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Diabetes Awareness among non-diabetic Saudi population in Al- Riyadh City, Saudi Arabia

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Abstract

The prevalence of type 1 and type 2 diabetes is very high in the Kingdom of Saudi Arabia. This continued rise in type 1 diabetes is due to changes in the people life style associated with a strong economy in the past few decades, whereas the type 2 has mainly the genetic component like consanguinity and several other factors. The outcome of diabetes is manifested as an elevated blood sugar levels, and in several patients, it goes unnoticed for an extended period of time. Moreover, among patients suffering from the disease, the nondiabetic family members and friends have a significant role in the management of diabetes. As such this study was specifically designed to evaluate the knowledge and perception of nondiabetic people regarding diabetes in several avenues like general characteristics of the disease, risk factors associated and complication for the people suffering from either type 1 or type 2 diabetes. In the general knowledge domain, one-third of the study population consider diabetes as a curable and same ratio is not aware that diabetes is a condition having elevated blood sugar levels. Importantly, a vast majority of the study population believes diabetes as an infectious disease (83%). In the domain of risk factors non-diabetic people knowledge showed mixed trends, however, a vast majority is unaware of complications associated with this disease. The knowledge manifested by the study participants is based on the information gathered from the friends, family members, and the media, and the contribution of health care professionals in providing public health knowledge relevant to disease is just 19%. Importantly, an in depth statistical evaluation revealed that males participants of this study have relatively better knowledge when compared with females about the disease strongly associated with their level of education. This study not only highlights the prevalence of diabetes, associated knowledge among the nondiabetic individuals as well as seminal thus requiring further extensive surveys for implementing programs aimed at the management of this disease appropriately.

Keywords: *Diabetes Awareness; Non-Diabetic Individuals; Type 1 Diabetes; Type 2 Diabetes; Saudi Arabia*

Introduction

Diabetes is a chronic disease manifested as the inability of the body to utilize glucose thus increasing its levels in the blood [1]. Humans suffer with three major types of diabetes including type 1 diabetes also known as insulin dependent diabetes associated with the deficiency of hormone insulin that is involved in the utilization of dietary carbohydrates [2]. Type 2 diabetes is linked with the insulin insensitivity, and third category gestational diabetes temporarily occurs during pregnancy [3]. In the year 2013, the global estimates suggest 382 million individuals suffering from diabetes that is expected to rise 592 million by the year 2035 based on the existing trends and changes in life styles of people [4]. Such dramatic increase in the number of individuals suffering from this disease and future projected trends are a major challenge for the health system of almost every nation.

In the Saudi Arabia, both diabetes 1 and 2 have been major issues, and overall the prevalence trend has been on the rise. A major factor linked with this issue is the change in life style from traditional style that involved an enormous amount activity to modern style mainly related to the better economy over the past few decades [5,6]. Relative prevalence of diabetes 2 is higher in the Saudi Arabia due to genetic predisposition besides consanguinity and several other factors [7]. Certain reports suggest the prevalence of Diabetes mellitus (DM) in Saudi Arabia as one of the highest in the world, estimated to be as high as 23.7% [8]. As far as the mortality associated with diabetes is concerned, it is one of the five leading causes of death [9].

Besides significant mortality and an adverse impact on the quality of life diabetic individuals are at risk of acquiring several other ailments like heart disease, stroke, high blood pressure, blindness, kidney disease, cognitive disorders, dental disease, and complications of pregnancy [10]. As the hallmark of diabetes is an elevated level of glucose in the blood, it is possible to implement dietary control and other management strategies lessening the deleterious impact of high blood glucose levels. Knowledge and awareness about diabetes, its risk factors, complications, and management are therefore important aspects of ensuring better control of the disease and improved quality of life [11].

As described above diabetes prevalence is relatively higher in the Saudi Arabia. The pathogenesis of the disease is mainly not recognized at initial stages, and many sufferers only become aware when they develop the disease and associated complications. Healthcare professionals, as well as public policy makers, are well aware of the public health impact of diabetes. Much effort has been devoted to educating the public about diabetes through various forms of media [12].

