Original Article

Socio-economic factors and diabetes consequences among patients with type 2 diabetes

Azar Tol, Gholamreza Sharifirad, Davoud Shojaezadeh[1], Elahe Tavasoli[2], Leila Azadbakht[3]

Department of Health Education and Promotion, School of Public Health, Isfahan University of Medical Sciences, [1]Department of Health Education and Promotion, School of Public Health, Tehran University of Medical Sciences, [2]Department of Health Education and Promotion, School of Public Health, Shahid Beheshti University of Medical Sciences, [3]Department of Nutrition, School of Nutrition, Isfahan University of Medical Sciences, Isfahan, Iran

ABSTRACT

Background: Considering the effect of socio-economic factors on the emergence of chronic diseases and the importance of this aspect of diseases for policy makers and authorities of health care organizations, this study tried to investigate the role of these factors in type 2 diabetes and its consequences, which can be used in health policy making for preventing from this disease. **Materials and Methods**: This descriptive-analytical study was conducted on 384 diabetic patients who were admitted to a diabetes center in the city of Isfahan. The participants were selected using simple random sampling. A questionnaire with 42 questions was used for gathering the data which were analyzed using chi-square and Fisher's statistical tests. **Results:** The studied population consisted of 52.1% male and 47.9% female participants. There was a statistically significant relationship between diabetes complications, age group, educational level, job status, relationship with family members, number of family visits and the reassurance provided by the family, type of leisure time activities, health status, years with diabetes, smoking, type of treatment, fried food consumption and income ($P < 0.001$), sense of security and communication in living environment ($P < 0.002$) and daily intake of vegetables ($P < 0.02$). **Conclusion:** It seems that the application of supportive resources and secondary strategies is an essential issue in the patients with chronic diseases, particularly diabetes. Empowering strategies can induce basic changes in order to increase positive expectations, hope, self-esteem and self- confidence in patients; this is the exact strategy which must be used to efficiently control diabetes and its different types of complications among patients.

Key words: Diabetes consequences, diabetes type 2, socioeconomic factors

Address for correspondence: Prof. Gholamreza Sharifirad,
Department of Health Education and Promotion,
School of public health, Hezar jarib Ave.,
Isfahan University of Medical Sciences, Isfahan, Iran.
E-mail: sharifirad@hlth.mui.ac.ir

INTRODUCTION

Diabetes is the most prevalent disease caused by metabolic disorders; in other words, it is the most prevalent endocrine disease.[1] Nowadays, diabetes is the fifth leading cause of mortality in western societies and the fourth reason of visiting doctors. Diabetes is a growing threat to world health so that World Health Organization (WHO) has called all the countries to fight against this disease since 1993.[2]

Serious disabilities like cardiovascular, ocular and renal diseases are among the complications of uncontrolled diabetes. Nevertheless, according to the latest reports by WHO, it is predicted that population of patients with diabetes

will increase by 122% in 2025; in developing countries, the number of patients has increased from 84 million to 228 million people which shows a 170% increase.[3]

There are different statistics about the prevalence of diabetes in Iran. Azizi reported the prevalence of 2 to 10% in adults[1] and Health Department of Ministry of Health and Medical Education reported it as 2.3%.[4] Isfahan Endocrine Research Center evaluated the prevalence of diabetes as 2-3 and 7.3% among general population and in people over 30, respectively.[5] Diabetes Center of Ahmad Nader Kazemi Clinic in Shiraz reported the prevalence of diabetes as about 5%.[6]

Today, most people believe that there are limited available resources for supplying health care.[7] Diabetes is one of the main public health problems in the contemporary world which is rapidly growing.[8] This disease has been allocated 15% of health care costs in the USA.[9]

Diabetes is an incremental threat for the world health and has become a global epidemic by demographic changes and cultural transition of societies accompanied by aging phenomenon in developing countries. Diabetes is a costly disease which has been known as the main reason of cardiovascular diseases, blindness and advanced renal failure and amputation in the adult population in many countries.[10]

