Original Article
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Medical Journal of the Islamic Republic of Iran (MJIRI)
Iran University of Medical Sciences

Is the status of diabetes socioeconomic inequality changing in Kurdistan province, west of Iran? A comparison of two surveys

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Received: 10 August 2015 Accepted: 20 October 2015 Published: 24 May 2016

Abstract

Background: About 80% of deaths in 350 million cases of diabetes in the world occur in low and middle income countries. The aim of this study was to determine the status of diabetes socioeconomic inequality and the share of determinants of inequalities in Kurdistan Province, West of Iran, using two surveys in 2005 and 2009.

Methods: Data were collected from non-communicable disease surveillance surveys in Kurdistan in 2005 and 2009. In this study, the socioeconomic status (SES) of the participants was determined based on the residential area and assets using principal component analysis statistical method. We used concentration index and logistic regression to determine inequality. Decomposition analysis was used to determine the share of each determinant of inequality.

Results: The prevalence of diabetes expressed by individuals changed from 0.9% (95% CI: 0.6-1.3) in 2005 to 3.1% (95% CI: 2-4) in 2009. Diabetes Concentration Index changed from -0.163 (95% CI: -0.301- -0.024) in 2005 to 0.273 (95% CI: 0.101-0.445) in 2009. The results of decomposition analysis revealed that in 2009, 67% of the inequality was due to low socioeconomic status and 16% to area of residence; i.e., living in rural areas.

Conclusion: The prevalence of diabetes significantly increased, and the diabetes inequality shifted from the poor people to groups with better SES. Increased prevalence of diabetes among the high SES individuals may be due to their better responses to diabetes control and awareness programs or due to the type of services they were provided during these years.

Keywords: Inequality, Diabetes, SES, Concentration Index, Decomposition, Iran.

Cite this article as: Moradi G, Majdzadeh R, Mohammad K, Malekafzali H, Jafari S, Holakouie-Naieni K. Is the status of diabetes socioeconomic inequality changing in Kurdistan province, west of Iran? A comparison of two surveys. *Med J Islam Repub Iran* 2016 (24 May). Vol. 30:375.

Introduction

The World Health Organization estimates that 350 million people have diabetes worldwide (1). It is estimated that only in 2004 more than 3.4 million people died of diabetes and its complications (2). It is also estimated that 80% of diabetes deaths occur in low and middle-income countries (3). World Health Organization has predicted that diabetes would be the seventh leading cause of death, and one of the first ten causes of diseases burden in 2030 (4).

The prevalence of diabetes in Iranian population is rising increasingly. According to a study, the national prevalence of diabetes among people aged 15 to 64 was 8.7%

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and it is raising more due to living in urban areas and other risk factors. The disease burden of diabetes in Iran is similar to that of developing and even developed countries (5).

Because it is difficult to interpret health indicators without considering their distribution among subgroups, the subject of health equality and the importance of the consequences of inequality have received a great deal of attention in the world over the past decade (6). Many countries have set health equality as one of their major goals as health determinants are of prime importance in health equality. Consequently, the economists and epidemiologists have tried to use different methods to show health equality quantitatively using numbers and quantities (6,7).

Overall, achieving equality has always been one of the major goals of national programs; and it has gained a special place in health strategic plans in the recent years (8).

It is of significant importance to determine diabetes inequality as it is highly dynamic, and predicting the distribution of diabetes in different socioeconomic groups based on developmental status is difficult. In addition, diabetes is highly dependent on culture and the development status of the society. Moreover, disparities and inequalities can affect the spread and incidence of the disease. Because the prevalence and spread of disease depends on individuals' behavior and lifestyle, proper interventions can provide equality in disease (9).

To our knowledge, no study has determined the changes in diabetes inequality in a five-year period in Iran. Therefore, the main objective of this study was to determine the socioeconomic status (SES) inequalities of diabetes and determine the share of these inequalities in Kurdistan province in 2005 and 2009.

Methods

In this cross-sectional study, data were collected from the Non-communicable Disease Surveillance Survey (NCDSS) in Kurdistan province in 2005 and 2009. In the latter survey in 2009, the authors added a questionnaire to the survey to determine the SES. The study population included Iranians aged 15 to 64 who were living in Kurdistan during the study years. The sample size was 2,500 individuals in 2005 and 1,000 in 2009 that were classified in 1,000 clusters of 20 people. Stratified sampling method was used, and stratified probability cluster sampling was utilized for each stratum. To determine the clusters, 10-digit postal codes were used. The cluster number was classified into five age groups: 15-24; 25-34; 35- 44; 35- 44; 45-54; 55-64. Four persons were selected (two males; two females) in each age group and finally 20 persons were questioned and examined in each cluster.

