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Research Article

Cardiovascular Risk Factors in Relation to Socio-economic Status Among Patients with Type 2 Diabetes in Urmia, Iran

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Abstract

Purpose: To investigate the effect of socio-economic status (SES) on cardiovascular disease among type 2 diabetic patients in Urmia, Iran.

Methods: A cross-sectional study was conducted on 251 patients with type 2 diabetes referred to the Urmia Diabetes Unit over the period September-March 2010. A self-administrated questionnaire was employed for data collection. Clinical data of glycemic control and blood pressure were collected from patient records. Multiple logistic regression analysis was used to assess the effect of SES on health outcomes.

Results: Patients with a high socioeconomic status were less likely to have uncontrolled HbA1c (OR=0.87; 95 % CI; 0.79-0.96), uncontrolled systolic blood pressure (OR=0.94; 95 % CI; 0.90-0.99) and uncontrolled diastolic blood pressure (OR=0.92; 95 % CI; 0.87- 0.97) compared to patients with lower socioeconomic scores. Higher amounts of fasting blood sugar, HbA1c, systolic and diastolic blood pressure were correlated with higher SES scores among diabetic patients in linear regression analyses (FBS coefficient = -2.23, HbA1c coefficient= -0.079 , systolic & diastolic blood pressure coefficient= -0.39 and -0.17).

Conclusion: Low socioeconomic status assessed in this Iranian population was associated with higher odds of cardiovascular risk factors predisposing to poor consequences among diabetic patients with low socioeconomic status.

Introduction

Socioeconomic status (SES) is considered as one of the important determinants of health. Evidence shows that poverty decreases life expectancy and increases mortality, especially among cardiovascular diseases [1-3] Nowadays, the rapid distribution of diabetes is a major concern in public health in different communities across the world [4]. In 2004, an estimated 3.4 million people died from the consequences of high blood sugar. The World Health Organization (WHO) projected that diabetes deaths will increase by two thirds between 2008 and 2030 [5]. The prevalence of diabetes type 2 is estimated to be 24% among the population aged more than 40 years and this figure is increasing annually[6].

Social determinants and characteristics of material deprivation, in particular, may directly influence the incidence and management of diabetes through biological, psychological and social mechanisms. SES has an important effect on the incidence and management of diabetes [3]. For instance, in diabetic patients, socioeconomic inequality has contributed to an increase in the prevalence of cardiovascular disease. Cigarette smoking is reported to be more common among poor diabetics patients, which is well known as a risk factor of

cardiovascular disease [7]. The complications of diabetes can be decreased through management of blood pressure [8] and controlling blood glucose by means of Fasting Blood Sugar (FBS) [9-11]. For example, tight control of FBS could prevent a primary stroke in diabetic patients [12] and is approved to reduce micro vascular complications in type 2 diabetes as a cost-effective approach [13]. Moreover, SES is an important contributor for poor glycemic control [14-17] through different mechanisms such as individual health behaviors and access to medical care [18].

There are many effective therapies for diabetes management and its complications. These therapies are less commonly used among low SES communities [10, 19]. In diabetic patients, low income is associated with an increased rate of hospitalization and mortality due to its complications [20-21].

Multiple studies have been directed with focus on social inequality and health in Iran concerning maternal mortality [22] and neonatal mortality [23], non-communicable disease risk factors [24], and hypertension [25]. However, there is scarce data regarding SES and its effects on cardiovascular risk factors in diabetic patients in Iran, particularly in Urmia. The present study was designed to investigate the association between SES and cardiovascular risk factors among type 2 diabetic patients in Urmia district, Iran.

Methods

This study was a cross-sectional study based on a register system, was conducted among all patients with type 2 diabetes by means of census among patients whom referred to the Urmia Diabetes Unit and institute between September-March 2010. In total, 251 diabetic patients were evaluated .All cases from two existed sources of patients with different social status were included in this study.

Diagnostic criteria

The diagnostic criteria for diabetes used in the study were following : [(Fasting plasma glucose≥7.0 mmol/l (126 mg/dl) or 2–h plasma glucose ≥11.1 mmol/l (200 mg/dl)] [26].

Data collection tool was a questionnaire that included age, duration of disease, smoking status (smoker/nonsmoker), and age of disease onset. In order to measure SES for subjects we collected social characteristics of patients including family size, housing characteristics (owner occupied/rented, number of persons living in the households, number of rooms available in the households as a marker of crowding, dimensions), patients' occupation and their spouses' as well as their educational level. The combination of variable's weighted scores (score × variable coefficient) were used as a marker of SES of patients. In this coefficient, higher score is a marker of higher SES score.

Body mass index (BMI) and blood pressure were measured by trained nurses. Systolic and diastolic blood pressure higher than 130 mm Hg and/or 80 mm Hg were considered as uncontrolled systolic and diastolic blood pressure, respectively. Body mass index (BMI, kg/m^2) was used to assess overweight patients and divided them into three groups (<25, 25–29.9 and ≥30) [27]. Patients taking medication for controlling their blood pressure were considered hypertensive, despite if they had controlled or uncontrolled blood pressure in current blood pressure measurement. Moreover, FBS and HbA1c values were recorded from the latest clinical examination, FBS out of normal range (70 - 130 mg/dl) and HbA1c higher than 7% were classified as uncontrolled glycemic control, respectively [27].

