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Indirect Cost Of Diabetes In The Arab Region

Review Article

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Abstract

Diabetes is one of the chronic diseases with a high prevalence and consequently a substantial socio-economic burden in Arab countries. In this paper, we propose for the first time an estimation of the indirect economic cost of diabetes incurred by the loss of productivity caused by disability and premature mortality due to diabetes in the Arab region. The 21 countries were divided into three income groups and the indirect cost of diabetes was estimated in each group. The total indirect cost was estimated to be around USD 72 billion whereas the average per capita indirect cost was estimated to be USD 2770, varying from USD 423 in group 3 to USD 7959 in Group1. The huge indirect economic cost and the associated social burden stress the importance that health decision makers should give to sensitisation, early diagnosis and treatment of diabetes in the Arab region where the prevalence of diabetes is very high.

Key Words: Diabetes; Indirect Cost; Prevalence; Arab Countries; Productive Life Years; Disability.

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Introduction

Once associated with economic development and considered as diseases of the rich, non-communicable diseases (NCDs) are now affecting countries worldwide, threatening particularly economic and human development of low and middle-income countries. Diabetes is one of these diseases having a high prevalence and consequently a substantial socio-economic burden in the Arab region (Boutayeb A, 2006). According to the International Diabetes Federation Report 2011, six of the top 10 countries with the highest prevalence of diabetes (in adults aged 20 to 79 years) are in the Middle East: Kuwait (21.1%), Lebanon (20.2%), Qatar (20.2%), Saudi Arabia (20.0), Bahrain (19.9%) and UAE (19.2%) (IDF2011, Boutayeb et al 2012).

As indicated in a previous paper, diabetes raises the equity problem between and within countries (Boutayeb A and Boutayeb S 2005). Due to its chronic nature with severe complications, this disease needs costly prolonged treatment and care. Consequently, its economical burden affects individuals, households and the whole society. The American Diabetes Association estimates that the yearly cost for treating a person with diabetes is over 5 times more than for a person without diabetes (US$13,243 vs $2560). In 2007, an amount of USD174 billion was spent on diabetes (USD116 billion for medical expenditures (direct costs) and USD58 billion (indirect costs) in reduced national productivity. It is estimated that the value will be more than $350 billion by 2025 and $2.6 trillion in the next 30 years (ADA2008).

In 2003, Barcélo et al. (2003) carried out a study on the cost of diabetes in Latin America and the Caribbean (LAC). The 26 countries of the LAC region were classified into four groups on the basis of per capita gross national product (GNP). The loss of productivity due to permanent and non-permanent disability, and mortality related to diabetes was responsible for an indirect cost of US$ 54.5 billion, representing 83.56% of the total cost of diabetes in LAC.

Following the study in LAC, Kirigia et al. (2009) proposed a similar study in the WHO African region. Evaluated in International dollars (PPP), the average cost per person with diabetes in groups 1, 2 and 3 was estimated at $ 11431.6, $ 4770.6 and $ 2144.3 respectively. The total economic loss for the whole region was $ 25.51 billion (PPP). Indirect cost of diabetes accounted for 43%, dominantly caused by permanent disability (88.5%) (Kirigia et al; 2009).

A study carried out on the direct medical cost of diabetes and its complications in the Eastern District of Abu Dhabi emirate (Al-Ain region) estimated that the annual direct treatment costs of a diabetic patient without complications (US$ 1605) was 3.2 times higher than the per capita expenditure for health care in the UAE (US$ 497)(Al-Maskari 2010).

In two recent papers, we estimated the direct and indirect cost of diabetes in Morocco (Boutayeb et al; 2013a), and the direct

cost of diabetes in the Arab region (Boutayeb et al; 2013b). The present paper is devoted to the estimation of indirect cost of diabetes in the Arab region.

Methods

Accurate estimation of diabetes prevalence is lacking in most Arab countries and reliable data on diabetes constitute a real problem. In absence of registries and precise data collected in each Arab country, extrapolations are often used by organizations like the World Health Organization (WHO) and the International Diabetes Federation (IDF).

In this study, following Barcélo et al (2003) and Kirigia et al (2009), the Arab region was divided into three income groups according to the WHO Global Health Expenditure Atlas (WHO Atlas 2012) (Table 1) and the indirect cost incurred by diabetes was estimated in each group, using all available data in each country and extrapolating for countries where data is not available by assuming that the costs are similar for different countries in the same income group.

