of the price from the company. After the Arab Spring in 2011, private companies were allowed to import drugs with no actual control over the registration of drugs or their prices. The prices of drugs markedly varied between various community pharmacies, and most over the counter (OTC) as well as prescription drugs became unaffordable for a great majority of the public, particularly those with low incomes and no medical insurance. The World Health Organization (WHO) report in 2020 showed that global spending on health continually rose between 2000 and 2018 and reached US$ 8.3 trillion, or 10% of global GDP. The data also show that out-of-pocket spending has

remained high in low and lower-middle-income countries, representing greater than 40% of total health spending in 2018.[1] The massive increase in the cost of drugs added to the multiple prescribing and the insistence of physicians on the prescription of brand drugs are among the factors that lead to non-compliance by patients', failure of therapeutic plans, and worsening of conditions, whether acute or chronic.[2-4]

It has long been shown that the high cost of drugs leads to non-adherence.[4,5] A study in the US demonstrated that cost-related non-adherence is a persistent problem hindering the ability of many Medicare beneficiaries to access pharmacologic treatments.[6] In addition to the health risks, cost-related non-adherence problems increase the burden on health authorities.

Libyan markets are flooded with a large number of branded formulations available for every drug molecule, together with differences in prices between the different brands of the same formulation. This creates an economic burden on the non-insured patient, who has to pay for his or her medication from his or her rather low salary or pension. A plethora of studies have explored the variations in the prices of drugs among various community pharmacies.[7-12] An Irish study also found wide variation in the prices of prescription drugs in community pharmacies.[9]

Proton pump inhibitors (PPI), H2-receptor antagonists (H2A), antacids, mucosal protective barriers, and prostaglandin analogs are all used for treating peptic ulcer disorders. However, PPI and H2 receptor antagonists (H2A) are the most commonly prescribed medications for treating peptic ulcer diseases. Acid peptic disorders, regardless of the causative agent, are mainly due to either excessive acid secretion or defective gastric mucosa. Disorders, whether gastric or duodenal, are common chronic conditions that are a significant burden on the health budget. In developed countries, the cost estimates of therapeutic approaches to peptic ulcers were very alarming.[13,14]

Besides treating peptic ulcer disorder, these drugs are also used in the treatment of non-ulcer dyspepsia and heartburn. Some of these drugs, e.g., misoprostol or proton pump inhibitors, are used as prophylactic agents with nonsteroidal anti-inflammatory drugs (NSAIDs), steroids, anti-platelets, and anticoagulation therapy.[15] It is worth noting that since *H. pylori* infection is a cause of almost 90% of peptic ulcer cases and complete eradication is achieved by the use of triple therapy, including a proton pump inhibitor, the incidence of disease has significantly decreased. For example, in Japan, from 2000 to 2020, the number of patients with peptic ulcers decreased by one-fifth.[16] However, studies of price variation primarily use the difference between maximum and minimum prices as a measure of variation, which is prone to error.[9,17,18,19] The present study is the first of its kind and aims to explore the variation in prices of some peptic ulcer medications in community pharmacies in Benghazi, Libya.

METHODS

The cost of the PPI and histamine H2-receptor antagonists was determined in four community pharmacies. As tablets, the prices were determined per 10 tablets/capsules and in the strength of 10 mg/tablet in the local currency (Libyan Dinar-LD) where $ 1 is equal to 5.5 LD (at present 16 April 2024 $ 1=7.40 LD). We also checked the prices of ampoules for injection containing PPI. This was done to compare the prices of the same medication between various brands, and also to assess the variation in prices between four community pharmacies. This study was carried out from 15 September to 30 December 2023.

Ethical approval

Ethical approval was obtained from the Ethical Research Committee of the Libyan International Medical University (certificate reference no: PHR-2023-00079).

Data analyses

The difference between the maximum and minimum cost of a particular generic PPI and histamine H2-receptor antagonists in the same strength, number of tablets/capsules, and dosage forms being manufactured by different companies was compared, and percentage cost variation in Libyan Dinars of these drugs was calculated by using the following formula:

$$\%\ \text{Cost variation} = (\text{maximum cost} - \text{minimum cost}/\text{minimum cost}) \times 100$$

$$\text{Cost ratio} = \text{Price of the most expensive brand}/\text{Price of the least expensive brand}$$

RESULTS

Table 1 shows that the highest cost ratio and percentage price variation was found with omeprazole 20 mg (1:14.8 and 1380) followed by omeprazole 40 mg (1:14, 1380). Other significant cost variations (>100%) were seen with pantoprazole 40 mg (128.6, 1:1:8), Downoprazol (omeprazole + sodium bicarbonate) 40 mg (150), and esomeprazole 40 (550).

Table 2 shows that ampoules of omeprazole, cimetidine, and ranitidine had cost ratios of 1:1.7, 1:1.7, and 1:1.8, and cost variation ratios of 71.4, 66.7, and 75 respectively.

Variations in prices of the same drug from the same manufacturer between different community pharmacies are common in Libya. Table 3 shows variations in prices of proton pump inhibitors and histamine H2 antagonists from the same manufacturer between different community pharmacies. The highest percentage cost variation (100) was seen with omeprazole 20 mg.

Table 1: Price variation of different proton pump inhibitors calculated as 10 tablets.