Data treatment

The Chi-square test (in qualitative variables) and independent sample t-test (in quantitative variables) was applied to assess the association between patients' other characteristics and uncontrolled cardiovascular risk factors. Variables with significant association in the univariate analysis were entered in the multiple regression models. Logistic and linear regression analyses were used to evaluate the impact of SES on rate of changes in HbA1c, FBS, systolic and diastolic blood pressure. All analyses were adjusted for age, duration of disease, age of disease onset, sex, BMI and smoking status if they had significant effect on cardiovascular outcomes using Chi-square or independent sample t-test. We offered odds ratios and their 95% confidence interval of variables in logistic regression model. P-values less than 0.05 were considered as significant. STATA version 10 was used for Statistical analyses.

Results

Table 1 shows distribution of demographic characteristics and cardiovascular risk factors among type 2 diabetic patients. The mean age of patient was 54.18± 10.73 years; Age of disease onset was 46.50± 9.70 years; Duration of disease was 8.35± 6.49 years; and socioeconomic status score for all patient was 29.79± 7.06. Moreover, close to nine of ten patients were nonsmokers. As table indicates, most of the diabetic patients didn't have controlled glycemic level. In overall, 182(72.50 %) of patient were in overweight and obese by means of category of BMI.

Table 2 represents distribution of uncontrolled cardiovascular risk factors and diabetic patient characteristic. Male patients significantly have had higher hypertension disorder and higher means of age at disease onset (Mean± SD; 48.60± 9.91 vs. 44.95 ± 9.30, P=0.02). Uncontrolled systolic blood pressure was higher among with obese patients (46.8 % vs. 28.4%, P=0.01). The other variables including current smoking, body mass index, sex and age of disease onset did not have significant association with other studied cardio-vascular risk factors.

Table 1. Distributions of patient characteristics and blood glucose/blood pressure status among type 2 diabetic patients in Urmia district between September-March 2010.

Characteristics		**N (%)**
Female		190(76)
Current smokers		23(9.3)
Uncontrolled HbA1c		207(82.7)
Poor controlled FBS		196(78.9)
Hypertension		111(44.9)
High systolic blood pressure		79(31.9)
High diastolic blood pressure		55(22.4)
BMI(kg/m^2)	<25	69(27.50)
	Overweight(25-29.9)	95(37.8)
	Obesity (≤30)	87(34.7)

Table 3. Association between socioeconomic score and cardiovascular risk factors among type 2 diabetic patients in Urmia district between September-March 2010 employing Logistic regression.

Risk factors	**Crude**		**Adjusted**	
Cardio Vascular risk factors	**OR**	**95%CI**	**OR**	**95%CI**
Uncontrolled HbA1c	0.91	0.86-0.97		
Poor controlled FBS	0.95	0.90-0.99		
Hypertension	0.98	0.94-1.01	0.97*	0.94-1.02
Uncontrolled SBP	0.95	0.91-0.98	0.95*	0.91-0.99

Uncontrolled DBP	0.95	0.90-1.03

* adjusted for the age of disease onset
**adjusted for the BMI

Table 3 represents the crude and adjusted odds ratios and 95% confidence intervals for odds with regard to uncontrolled cardiovascular risk factors. The lower socioeconomic score significantly was associated with higher odds in uncontrolled HbA1c levels (OR =0.91; 95%CI= 0.86 - 0.97); uncontrolled systolic blood pressure (OR =0.95; 95%CI= 0.91 - 0.98) and diastolic blood pressures (OR =0.90; 95%CI= 0.90- 1.03); fasting blood sugar out of normal range (OR =0.95; 95%CI= 0.90- 0.99) and having hypertension (OR =0.98; 95%CI= 0.94-1.01).

Discussion

The results of the present study indicated that socioeconomic status was associated with higher odds of cardiovascular risk factors, which are contributed to having more complication of diabetes. Moreover, uncontrolled glycosylated hemoglobin (HbA1c) as a good marker of glycemic control in diabetic patients, was more strongly associated with socioeconomic score than other cardiovascular risk factors including FBS, uncontrolled diastolic/systolic blood pressure in study population.

The effect of socio economic status and other health indicators are shown in the studies with regard to other health domains. The Whitehall study in 1967, showed a steep inverse association between social class, as assessed by grade of employment, and mortality from a wide range of diseases. This inverse association was found between employment grade and prevalence of angina, electrocardiogram evidence of ischemia, and symptoms of chronic bronchitis, and health-risk behaviors including smoking, diet, and exercise [2]. Even, the lower socioeconomic groups usually are more exposed to the highest risks of injury and death [28]. Reverse association between infant and maternal mortality and socioeconomic status is shown across whole provinces of Iran [23]. All findings indicated an inverse association between low SES and health outcome, which imply on more attention on the SES in order to improve health outcomes in important health problems. This implication by means of attention on SES improvement has been employed to some high income countries like Sweden in order to overcome health problems [29].

