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Original Article

Evaluation of Affordability and Impoverishment Effect of Cardiovascular Medicines in Iran

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Abstract

Cardiovascular disease is one of the most important causes of death in the world. There are variety of plans and strategies to treatment and prevention of CVD. Medicines have significant role in reaching the goals. Ensuring affordability of medicines is very crucial to success in these programs. The impoverishment method which focuses on the impoverishing effect of the purchasing of medicines is one of the most popular methods to quantifying affordability of medicines. We applied this method to measure affordability of cardiovascular medicines in Iran. We used two poverty lines 1.25 USD and 2 USD per day which are recommended by World Bank to access the affordability of medicines. Mono therapy with one anti platelet, Beta blocker, ACE inhibitor and Statin as well as combination therapy have been determined. Our study highlighted that the poorest households in Iran would be at risk of pushing under poverty line because of price of the medicines.

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1. Introduction

According to the World Health Organization (WHO) report, non-communicable diseases (NCDs) caused 68% (38 million) of global deaths (out of 56 million) in 2012 and more than 70% (28 million) of NCD happened in low and middle-income countries. Sixty million deaths due to NCDs annually occur before the age of 70, with 82% prevalence in low and middle-income countries [1]. Furthermore, age-standardized death rates of most NCDs are higher in low and middle income countries [2].

Since recognition of NCDs as a major threat to societies, in May 2013 global action plan 2013−2020 for the prevention and control of these diseases was adopted by the Sixty-sixth World Health Assembly [3].

However, obstacles to access essential medicines for the treatment of NCDs such as cardiovascular disease (CVD) and diabetes exist at many areas of the healthcare systems. Access to medicines, as a key component of health, has been considered a fundamental human right by the WHO and many international organizations. Access to medicines is critical to achieve optimal outcomes in a broad range of chronic health conditions.

According to the WHO, fair access to safe and affordable medicines is vital to obtain the highest standards of health [4]. The most significant determinants of access to medicines are price and affordability. The affordability of medicines is an important indicator of the sustainable development goal [5]. The affordability seems to be health care concern in high and low and middle-income countries, and healthcare politicians face with the challenges to ensure and enhance sufficient access to health care services [6].

Price of medicines is a principal indicator of access to medicines.[7] Especially in countries with poor public health sector and patients have to purchase their medicines from the private market [5].

The affordability has been determined by WHO methodology as the number of days' wages of the lowest-paid, unskilled government worker required to purchase the treatment course [8]. The second measure of affordability is the total health care expenses that could be considered catastrophic if they overpass ten percent of the total household's resources [9]. Another estimation of affordability examine the proportion of the population that would be pushed below the international poverty lines of 1.25 or 2 USD per day due to medicines or medical care payments [10].

Clinical guidelines recommend four medicines for the secondary prevention of CVD including aspirin, Beta blockers, Angiotensin-converting enzyme inhibitors or Angiotensin-II receptor blockers, and Statins [11].

Our previous effort demonstrated the affordability of CVD medicines using the WHO methodology. [12] However, several studies have shown that many treatment options for CVD were not affordable, especially when treatment with multiple medicines was necessary [13].

In this study, instead of estimating only how the medicines are affordable for the lowest paid public sector worker, we measured the impoverishing effect of a medicine by using the most recent widely recognized poverty indicators as used by the World Bank [5].

The present study aimed to evaluate the affordability of medicines used for secondary prevention of CVD in Iran using the aforementioned method.

2. Materials and Methods

2.1. Study Design

This study was conducted in a number of public and private pharmacies in Tehran province. We used impoverishment method to measure the affordability of medicines recommended for the secondary prevention of

CVD through calculation of the impoverishment rate.[14] The impoverishing effect of a medicine was defined in the terms of the percentage of the population that would be pushed below an income level of 1.25 or 2 USD (the most recent widely known poverty indicators as used by the World Bank) per day due to purchasing the medicine [15].

Thus, the approach principally compares the households' daily per capita income before and after the procurement of CVD medicines. If the prepayment income is above the 1.25 or 2, USD poverty line and the post payment income falls below these lines, purchasing the medicine impoverishes people. The unaffordability of the medicines then has been referred to the percentage of the population with CVD that already is or would fall below the poverty line when having to buy the medicines [16].