The diabetes is a silent disease, and in a nation where the prevalence is at higher levels almost every individual is prone to illness and should be aware of the requisite knowledge about diseases that can be managed through diet and life style like diabetes. Given the etiology of disease, this study aimed to assess the level of awareness of diabetes among nondiabetic individuals in Al-Riyadh, Kingdom of Saudi Arabia, as well as the factors affecting awareness levels. Knowledge gaps and/or misconceptions were also identified in a number of areas related to the disease. Based on the outcomes of this study, the health care professionals will be better equipped to make fundamental decisions regarding the best ways to raising awareness among nondiabetic individuals, as prevention is better than a cure. Awareness is one important means of reducing incidences of early onset of diabetes and its associated complications. An appropriate awareness will help in reducing the burden of the disease in the Kingdom of Saudi Arabia; diabetes is a major public health issue.

Materials and Methods

Study Design and Population

This cross-sectional community-based study was conducted in the eastern part of Al-Riyadh city in the Kingdom of Saudi Arabia. The number of individuals participating in this study from each province was decided based on the population structure as per the 2014 census (Department of Statistics, 2014, Riyadh, Saudi Arabia). The sample size was calculated to estimate the proportion of subjects having adequate knowledge with 95% confidence. As there is no information available as far as the knowledge relevant to diabetes, it was presumed that, in each province, 50% of the subjects had adequate knowledge in order to get the maximum sample size. A multistage random cluster technique was employed for sampling.

Data Collection

The data was collected during March 2014 to June 2015. A pre-piloted questionnaire was used to collect data from the consenting individuals during visits to homes and public places such as Estarahes (party lounges) and markets. This well-designed and approved questionnaire contained a series of questions related to participants' demographic characteristics (5 questions) and awareness of diabetes, including general knowledge (5 questions), risk factors (3 questions), symptoms (4 questions), and complications (3 questions). Additionally, participants' sources of information on diabetes were also recorded. The questions were translated into the Arabic language for better understanding by the participants. All the questions were closed-ended with the only possible answers being 'yes' or 'no'.

Ethical Considerations

This study was approved by the Saudi Society of Endocrinology and Metabolism in Riyadh city and considered as an exempt as there is no harm involved to the participants. Furthermore, no personal information was collected except screening the consenting individuals for their eligibility. Participation was voluntary and verbal consent was acquired from each participant. Confidentiality of all participants was maintained as no names were mentioned in the questionnaires.

Statistical Analysis

Statistical Packages for the Social Sciences (SPSS) version 13.0 was utilized for data analysis. The demographic variables of participants were expressed as number (%). For calculation of mean knowledge score of diabetes (general, risk factors, symptoms, complications), the correct answer was given one point, while incorrect and unsure answers were given zero. The mean score for each section (general knowledge, risk factors, symptoms, and complications) was calculated based on the total possible score in each category (5, 3, 4, 3, respectively); then, it was expressed as mean ± standard deviation (SD) and also as percentage of total score in each category. The calculation of mean diabetes knowledge score was based on the total score of the four mentioned sections (that is, it was based on a total of 15 marks). Odd ratios were calculated using Win Episcope (version 2.0) to find the association between some demographic variables (age, gender, education, and occupation) and sound knowledge of DM.

Results

Demographic Data of Participants

Three hundred questionnaires were distributed among the consenting individuals and among these 278 (92.66%) completely filled questionnaire. The male population in the study represented 61.87%, and the rest were females. Almost 75% of the study participants ages were less than 34 years suggesting that majority of responding individuals are young. As far as the education level is concerned male participants in this study were more literate comparing with females. Approximately, 52.1% of the survey participant men have acquired secondary or high education level when compared with women that were 26.6%. The majority of the female participants in this study were almost illiterate. The students comprised half the population of this study. The demographic data of study participants are outlined in table 1.