In the present study, HbA1c higher than 7% was considered as uncontrolled blood glucose. In overall, most patients in this study didn't have blood glycemia control. Although in cohort of London, glycemic controls of diabetic patients were improved among all ethnic groups, worse glycemic control permanently was associated to lower social deprivation what were measured according to Townsend score. In London study, diabetic patients from minor ethnicities received more intensive treatment for HbA1c control and they had worse glycemic control than other London ethnicities [30] and ethnicity was more strongly associated with HbA1c level than socioeconomic status of patients , which implies that the effect of ethnicity as a social marker related with health, is more important than the effect of socioeconomic status in glycemic control of diabetic patients. Currently different ethnicities live together in Urmia city, nevertheless this factor was not considered in the current study. It implies that rather than the SES, other social factors should be considered in the regression model and also this topic should be studied more in-depth in Urmia latter on.

Another study indicated that improvement in cardiovascular risk factors in diabetic patients can be achieved in another way which is independent from socioeconomic status. For instance, in a cohort study of diabetic patients with actively management of lipid markers, hypertension, platelet and other cardiovascular risk factors, management of blood glycemic status as well as socioeconomic status was strongly related to measuring of integration and attitude in diabetes disease but not related with management of metabolic or cardiovascular risk factors [31]. Similar in Salford, a deprived urban area in North West England, patients from more affluent areas received more frequent clinical monitoring and preventive treatments, and had a lower level of cardiovascular risk factors and better glycemic control, which though risks of first micro vascular or macro vascular complications were similar [32].

In our study, close to half of patients have hypertension; about two third and around eight out of ten patients have controlled systolic and diastolic blood pressure. Similarly, a new review based on the national health examination surveys in three developed countries and four developing ones shows that less than 15% of individuals with diabetes were meeting treatment targets for blood pressure and 28-78 % of hypertensive diabetic patients had controlled blood pressure based on therapeutic control targets[33].

In our study uncontrolled blood pressure significantly was higher among patients with lower socioeconomic status; however in a cohort study of diabetic patients Oaken et al. showed that good control of lipid, hypertension, platelet, and successful management of hypertension were independent of socioeconomic status in diabetic patients [31]. In a study in Germany the association between socioeconomic status and blood glucose level disappeared after giving structured education to diabetic patients referred to the tertiary care center [34].

Conclusion

Low socioeconomic status was associated with higher odds of cardiovascular risk factors which lead to increased complications among diabetic patients with low socioeconomic status. Moreover, finding of this study indicated that most patients didn't have blood glycemia control, but blood pressure control was better among more than half of diabetic patients.

Limitations of the study: Getting accurate measures of socioeconomic status is a limitation in many studies focusing on this subject. However, in order to somehow overcome this, we measured socioeconomic status using a combination of social variables such as family size, housing and job status, and educational level which may be more sensitive and accurate indicators of current socioeconomic status among type 2 diabetic patients. The recruitment of patients was based on those referred to the Diabetes Unit that means it may not distributed at random sample of diabetic patients in Urmia district, and the limitation are known in all registered based studies.

Conflict of interests: The authors declare no conflict of interest.

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Table 2. Distribution of cardiovascular risk factors and diabetic characteristic among type 2 diabetic patients in Urmia district between September-March 2010.

Variables		Uncontrolled A_1C Hb			Uncontrolled FBS			High systolic Blood pressure			High Diastolic Blood pressure			Having Hypertension		
		Yes	**No**	**sig**	**Yes**	**No**	**Sig**	**Yes**	**No**	**sig**	**Yes**	**No**	**sig**	**Yes**	**No**	**sig**
		Percentage*														
Sex (male)%		46(22.4)	10(25)	0.8	46(23.3)	15(29.2)	0.4	20(25.3)	40(23.8)	0.79	16(29.1)	44(23.2)	0.36	19(17.3)	40(29.4)	**0.02**
Current smoking		16(7.5)	5(11.1)	0.46	15(7.8)	9(16.7)	0.09	8(10.4)	15(8.9)	0.70	15(7.9)	8(14.8)	0.12	9(8.2)	14(10.4)	0.58
BMI(kg/m^2)	<25	29(21.6)	12(42.9)	0.06	49(27.2)	14(29.2)	0.08	16(20.3)	53(31.4)	**0.01**	12(21.8)	57(29.8)	0.11	29(26.1)	40(29.4)	0.58
	25-29.9	7(25.0)	7(25.0)		74(41.1)	12(25.0)		26(32.9)	68(40.2)		18(32.7)	76(39.8)		40(36.0)	53(39.0)	
	30≤	9(32.1)	9(32.1)		57 (31.7)	22(45.8)		37(46.8)	48(28.4)		25(45.5)	58(30.4)		42(37.8)	43(31.6)	
		Mean±SD**														
Age of onset		46.94± 9.95	47.60± 9.90	0.75	46.62± 9.98	46.26 ±9.49	0.83	48.29± 9.02	45.56± 9.90	0.05	48.25± 8.58	45.80± 9.97	0.11	48.60± 9.91	44.95± 9.30	**<0.01**

*P-value for chi-square test

** P-value for Independent sample t-test