Prevalence of diabetes

For the number of people with Type2 diabetes, our study was based on a bibliographic research on recent studies carried out in different Arab countries in order to estimate the prevalence of diabetes mainly among adult people(20 years and over). Our database was limited to published works based on surveys respecting the standards of statistical sampling techniques (population size, age, sex, selection criteria, etc...). In countries for which no prevalence was available, the value considered was the mean of income group to which the country belongs.

For the number of people with Type1 diabetes, lack and scarcity of reliable data was more crucial but the previous procedure was followed.

Indirect cost of diabetes

Indirect economic cost of a disease is mainly estimated by the cost of premature mortality, permanent and temporarily disability caused by this illness. It should be stressed, however, that these non-medical costs are difficult to measure. Beside the problem raised by what to include in indirect costs and how to measure and value such economic costs, overlapping and double counting that may result from indirect cost estimation constitute a subject of discussion and debate among researchers (Bjork2001). Usually, three approaches are used to estimate indirect costs of diseases: human capital, willingness-to-pay and friction costs. In this study, following Barcélo et al (2003), we use the first approach in which indirect costs of diabetes are estimated by the lifetime forgone earnings caused by premature death and disability due to diabetes.

• Mortality cost

Following the method used by Kirigia et al (2009) and using the probabilities of diabetes associated deaths in different age groups given by Murray and Lopez (1996), the number of productive years lost by people aged 15 to 60 years was estimated by subtracting the averages of age of onset and duration of diabetes from life expectancy of the country. For children and adolescents, productive years lost was calculated by subtracting the averages of age of onset and duration of diabetes plus 14 years from life expectancy of the country.

• Cost of permanent disability caused by diabetes

Following Barcélo et al (2003), we assumed that 5% of the total population with diabetes was permanently disabled. The estimated cost of permanent disability was calculated by multiplying the number of productive years lost to disability by the per capita GDP.

• Cost of temporarily disability caused by diabetes

The cost of diabetes-related disability was estimated for people with diabetes aged 15 to 60 years. The cost of disability in young people (0-14) and those retired (above 60 years) was ignored. It should be stressed that, following Barcélo et al (2003) and Kirigia et al (2009), we assumed that 40% of the population with diabetes aged <60 years were economically active and that 60 years is the age of retirement for the majority of Arab populations.

A computer program was written, using Excel to compute all the economic costs.

Results and Discussion

The total indirect cost was estimated to be around USD 72 billion whereas the average per capita indirect cost was estimated to be

Table1: Arab countries classified according to per capita gross domestic product (GDP, USD)

Income group (2010)	Per capita GNP (USD)	Countries
1	>8000 Average: 22232	Bahrain(17379), Kuwait(46537), Lebanon(9262), Libya(12461), Oman(20764), Qatar(82248), Saudi Arabia(15836), UAE(39619)
2	2000-8000 Average: 3109	Algeria(4272), Egypt(2646), Iraq(2932), Jordan(4445), Morocco(2848), Syria(2835), Tunisia(3831)
3	<2000 Average: 1181	Comoros(736), Djibouti(1266), Mauritania(967), Somalia(500), Sudan(1328), Yemen(1219)

Table 2: Bibliographic review on prevalence of diabetes in Arab countries

Country	Author	Publication date	population	Sample	Prevalence
Algeria/Setif	Malek	2001			8.2%
Algeria/Tlemcen	Zaoui	2007	20 years+	7656	14.2%
Algeria MOH	STEPS	2003	25-64	4000	7.3
Bahrain	Al-Mahroos	1998	40-70	2000	29.8%
Egypt STEPS	Ellabany et al	2005	15-65	10000	15.8%
Iraq/AlMadina	Mansour	2008	20 years+	3176	7.43%
Jordan	Ajlouni	2008	25 years+		17.1%
Jordan	Ajlouni	1998			3.69%
Jordan	Jordan STEPS	2008	18 years +	3334	16.9%
Kuwait	Abdella	1998	20 years+	3003	14.8%
Iraq MOH	STEPS	2006	20 years +	1000	13.5%
Libya	Kadiki	2001	20 years +	868	14.1%
Morocco	Tazi	2000	20 years +		6.6%
Morocco/Oujda	Ramdani	2012	40 years+	1628	10.2%
Oman	Asfour	1995		5096	10%
Oman	Al-Lawati	2002	20 years +	5838	11.5%
Oman	Al-Moosa	2006	20 years+	7179	U:17.7 ; R:10.5
Qatar	Bener	2009	20 years+	1117	16.7%
Saudi Arabia	Al-Nuaim	1997	15 years +	13177	UM12 ; UF14 RM7 ; RF8
Saudi Arabia	El-Hazmi	1998	2-77 years	25337	M:5.63 F:4.53
Saudi Arabia	Al-Nozha	2004	30-70 years	16917	23.7
Saudi Arabia	MOH-WHO	2005	25-64	1768	19.2%
Tunisia	Bouguerra	2008	20 years+	3729	9.9%
UAE/Al Ain	Saadi	2007	20 years+	2455	17.1%
UAE	Malik	2005	20 years+	5844	20%
Yemen	AlHabori	2004	25 years+	498	4.6%