Diabetes can cause undesirable consequences in all parts of human body; therefore, devastating complications of this disease are the strong evidence for the importance of its consideration. For instance, World Health Organization has estimated that there are 24 million cases of diabetic neuropathy, 6 million cases of amputation and 5 million cases of retinopathy caused by diabetes; and cardiac complications (myocardial ischemia, attack and peripheral vascular diseases) have been reported among the major causes of mortality in people with this disease. In this regard, 60% of mortality in people with diabetes was due to cardiovascular disorders in the USA in 1992. It has been also estimated that 3.8 million years of life-time was lost in 1990 due to this disease; this number is expected to increase from 9.5 to 15 million years in 2020; meaning that the load of this disease will increase by four or five times during this 30-year period.[11,12]

Another reason for the importance of considering diabetes is the high expense of this disease. Several studies worldwide have given enough reasons to increase concerns in this regard. For instance, it was estimated that the whole diabetes cost is almost 91.8 billion dollars per year in the USA which includes 49% direct and 51% indirect costs.[13] Diabetes is considered one of the costly disorders for each patient due to its high prevalence and required costs so that a high percentage of this cost is related to the treatment of its complications.[13] According to the studies in India, 25% of total family income is allocated to the patient care in a low-income family with one diabetic adult [2].The analysis of health care costs in the West Pacific Region which has been done by World Health

Organization during recent years has revealed that 16% of hospital costs are related to diabetes.[14]

In Iran, diabetes costs are also very high. In a study by Amini *et al*, the direct and indirect medical costs related to over 40-year-old type-2 diabetics in Isfahan were reported as 8.998 billion Rials and over 167 billion Rials, respectively. Thus, annual indirect costs of each non-insulin-dependent patient who is over 40 years old are 18.6 times as much as annual direct costs.[15] Considering the above mentioned factors and necessity of considering diabetes, profound effects of socio-economic factors on this disease and its complications, this research was undertaken in order to analyze the role of effective socio-economic factors in type-2 diabetes and its complications in one of diabetes centers in the city of Isfahan.

MATERIALS AND METHODS

Participants and Study Design

The present study was a cross-sectional and descriptive-analytical study which aimed at considering the role of effective socio-economic factors of type-2 diabetes and its complications in one of the diabetes centers in Isfahan in 2009. The mentioned diabetes center received all the referred patients and offered screening, treatment and training services; it also offered consulting services on the complications of diabetes to the patients in case of necessity. The inclusion criteria were tendency of type-2 diabetics who were admitted to that center and had no confirmed mental illness to participate. The research participants were 384 people who were selected by simple random sampling.

Measures

The data collection tool was a self-made questionnaire consisting of two parts: 1) demographic information and 2) questions of social support, public health and physical activity. The questionnaire was prepared based on valid books and resources on diabetes and its validity was assessed by qualified professors. Then, their comments were applied to the questionnaire and, after resolving some of its problems and ambiguities, its validity was approved. Furthermore, to investigate its reliability, internal consistency method (Cronboch's alpha) was used and alpha coefficient of 0.89 was calculated.

The answers to the questions on social support, general health status, smoking background and physical activity and diabetes complications (which were filled out by the researcher using the records of patients) were designed as 5-option (always, often, sometimes, seldom, never), 3-option (unsatisfactory, satisfactory, very satisfactory), 2-option (yes, no) and 2-option items, respectively.

After obtaining the recommendation letters from Research Department of School of Health, Isfahan University of Medical Sciences, the researcher went to the center and introduced himself; then, he presented the required information and explanation on the research goals and

made the staff aware of the requirements of this type of research. After that, the patients' records were studied and the desired group was randomly selected from among those patients who had records, address and phone numbers. After contacting them, offering sufficient explanations about the study and its aims and obtaining their written consents, they were invited to the center and filled out the questionnaire if they desired.

Statistical Analysis

Data collected in this research were analyzed using SPSS statistical software by χ^2 and Fisher's tests.