The diabetic patients had been diagnosed by physicians or medical staffs or were under treatment. The NCDSS method is described in more detail elsewhere (10,11).

To measure the socioeconomic inequalities, we used Concentration Index, concentration curve and compared the ORs of different socioeconomic groups. Concentration Index was calculated using the covariance method in which the covariance of health indicators and SES was weighted two times and compared with the average health status. To draw the concentration curve, the cumulative percentage of diabetes was plotted on y-axis, and the cumulative percentage and the proportion of SES of the poorest group to the richest group were plotted on y-axis. Concentration Index values were between -1 to 1. To interpret the data, if the curve was above the equality line, the Concentration Index values were between 0 and -1, indicating the distribution of risk factors among the poor group. When the curve was below the equality line, the Concentration Index values were between 0 and 1, indicating the distribution of risk factors among the rich group (12,13).

In addition to the Concentration Index, logistic regression and OR values were used to determine the SES of different

groups. The poorest socioeconomic group was selected as the base group and other groups were compared to it. In this study, both the crude and adjusted ORs were calculated. In the adjusted logistic model, the variables that were associated with the outcome in the modified model were selected for decomposition analysis. Decomposition analysis showed the contribution of each determinant in inequalities. In decomposition analysis, we tried to find the factors generating inequality and learn to what extent each factor contributed to the inequality. In fact, the goal of decomposition analysis is to quantify the contribution of each factor affecting the socioeconomic inequality. In this study, the SES was determined based on the residential area and some assets. Accordingly, principal component analysis (PCA) was performed on the residential area and some assets. The SES was determined for all the participants using the PCA of the residential area and assets. PCA provides an asset score for each person, which ranks people from the poorest to the richest. With respect to the asset score, participants were divided into five groups, including the poorest, poor, average, rich, and the richest. Then the prevalence of diabetes was compared between the groups (14).

Results

In 2005, 2,494 individuals participated in the survey, and the response rate was 99.8%; and 997 patients participated in the second survey in 2009, and the response rate was 99.7%. Of those participants aged 15 to 64, forty- three individuals in 2005 and 45 in 2009 had diabetes with a prevalence of 0.9% (95% CI: 0.6-1.3) and 3.1% (95% CI: 2-4), respectively.

Table 1 demonstrates the frequency of diabetes in different SES groups in the five quintiles in 2005 and 2009. In this table, the first quintile is the poorest and the fifth quintile is the richest group. In addition, the first quintile (i.e., the poorest group) was considered as the base group and the OR of other groups was calculated by comparing them to this group.

Based on the calculations, diabetes concentration index in 2005 and 2009 was equal to -0.163 (95% CI: -0.301-0.024) and 0.273 (95% CI: 0.101-0.445), respectively. The negative concentration index values indicate higher distribution of diabetes among poorer groups and the positive concentration index values indicate higher distribution of the disease among richer socioeconomic groups.

Figure 1 shows the concentration curve of diabetes in 2005 and 2009. This graph shows that diabetes was more prevalent among the poor in 2005. In addition, this figure displays that the prevalence of diabetes was higher among the rich in 2009. In this period, the diabetes inequality tended to become more prevalent among the rich.

In the next stage, the relation between diabetes and other variables were determined using crude and adjusted odds ratios through logistic regression method. The adjusted OR values obtained in 2005 restricted the decomposition analysis. However, the data obtained in 2009 made it pos-

Table 1. Distribution of Diabetes among Different Socioeconomic Groups in Kurdistan in 2005 and 2009

Diabetes		1st Group (The poorest)	2nd Group (Poor)	3rd Group (Average)	4th Group (Rich)	5th Group (The richest)
2005	Number of Diabetics/ Participants	12/755	13/489	10/454	3/379	3/410
	OR	1	1.50	1.25	0.67	0.44
	Confidence Interval		(0.65, 3.45)	(0.50, 3.14)	(0.22, 2.04)	(0.13, 1.44)
2009	Number of Diabetics/ Participants	5/224	7/186	8/183	10/186	15/184
	OR	1	2.27	2.81	3.55	6.02
	Confidence Interval		(0.65, 7.95)	(0.84, 9.35)	(1.12,11.2)	(2.05,17.67)