Drug names	Dose (mg)	Minimum price (LD)	Maximum price (LD)	Cost ratio	Percentage cost variation (%)	Number of manufacturers
Omeprazole	20	2.5	37	14.8	1380	3
Omeprazole	40	3	42	14	1300	3
Pantoprazole	40	14	32	2.3	128.6	2
Esomeprazole	40	8	52	6.5	550	3
Downoprazol	40	4	10	2.5	150	2

Table 2: Price variation of one ampoule of anti-ulcer drugs for intravenous injection.

Drug names	Dose (mg)	Minimum price (LD)	Maximum price (LD)	Cost ratio	Percentage cost variation (%)	Number of manufacturers
Omeprazole	40	7	12	1.7	71.4	2
Cimetidine	200	3	5	1.7	66.7	2
Ranitidine	50	4	7	1.8	75	2

Table 3: Price variation of the same drug from the same manufacturer between different community pharmacies calculated as 10 tablets.

Drug names	Dose (mg)	Minimum price (LD)	Maximum price (LD)	Cost ratio	Percentage cost variation (%)	Number of manufacturers
Omeprazole	20	2.5	5	2	100	1
	20	13	15	1.2	15.4	1
	20	32	37	1.2	15.6	1
	40	3	4.5	1.5	50	1
	40	14	17	1.2	21.4	1
	40	36	42	1.2	16.7	1
Pantoprazole	40	14	18.3	1.3	32.1	1
	40	25	32	1.3	28	1
Esomeprazole	40	11	14	1.3	27.3	1
	40	44.5	52	1.2	16.9	1
	40	6.5	8	1.2	23.1	1
Lansoprazole	15	7	8	1.1	14.3	1
	30	18	23	1.3	27.8	1
Downoprazol	40	4	5	1.3	25	1
	40	7	10	1.4	42.9	1

DISCUSSION

In the year 2023, the PPIs worldwide market reached $3.27 billion with an expected growth rate of 4.3% and is expected to reach $16.8 billion by 2032.[20] They are the most potent inhibitors of gastric acid secretion. Another therapeutic class of acid anti-secretory drugs is histamine H2-receptor antagonists. The global market is estimated to be valued at $4.21 billion in 2024 and growing at a rate of 6.1%; it is expected to reach $6.36 billion by 2031 (H2 receptor antagonist market size and share analysis, 2024). The market for both PPIs and H2 antagonists is primarily driven by the increasing prevalence of acid reflux diseases and peptic ulcers.

In Libya, the drug market is not controlled by the Ministry of Health as it used to be before the Arab Spring in 2011. At present, the market is controlled mainly by private drug-importing companies and the owners of private community pharmacies. The situation is further worsened by a shortage of essential drugs in public hospitals and polyclinics. In the present study, we aimed at exploring the cost variation of PPIs and H2-receptor antagonists. The current study is, to our knowledge, the first pharmacoeconomic investigation to explore such a problem. We have collected cost information only from four community pharmacies. The study compared the prices of tablets and also ampoules for injection of the available PPIs and H2-receptor antagonists. The brands subjected to the study are the only ones available in the area of the study, namely Benghazi, the second-largest city in Libya.

The highest cost ratios (14.8 and 14) were for omeprazole 20 and 40 mg, respectively, with the highest percentage cost variation of 1380 and 1300. For esomeprazole 40, the cost ratio was 52 and the percentage cost variation was

500. These results are far better than those reported for India.[22]

Various forms of stress can lead to many disorders, including peptic ulcer, the prevalence of which has tremendously increased lately in the community due to many factors. These include, among others, the political instability, the shortage of cash currency, the high inflation, and the massive increase in the prices of food and medicines. In the case of healthcare, the problem is worsened by physicians prescribing brands despite the recommendation of the World Health Organization (WHO) to prescribe generics of equal efficacy and reduced cost. This adds to the economic burden on poor patients and those without medical insurance. Therapeutic switching to an equivalent, cheaper, or generic PPI would reduce the financial burden on patients without affecting the quality of patient care.[23]

The cost ratios for ampoules were within a reasonable (<2) level, and the percentage cost variation was almost 70.

Based on the results of the present study, it becomes urgent for the Ministry of Health to issue policies regulating drug pricing and exert strict control over drug prices in community pharmacies. Efforts must be made to control the import of drugs by the private sector, increase the pricing of imported drugs, and increase the awareness of prescribers to the benefit of prescribing cheaper generics. These steps will not only reduce the economic burden on patients, but they will also increase adherence to drug treatment and improve therapeutic outcomes.

Limitations

The main limitation of the present study is the limited geographic area of the study to only Benghazi; therefore, the results cannot be generalized. The second limitation is that the data was collected by pharmacy students and not by disguised customers, a fact that may have influenced the actual prices and consequently the results of the study.

CONCLUSION

At present and in this era of political instability, the Ministry of Health neither regulates nor controls the prices of essential drugs through the Drug Price Control Unit, and the prices of all drugs are controlled by private companies and the owners of community pharmacies. This leads to an unbearable economic burden on the majority of patients who cannot afford such high prices for medications and do not have medical insurance. The Ministry of Health and the Syndicate of Pharmacists should take urgent firm decisions, implement them, and exert strict control concerning the pricing of medications for patients to get them at reasonable prices, particularly medications for chronic diseases that need multiple medications. Physicians must also be aware of the availability of low-cost brands or generics and the economic status of the majority of patients to reduce the economic burden on patients and increase drug adherence to improve therapeutic outcomes.

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