RESULTS

The results of this study showed that 52.1% of population were men, 47.9% women, 57.6% under 60 years old, 90.6% married, 51% were high school dropouts, 47.9% were housewives, 27.9% retired and 54.1% had an annual income between 36000000 and 72000000 Rials. 91.47% smoked, 55.7% had no physical activity, 47.4% had face-to-face communication with family members, 48.2% always felt secure in their living environment and 46.4% always had proper communication in their living environments. Fifty-one percent always experienced sense of security by their family and 47.9% spent their leisure time at home. 47.9% described their health status as satisfactory, 50% had weekly communication with their families and 40.4% had diabetes record of less than five years.

The highest frequency in the patients was one cardiovascular (22.4%), two cardiovascular and ocular (13%) and three cardiovascular, ocular and foot ulcer (3.5%) complications. Furthermore, 60.4% took oral medication, 44.3% consumed 3-5 units of vegetables per day, 46.1% had more than 3 units of meat group per day, 56.8% took more than 11 units from bread and grain group, 27.9% consumed fat group less than once a month and 55.2% consumed more than 3 units of dairy products per day.

Some 50% of patients experienced one complication of diabetes while 34.1% had two complications and 15.9% had three or more. 71.9% had no record of coronary angiography, 51% had no record of hospitalization in CCU, 96.1% had no record of amputation, 80.2% had no record of cataract surgery, 93.2% had less than 150 min physical activity and 50% had weekly communication with their families. There were statistically significant relationships between the number of diabetes complication and age group (occurrence of one or two diabetic complications in the age group of under 60 years old and three complications in the age group of 60 to 70 years old) [Table 1], education level (one and two complications in the high school dropout group and three complications in higher education levels) [Table 2], employment status (the highest number of complications were among housewives and retired people), communication type with family members (by phone and face to face) [Table 3], frequency of communication (weekly and monthly

diabetes), sense of security in the patient by family members, leisure time activities, health status (i.e. most people with one complication evaluated their health status as satisfactory and most patients with two or three complications considered it as unsatisfactory) [Table 4], the years with diabetes (most of the people with one or two complications were in the group of less than 5 years and most of the people with three complications were in the group of over 20 years), smoking, the treatment type (most patients with complications took oral medication), intake of fried food and income group (most patients with diabetic complications were in the income group of less than 72,000,000 Rials per year) ($P < 0.001$), sense of security and communication in the living environment ($P < 0.002$) and daily vegetable intake ($P < 0.02$).

DISCUSSION

The results of the present study did not show any significant relationship between the number of complications and gender ($P = 0.15$). The results of Krishnan *et al*.'s study demonstrated doubled prevalence of diabetes among women with lower socio-economic status.[16] There was a statistically significant relationship between the number of complications and education level ($P < 0.001$). Krishnan *et al*, found that the incidence of diabetes in individuals with less than 12 years of education was 1.28 times more than those who had more than 17 years of education; this finding was in line with the results of the present study.[16]

The relationship between type 2 diabetes and education level, occupation and income was approved in this study which was true for all adult age groups.[16] In a study, the tripled prevalence of diabetes in high school dropouts was shown as compared with those with high school diploma or higher degrees.[17] Four epidemiologic studies on the role of mental and social factors in recognizing the risk of chronic diseases and health revealed that the adverse effects of economic factors were cumulative and the highest risk of weak physical and mental health was among those who experienced hard conditions over time.[17]

The results of the present study found a significant relationship between the number of complications and communication in the living environment (P < 0.002) and sense of security in the patient by family (P < 0.001). Only one study has been done on the probable effects of living place, the findings of which have revealed a seemingly positive relationship between increase of diabetes and its complications and inappropriate living environment.[18]

A statistically significant relationship was observed between the number of complications and leisure time activities (P < 0.001). The results of the study showed that the studied diabetics mostly spent their free time at home, which indicated their low economic condition and this needs a particular consideration. There was statistically significant relationship between the number of complications and the years with diabetes (P < 0.001). The results of the study demonstrated