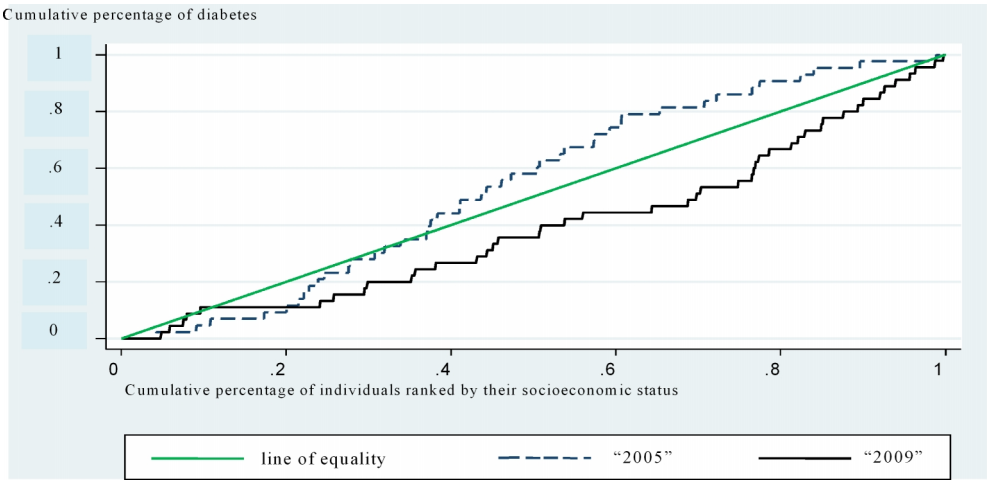

Fig. 1. Concentration Curve of Diabetes in 2005 and 2009 in Kurdistan Province

sible to perform decomposition analysis for a number of variables. Table 2 uses crude and adjusted odds ratios and logistic regression to illustrate the relationship between diabetes and other the variables.

Table 2 demonstrates that the adjusted OR values for the four variables of gender, residential area, SES, and age are significant. In our final model, we performed decomposition analysis for the four variables of gender, residential area, SES, and age.

The results of the analysis are shown in Table 3.

Table 3 shows that 67% of the inequality was due to SES, and 16% to residential area. It was found that gender (being female) and age (increase by age) can reduce inequality by 6% and 9%, respectively. However, 31% of the inequality was due to unknown factors.

Table 2. Diabetes Crude and Adjusted Odds Ratios in Kurdistan, 2009

No.	Variable	Crude OR	Adjusted OR
1	SES (rich and the richest compared with others)	2.39(1.22, 4.68)	2.19 (1.13, 2.24)
2	Educational status (academic compared with less educated)	0.60(0.14,2.52)	0.85(0.19, 3.75)
3	Age (older than 40 years compared with younger people)	5.05(2.37, 10.73)	5.32(2.49, 11.37)
4	Gender (female)	2.56 (1.29, 5.08)	2.81 (1.45, 5.45)
5	Residential area (rural)	0.48 (0.24, 0.96)	0.73 (0.38, 0.41)

Table 3. Results of the Decomposition Analysis of Diabetes in 2009 in Kurdistan

Variables	Coefficient	Mean	Elasticity	Concentration index	Contribution to c	Contribution to c (%)	%
Gender (female)	0.0295736	0.501030	0.4759698	-0.027411	-0.01304	-0.046149	-0.5
Residential area (rural)	-0.0110	0.5568	-0.1961	-0.2355	0.0462	0.1634	16
SES (rich and the richest compared with others)	0.0247	0.3998	0.3169	0.6009	0.1904	0.6736	67
Age (older than 40 years compared with younger people)	0.0597	0.2801	0.5374	-0.0480	-0.0258	-0.0913	-9
Unknown factors							31
Total							100
	.2827158		Concentration index				
	.03113071		Mean of risk factor				

Discussion

Based on our findings, the prevalence of diabetes had an increasing trend from 2005 to 2009 and changed from 0.9% to 3.1%. In addition, diabetes concentration index in 2005 was -0.163 (95% CI: -0.301- -0.024) while it reached 0.273 (95% CI: 0.101-0.445) in 2009. The results showed that the disease was more prevalent among poorer socioeconomic groups in 2005, while it became more prevalent among richer socioeconomic groups in 2009.

The findings of the logistic regression proved the above results. The calculated ORs showed that the risk factors were more prevalent among the poor group in 2005, but it became more common among the richer group of the society in 2009. The results of the decomposition analysis showed that 67% of the inequality was due to SES factors and 16% to residential area. Gender (being female) and age (increase by age) can reduce inequality by 6% and 9%, respectively.