2.2. *Medicines Selection*

The volume of prescription and consumption of four recommended medicines including Metoprolol 50mg, Captopril 25mg, Atorvastatin 20 mg and ASA 80 mg has been reviewed in Iranian Food and Drug Administration (IR-FDA) data bank. The standard defined daily dose (DDD) for ASA 80mg and Atorvastatin 20 was one tablet, for Captopril 25 two tablets daily, and for Metoprolol 50mg in three tablets per day.

2.3. Data Collection

With regards to the medicine price, we used a validated questionnaire by an expert panel discussion. Seventy percent of these medicines costs have been covered by the main insurance organizations in Iran and the patients have to pay the remaining 30 percent out-of- pocket. The daily treatment price (the lowest price generic) of medicines was obtained from the WHO/HAI data-base and was converted to USD [17].

Senior students of pharmacy who were fully acquainted with medicines and prescription were responsible for data collection. A training meeting was held for the students before the data collection and an official letter was issued by the general director of Pharmaceutical and Narcotic Affair of Iran FDA to ensure good cooperation between the pharmacy staff and the team of researchers. Data collectors had to fill the required field through a face to face interview.

2.4. Data Analysis

To compute the daily average income per capita, the household final consumption expenditure (HHFCE) was obtained from World Bank data base and total population from Statistical Center of Iran data bank. [18]

The total population, HHFCE, and income distribution were used to estimate the daily average income per capita per income in seven groups. The average daily income per capita for all income groups was calculated in the same way. For instance, it was calculated in the lowest 10% income group through the following equation:

The average daily income per capita: (HHFCE*percentage of total income)/(total population*10%)

3. Results and Discussion

120 private and public pharmacies were selected for data collection using the WHO/HAI methodology. In 2015, the total HHFCE for Iran was estimated by World Bankabout197891308683.29 USD, and the total population of Iran was nearly 78947000.Table 1 shows the daily average income per capita in Iran in 2015.The Development Indicators were provided by the World Bank as the percentage of total income earned in seven income groups. This ranking consists of five quartiles in which the poorest and richest quartiles are divided into deciles. The distribution of households in Iran has been presented in these seven categories. The average daily income per capita in the lowest 10% income group was 1.75 USD which is the most endangered group. The second poorest group earns about 2.97 USD per day and would be at risk of pushing under the poverty line due to medicines purchasing.

For each medicine, the LPG which was available in public and private pharmacies was chosen for the affordability measurement. The price of medicines was converted to US Dollar based on Iran central bank rate. Table 2 describes the DDD, prices in local currency per tablet, prices in USD per tablet, price per day, and price per month in USD.ASA 80mg had the lowest price with the DDD of one tablet per day and had the lowest price per day among the survey medicines. Captopril 25mg and Metoprolol50 mg had the same price but different DDD, so the patients have to pay more for Metoprolol for daily treatment.

Since the data on average income in different quartiles and deciles were available, we assumed linearity of the income distribution within the groups in which the 1.25 and 2 USD poverty lines were located in calculating poverty and impoverishment. The CVD medicine was supposed affordable for the proportion of the population that would remain above the poverty line after buying it. As the combination therapy with at least four

Table1. The daily average income per capita.

HHFCE	197,891,308,683.29	
Total Population	78,947,000	
Population Ranking	Percentage of total income	Average daily income per capita in USD
Poorest 10%	2.54	1.75
2nd poorest 10%	4.32	2.97
2nd quartile	11.81	8.11
3rd quartile	16.11	11.06
4th quartile	22.38	15.37
2nd richest 10%	15.62	10.73
Richest 10%	27.22	18.70

Table 2. The medicines price description.

Medicines	DDD	Local price per tablet	Price in USD per tablet	Price per day in USD
ASA 80mg	80 mg	300	0.010	0.010
Atorvastatin 20mg	20 mg	1350	0.046	0.046
Captopril 25 mg	50 mg	340	0.012	0.023
Metoprolol 50mg	0.15 g	340	0.012	0.035
Combination therapy		2330	0.079	0.114

groups of medicines is recommended by therapeutic guidelines, we also measured the affordability of multi-treatment regimen.

Table 3 represents the percentages of the population that are pushed below the poverty line due to the purchasing of each of the four study medicines and combination therapy. This table describes impoverishing effect of generic medicines (LPG) because the originator brands were not available in the market.

The data presented in table 3 illustrate the proportion of the population who are already below the 1.25 and 2 USD poverty lines before buying these medicines. By adding the proportion of the population already living below the poverty lines to the group that would fall below these poverty lines after procuring the medicines, we could achieve the proportion of the population for which the four medicines were unaffordable.