Table 1: Absolute and relative frequency distribution of patients and number of complications and age group

Age group Number of complications	Under 60 years old		60-70 years old		Over 70 years old		Sum	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
One complication	132	68.8	20	10.4	40	20.8	192	50
Two complications	76	58.0	23	17.6	32	24.4	131	34.1
Three or more complications	13	21.3	35	57.4	13	21.3	61	15.9
Sum	192	50	94	20.9	109	24.2	384	100

χ^2=69.58, df 4, P<0.001

Table 2: Absolute and relative frequency distribution of patients and number of complications and educational level

Educational level Number of complications	Illiterate		Under diploma		Diploma and higher		Sum	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
One complication	41	21.4	101	52.6	50	26	192	50
Two complications	47	35.9	73	55.7	11	8.4	131	34.1
Three and more complications	12	9.716	22	36.1	27	44.3	61	15.9
Sum	100	26.0	196	51	88	22.9	384	100

χ^2 =35.77, df=4, P<0.001

Table 3: Absolute and relative frequency distribution of patients and number of complications and communication type with family members

Communication type Number of complications	By phone		Face to face		Without communication		Sum	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
One complication	52	27.1	111	57.8	29	15.1	192	50
Two complications	53	40.5	55	42.0	23	17.6	131	34.1
Three and more complications	34	55.7	16	26.2	11	18	61	15.9
Sum	139	36.2	182	47.4	63	16.4	384	100

χ^2 =22.87, df=4, P=<0.001

Table 4: Absolute and relative frequency distribution of the studied people in terms of the number of complications and health status

Health status Number of complications	Very satisfactory		Satisfactory		Unsatisfactory		Sum	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
One complication	21	10.9	1167	60.9	54	28.1	192	50
Two complications	1	0.8	55	42	75	57.3	131	34.1
Three and more complications	10	16.4	12	19.7	39	63.9	61	15.9
Sum	39	8.7	218	48.4	193	42.9	450	100

χ^2 =55.09, df=4, P<0.001

that most people with one or two complications were in the group of less than five years. Additionally, this issue revealed that micro and macro vascular complications of diabetes appeared in this short period of time, both of which show the inappropriate control of diabetes and, probably, late diagnosis of this chronic and asymptomatic disease at the beginning. There was no statistically significant relationship between the number of complications and physical activity (P = 0.08). There was also no statistically significant relationship between the number of complications and level of physical activity (P = 0.32).

Considering the influence of the level and type of physical activity in reducing insulin resistance in diabetics, it seems that with the increase in sample size, there are changes in the significance status of this variable with diabetes complication. There was a statistically significant relationship between the number of complications and treatment type (P < 0.001). The highest frequency was related to people who were taking oral medication; this revealed that diabetes of the sample was not under control; consequently, some complications appeared.

There was a statistically significant relationship between the complication occurrence and income group (P < 0.001). The results of the current study indicated that most of the participants had low economic condition; this can be relevant to the inappropriate and insufficient receipt of services. That

is because considering the treatment and care aspects and the dimension of its effect on occupation status and absence from the workplace along with load of disease and its cost can be attributed to low economic status. Furthermore, the number of complications had a statistically significant relationship with income ($P < 0.001$). The results of this study were in line with those of Krishnan *et al*.; they found that the incidence of diabetes in individuals with less than $15000 annual income was 1.57 times more than those who had more than $100000 annual income.[16] Robinson *et al*. found that income-poverty ratio (resulted by dividing annual income by poverty line of the country) had a strong relationship with prevalence of diabetes.[19]

The existence of strong social differences in health has been well approved.[19] Life-expectancy is remarkably unfavorable in lower socio-economic classes. This issue specially includes cardiovascular diseases, which are considered the main mortality causes in western world (cardiovascular diseases are among the complications of type 2 diabetes). The reason of this difference is controversial and a wide array of factors from lifestyle behaviors such as smoking, consuming unhealthy food and lack of proper physical activity to wider social impacts accompanied by inequality in income, on the one hand, and stressing factors in the workplace such as lack of job security and stability, on the other, are included. Diabetic people also follow this social health and disease model.