The results of our study are consistent with most other studies; however, the direction of inequality varies in different studies. In general, other studies have also indicated that the risk factors for diabetes and metabolic syndrome are increasing in Iran and in Kurdistan province, and the rise and spread of the disease is expected (15). Our results on the relation between diabetes and SES are consistent with those of other studies, but they had different directions. A study, which assessed the relation between diabetes and SES in Southern European countries, revealed that diabetes is more common in lower socioeconomic groups. This is particularly pronounced more in women. In that study, the prevalence of diabetes was associated with both educational and occupational status (16).

In another study, there had been both socioeconomic and ethnic inequalities in disease treatment and control and in accessibility of health services. Such a socioeconomic inequality was observed in the diagnosis of diabetes (17).

According to a study, inequalities exist not only in the prevalence of diabetes but also in other features and characteristics of the disease, and diabetes' mortality happens more in women, and in socioeconomic and ethnic minorities (18).

Two other studies have also reported gender inequalities in diabetes control; however, gender inequality has been observed in the smallest scales (16,19). On the other hand, a study in Switzerland reported that women refer to the medical and health facilities more, and inequality in diabetes among women may be due to their regular visits to control diabetes. A study also found diabetes treatment inequality among ethnic minorities (20). In addition to the prevalence of diabetes, other studies have shown socioeconomic inequality in the diagnosis of diabetes (21,22). Reisig's study, reported a strong association between indicators of SES with glycemic control (measured by HbAlc levels). This association could not be related to sex, age, diabetes duration, obesity and physical activity differences in social groups. Thus, the researcher stated that social inequalities do exist in glycemic control. Moreover, in Lawlor's survey, socioeconomic status was associated with higher levels of fasting insulin and triglycerides in women with and without diabetes (22,23). Socioeconomic inequalities in accessing health services have been reported in two other studies (19,24).

Most notably, the highest level of socioeconomic inequality has been observed in delay in the diagnosis of diabetes (16). A study reported inequalities not only in prevalence, but also in the incidence and mortality of Type 2 diabetes (25).

In general, in developed and developing countries diabetes inequality is becoming more prevalent in poorer groups. However, in under-developed countries diabetes is more prevalent in higher socioeconomic groups (26,27). The results of our study in 2005 and 2009 showed two different results, and this might be due to the speed of social, economic and health changes in Iran, or to the administration of training and

screening programs in the country, or to the method of providing care in different regions during this period. The increased prevalence of diabetes among the rich indicates that they responded better to training interventions and have better access to diagnosis services. During the study period, the prevalence of diabetes in Kurdistan province changed from 1% to 3%. Our results on the direction of inequality in the prevalence of diabetes and its changes in 2005 and 2009 are consistent with those of a study about inactivity. However, it is not in line with the results of other studies on the risk factors of other non-communicable studies (28).

The status of inequalities in cardiovascular disease risk factors and behaviors depend on the developmental and cultural conditions. Distribution of these behaviors in different socioeconomic groups among different communities can change rapidly (29).

In addition to the high disease burden, diabetes has more complications such as amputation in Iran. The most important factor associated with amputation was female gender. Thus, it is of utmost importance to develop appropriate plans to provide equality of care for diabetic patients (30).

This study had some limitations including the small number of socioeconomic variables in 2005. Another limitation was the small sample size in 2009, which lowered the precision of the results. Moreover, it was not possible to consider and measure the SES over time (SES lifetime), but this is a common limitation in all the studies that use assets to determine the SES.

Conclusion

The results of this study can be used to initiate advocacy among officials to show that health system alone cannot reduce inequalities and other factors like education and SES are involved. As reported in other studies, the diabetes inequality pattern depends on time, developmental status, age group, and some cultural, social, and political factors. The following items are recommended based on the mentioned results: The goal of reducing health inequality should be included in the goals of diabetes control; and instead of assessing inequalities about diabetes risk factors, it is better to study the socioeconomic inequalities about diagnosis of diabetes, control of diabetes, and access to services and service provider units.

Moreover, diabetes socioeconomic inequalities should be measured every three or five years by Non-communicable Diseases Surveillance System. As the SES of people is related to diabetes, it should be considered when planning interventions to control this disease. Measuring the diabetes prevalence inequality alone is not enough and it is essential to determine inequalities in incidence, diagnosis delay, and control, the services and service providers, diabetes mortality, and changes in the diabetes inequality over time. Therefore, the results suggest measuring the abovementioned inequalities as well.

Acknowledgments

We would like to express our appreciation to Dr. Farzam Bidarpour, the Health Deputy of Kurdistan University of Medical sciences and Mr. Mohammad Karimi and Ms. Soraya Amani, and the interviewers who not only provided us with the data but also helped us on filling the complementary questionnaires.

Conflict of Interest

There is no conflict of interest.

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