The poorest households in Iran earn at least 1.79 USD per day and the medicine costs would not affect them with poverty lines 1.25 USD per day and this group is at risk of being pushed below the poverty line 2 USD. Although, 7.05 per cent of households are under the poverty lines without purchasing medicines, these costs push some other below the poverty line.

Among the medicines, ASA 80mg had the lowest effect due to its lower price with DDD of one tablet per day. Captopril 25 mg and Metoprolol 50mgwerethe second cheapest medicines in the list, but the DDD 50 and 150 mg per day could have more effects on household expenses. Atorvastatin 20mg was the most expensive medicines of the list. Obviously, the combination therapy with four medicines has the biggest influence on the household impoverishment.

This evaluation reveals that CVD medicines seem to be still unaffordable for some households in Iran. Access to medicines is affected by multiple elements including affordability, rational prescription, continuous financing, and authentic supply systems. The price is one of major obstacles to access the medicines especially in developing countries and chronic diseases.[2, 19, 20] The pricecould have a detrimental effect on patients' health and the healthcare system in

Table 3. The affordability of medicine before and after purchasing the medicines.

	Percent of population before medicine purchase		Added Percent of population after medicine purchase	
	1.25 USD	2 USD	1.25 USD	2 USD
ASA 80mg	0	7.05	0	0.08
Atorvastatin 20mg			0	0.4
Captopril 25mg			0	0.19
Metoprolol 50mg			0	0.33
Combination therapy			0	0.93

the terms of reducing patient compliance with the treatment. The medicines should be affordable in order to counteract any restricting barrier that might prevent medicine access [21]. Due to burden of CVD in all around the world [22], mainly in low and middle income countries[23] the access and affordability of medicines serve essential role to achieve optimum therapeutic goals.

Three criteria have been utilized to approximate the affordability of medicines including WHO/HAI methodology, the catastrophic approach, and the impoverishment approach [24, 25]. In this study we applied the impoverishment approach to assess the affordability of CVD medicines for secondary prevention in Iran. The findings revealed that CVD medicine therapy is affordable for Iranian patients with poverty line of 1.25 USD, but those are still unaffordable for more than 7% of population.

Another study conducted in sixty low and middle income developing countries using catastrophic and impoverishment expenditure methods, showed that medicines prices could push a large number of people under poverty line and it is vital to improve the affordability of CVD medicines. Furthermore, originator brands were less affordable in those countries compared to the lowest price generics [16].

Since the CVD like other chronic disease require combination therapy, it is possible that treatment of CVD is more unaffordable than what is currently claimed. To address this problem we applied a representative medicine from four therapeutic groups. In a study with the same methodology in India, five medicines were selected to estimate the affordability of CVD treatment. The data from this study demonstrated that CVD medicine costs are likely to pose financial burden to a considerable number of people in India. So it seems essential to develop programs to decrease the costs of CVD medicines [26].

Also, out-of-pocket payments for procuring the CVD medicines could cause significant costs for households. In a study in china, up to 71% of patients with the history of an acute stroke confronted catastrophic health expenses, while 37% of them fell under the poverty line of 1 USD per day after their health care payments. Furthermore, it was also

proposed that catastrophic payments and impoverishment due to CVD are more frequent in people with no health insurance [10].

The present study indicated that medicines for CVD treatment might be still unaffordable for some households in Iran. Nevertheless, our previous effort for assessment of availability and affordability of CVD medicines showed the affordability of all medicines consumed for mono-therapy of CVD using WHO/HAI methodology.

To improve affordability several strategies have been proposed. It is necessary to represent explicit price information to healthcare professionals and patients to find the most affordable medicines[27]. Moreover, multiple policy options have been suggested including promoting generic medicine prescription, creating alternative financing systems, declining prices [15], providing public health insurance, and reduction of taxes and retail margins [28]. Some studies have suggested poly pill-fix dose strategy for prevention of cardiovascular disease (CVD). This strategy is supposed to improve adherence to treatment and improve treatment affordability by reducing the cost of treatment [29]. In our case, medicines like ASA and Atorvastatin would be a candidate for poly pill- fixdose for cardiovascular diseaese treatment stretegy.

4. Conclusion

The affordability of medicine has crucial role to access to medicine for chronic diseases like CVD. The findings of this study indicated that CVD medicines were not affordable for the poorest population in the society and a very careful attention should be paid to them by government. Some strategies like improve health insurance system for poorest population, promoting public health facilities, and poly pill- fixdose are recommended to protect households impoverishing effect of treatment.

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