There are few reasons for explaining why socio-economic differences in smoking and other health related behaviors should not be present in diabetic patients; in fact, any kind of reason which can justify the results of these kinds of chronic and long-term diseases (except financial problems caused by occupational pressures) might affect the diabetics from lower socio-economic classes more than others who have a better living condition. Furthermore, the role of high quality health care in prevention from the reduction of diabetic complications has been fully shown in the recent decade and this factor can be caused by social inequality,[19] in fact, it has been approved that the ability and tendency of care-providers in health systems for conducting more precise analysis of complications in diabetic patients and newer scientific information sources are weaker in deprived regions. Moreover, the perception of the patient about the importance of adhering to the prevention strategies, motivation, tendency and workplace related conditions might be unfavorably affected by lower socio-economic conditions.[20,21]

It appears that there are several reasons that diabetic people experience socio-economic inequalities in health at least in a similar way to that experienced by general population of the community. The results of an analytical-descriptive study by Larranaga *et al*. on 65000 over-24-year-old people which aimed at determining the relationship between socioeconomic status and prevalence of type-2 diabetes, cardiovascular factors and chronic complications of diabetes

in Spain are shown below; some of these cases were in line with the findings of this study:

- The prevalence of type-2 diabetes in individuals with lower socio-economic status was reported as 2.17 times as much as other people; specifically, it was 2.28 times among women.
- In type-2 diabetic patients, obesity, sedentary lifestyle and abnormal blood fat levels were more prevalent among those with lower socio-economic status.
- Macroangiopathy complications were inversely related to socio-economic status.
- The patients with lower socio-economic status had more times of admission to the treatment centers.
- This study demonstrated a relationship between cardiovascular risk factors and chronic complications of type-2 diabetes.
- Despite more admission rate to the treatment centers, there was poor glucose control and more frequent chronic complication of the disease in these individuals.[22]

The relationship between lower socio-economic status and unfavorable health condition has been proven so that the lower the socioeconomic condition, the more unfavorable the prediction for the development of stable health would be.[23] in the present study, due to low annual income, low education level and involvement of under-60-year-old individuals with diabetes complications, the cases of the above mentioned study were also approved.

It is essential to notice mental aspects and adaptability rate of diabetics in diabetes related investigations because proper adherence to the treatment diet (in treatment, management and care aspects) can be influential in controlling, preventing from and postponing the occurrence of diabetic complications.

The most frequent complication of all three groups in the present study was cardiovascular complications. It seems that applying supportive strategies and resources of individuals is vital. Empowering strategies lead to upheavals in individuals which increase their positive expectations, hope, self-esteem and self-confidence; this is the strategy that should be applied in diabetic patients in order to better control their diseases. To change diabetic management and control, it is very helpful to consider supportive and social approaches. The goals of the empowering process are based on the potential increase in the control of individuals and self-determining actions.[24]

CONCLUSION

The aim of emphasizing some factors such as gender, age, education level, occupation, income status, physical activity and nutrition, spare time activities, nutrition model and so on in the discussion section along with type and number of complications was due to the fact that chronic diseases, especially diabetes, are related to the social classes of people, which are measured by variables like educational level, occupation and income status.