USD 2770, varying from USD 423 in group 3 to USD 7959 in Group1. The indirect cost in the first group was 7 times higher than in the second group and nearly 19 times higher than in the third group. This huge variability is explained by the use of per capita income for the evaluation of lost productivity. The average indirect per capita cost of diabetes is nearly 9 times higher than the per capita health expenditure (Table3). The indirect cost of diabetes in each Arab country is given in Table Annex 1. Obviously, three parameters determine the total cost incurred indirectly by diabetes in each country: population size, diabetes prevalence and per capita GDP. Seven countries with the highest prevalence of diabetes contribute to more than 75% of the indirect cost incurred by diabetes in the Arab region.

For the 26 countries of Latin America and the Caribbean, the loss of productivity due to permanent and non permanent disability, and mortality related to diabetes was responsible for an indirect cost of USD 54.5 billion, representing 83.56% of the total cost of diabetes in LAC.

In the United States of America, it was estimated that US$174 billion was spent on diabetes in 2007. The indirect direct cost (USD 58 billion) accounted for 1/3 of the total cost incurred by diabetes (ADA2007).

According to Kirigia et al (2009), the 7.02 million cases of diabetes recorded by countries of the African Region in 2000 resulted in a total economic loss of Int$ 25.51 billion with indirect cost accounting for Int$8.1 billion(32%) in the Region.

Study Limitations and intangible costs

In our study, we were limited by lack and scarcity of reliable data. Other limitations were related to different assumptions concerning the number of people with permanent or temporarily disability, the proportion of economically active population and the age of retirement in each Arab country.

Diabetes is a chronic disease with a high economic burden affecting rich and poor people worldwide. However, its burden goes beyond the limits of economical problems. The disease incurs also costs that are intangible and not quantifiable such as inconvenience, anxiety, pain, and more generally lower quality of life (WHO Cost). Indeed, diabetes causes more than half of all non-traumatic lower limb amputations. It is also one of the leading causes of visual impairment and blindness, and the leading cause of renal failure in many developing countries. How can we evaluate financially the loss of vision, kidneys or lower limb? And how can we estimate the affective care devoted by a family to

Table 3: Total and per capita indirect cost of diabetes per group per year compared to per capita health expenditure

Income group	Indirect cost (USD billion)	Per capita indirect cost (USD)	Per capita health expenditure (USD)	Ratio
Group1	51.91	7959	827.5	9.6
Group2	19.00	1113	164.5	6.8
Group3	1.14	423	66.5	6.4
Total or average of 3 groups	72.05	2770	300.3	8.9

one of its members affected by diabetes complications? As indicated earlier, the treatment of diabetes appears not only as an economic problem but also as a sustainable development issue. For this reason, health decision makers should consider such a disease in its integrated context, requiring health education and sensitization, early diagnosis and efficient treatment to avoid complications or at least to delay them as far as possible. For instance, the budget required for sensitization, diagnosis and treatment of diabetes without complications is cost-efficient compared to the socioeconomic burden imposed by blindness, kidney failure or foot amputation.

Conclusion

Despite the limitations imposed by lack and scarcity of reliable data concerning the number of people with diabetes in the Arab countries and the large variability of prices, our study proposes for the first time an estimation of the indirect economic cost of diabetes incurred by the loss of productivity caused by disability and premature mortality due to diabetes. The huge indirect economic cost and the associated social burden stress the importance that health decision makers should give to sensitisation, early diagnosis and treatment of diabetes in the Arab region where the prevalence of diabetes is very high.

JEL classifications: I11, I13, I15, J14

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** Supplementry Attached (**Annexure 1**)