ACKNOWLEDGMENTS

REFERENCES

1. Azizi F, Hatami H, Janghorbani M. Epidemiology and controlling prevalent disease in Iran. 1st ed. Tehran: Eshtiagh Publication: 2000; 32.P.35-39 [Persian].
2. Spinaci S, Currat L, Shetty P, Crowell V, Kehler J. Tough Choices: Investing in health for development: Experiences from national follow-up to commission on macroeconomics and health. WHO Report 2006.
3. International Diabetes Federation. Diabetes Atlas. 3rd ed. Brussels, Belgium: International Diabetes Federation; 2006.P.50-78
4. Deputy of Health, Deputy for research and technology. National health situation states. Tehran: Tabalwor Publishing Group; 2003. p. 59.
5. Hazavehei SM, Sharifirad G, Mohabi S. The effect of Educational program based on Health Belief Model on diabetic foot care. Int J Diabetes Dev Ctries 2007;27:18-23.
6. Ashidi M. Annual Diabetic Research Center Report in Shiraz 2008:36.
7. Amini M, Khadivi R. Direct medical costs of nephropathy resulting from type II diabetes in Isfahan. Iranian Journal of Endocrinology & Metabolism 1999;1:223-15.
8. Azizi F, Hatami H, Janghorbani M. Epidemiology and controlling prevalent disease in Iran. 1st ed. Tehran: Eshtiagh Publication: 2000; 32.P.35-39 [Persian]
9. Falahati M. Survey of practice in diabetic control, diabetic patient's type 2, referee to diabetic research centre of Yazd. Ms Thesis, Yazd University of medical sciences 2000. p. 34-45.
10. Ghanadi Fazlolah in translate diabetes (patient's education). Rabert M, Jams B. Printing 1, Isfahan: Kankash publication; 1998. p. 9.
11. Shahshahan T, Karimi J. Prevention principles of 2 diabetes, printing 1, Isfahan: Charbagh publication; 2002. p. 13-31.
12. Connolly VM, Roper NA, Unwin NC, Jones SC, Bilous RW, Kelly WF. Quality of diabetes care, material deprivation and mortality. Diabet Med 2002;19(Supplement 2):47.
13. Coster S, Gulliford MC, Seed PT, Powrie JK, Swaminathan R. Monitoring Blood glucose control in diabetes mellitus: A systematic review HTA 2002; 4(12):1-5.
14. Mahdavi Hazaveh A, Delaveri A. Prevention and controlling program of diabetes. Health Counselor of Disease Management Center, 2004; 53 [Persian].
15. Ortegon MM, Redekop WK, Niessen LW. Cost-effectiveness of prevention and treatment of diabetic foot: A Markov analysis. Diabetes Care 2004;27(4):901-7.
16. Amini M, Khadivi R, Haghighi S. Costs of type 2 diabetes in Isfahan, Iran. Iranian Journal of Endocrinology & Metabolism 2002;4:104-97.
17. Krishnan S, Cozier Y, Rosenberg L, Palmer JR. Socioeconomic status and incidence of type 2 diabetes: Results from the Black Women's Health Study. Am J Epidemiol 2010;171:546-70.
18. Everson SA, Maty SC, Lynch JW, Kaplan GA. Epidemiologic evidence for the relation between socioeconomic status and depression, obesity, and diabetes. J Psychosom Res 2002; 53(4):891-5.
19. Schootman M, Andresen EM, Wolinsky FD, Malmstrom TK, Miller JP, Yan Y, *et al*. The effect of adverse housing and neighborhood conditions on the development of diabetes mellitus among middle-aged African Americans. Am J Epidemiol 2007;166:379-87.
20. Robinson N, Lloyd CE, Stevens LK. Social deprivation and mortality in adults with diabetes mellitus. Diabet Med 1998;15:205-12.
21. UK prospective Diabetes Study Group. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). Lancet 1998;352:837-53.
22. Larrañaga I, Arteagoitia JM, Rodriguez JL, Gonzalez F, Esnaola S, Piniés JA, *et al*. Socio economic inequalities in the prevalence of Type 2 diabetes, cardiovascular risk factors and chronic diabetic complications in the Basque Country, Spain. Diabet Med 2005;22:1047-53.
23. Antonovsky A. Social class, life expectancy and overall mortality. Milbank Mem Fund Q 1967;45:37-73.
24. Rappaport J. Terms of empowerment/exemplars of prevention: Toward a theory for community psychology. Am J Community Psychol 1987;15:121-48.