	Male respondents	Female respondents	Total
Respondents Age	172 (61.87%)	106 (38.13%)	
15 - 23	86 (30.8%)	53 (18.8%)	139
24 - 33	50 (17.8%)	28 (10.1%)	78
34 - 44	23 (8.4%)	16 (5.9%)	39
45 - 54	10 (3.6%)	7 (2.6%)	17
55 - 64	3 (1.2%)	2 (0.8%)	5
Level of Education			
Intermediate	26 (9.7%)	32 (11.5%)	58
Secondary	61 (21.8%)	28 (10.1%)	89
University	76 (27.2%)	43 (15.5%)	119
Postgraduate	9 (3.1%)	3 (1.1%)	12
Occupation			
Student	87 (31.2%)	53 (19.1%)	140
Private/Govt. Job	62 (22.4%)	18 (6.3%)	80
Health Professional	8 (2.7%)	1 (0.4%)	9
Housewives	0 (0%)	31 (11.5%)	31
Retired- workers –others	15 (5.3%)	3 (1.1%)	18

Table 1: *Demographic characteristics of diabetes study participants.*

General Perception/Knowledge of public about Diabetes

Public health education is crucial in controlling the preventable/manageable diseases like diabetes [13]. The consenting participants' responses relevant to diabetes associated knowledge were recorded in reference to general perception about the disease, risk factors linked with the diabetes onset, symptoms linked with the illness predisposition and complications linked with the disease. Table 2 shows the mean (± SD) values of diabetes knowledge score of all participants that were 10.11 ± 1.02 out of a total score of 15. The performance for general knowledge of diabetes was reasonable. However, only 31.3% of subjects answered that diabetes is a non-curable disease, although all participants (100%) had heard of diabetes.

	General knowledge	Risk factors	Symptoms	Complications	Overall
Total score	5 marks	3 marks	4 marks	3 marks	15 marks
Mean ± SD	1.01 ± 03.55	0.93 ± 01.90	1.15 ± 03.23	0.98 ± 01.43	1.02 ± 10.11
Percentage	71.1%	63.4%	80.8%	47.7%	67.4%

Table 2: *The mean knowledge score and the mean scores for general knowledge, risk factors, symptoms, and complications of diabetes (values expressed as mean ± SD and as percentage)*

General knowledge of each participant relevant to diabetes was evaluated by asking questions: i) Have you heard about diabetes? ii) Is diabetes a curable disease?, iii) Is diabetes a condition of high blood sugar?, iv) Is diabetes an infectious disease?, v) Is diabetes a disease related to insulin? The percentages of correct responses regarding DM general knowledge from five questions were 100, 31.3, 68.8, 83.4, and 72.5%, respectively. Furthermore, the data showed that the knowledge of risk factors and symptoms of diabetes was 63.4% and 80.8%, respectively. The majority of the people believe diabetes as an infectious disease (83%) a general misconception prevailing in the society.

The questions asked to evaluate knowledge of risk factors and symptoms were: Is diabetes an inherited disease? Does obesity lead to diabetes? Is the risk of having diabetes more common after 40 years? Almost 72% of the respondents believe diabetes as genetic disorders whereas the rest 28% consider it as a non-genetic disorder. People having general beliefs on obesity linkage with diabetes and prevalence of disease linked with age > 40 were 62 and 55% respectively.

Nondiabetic individuals evaluated in this study were mainly aware of the disease symptoms like thirst (90%), excessive urination (83%), delayed healing processes 75%) and tiredness feelings (74%). As far as the complications linked with elevated blood sugars are concerned, people have relatively lesser awareness as manifested from the results. Regarding knowledge of complications of diabetes, the lowest score was obtained (47.7%) concerning kidney problems (40.5%) and high blood pressure (41.2%), while knowledge on complications with eye problems was 61.7%.

Questionnaires on knowledge of DM

	General knowledge	Yes	No
1	Have you heard about diabetes?	278 (100%)	0 (0%)
2	Is diabetes a curable disease?	87 (31.3%)	191 (68.7%)
3	Is diabetes a condition of high blood sugar?	191 (68.8%)	87 (31.2%)
4	Is diabetes an infectious disease?	232 (83.4%)	46 (16.6%)
5	Is diabetes a disease related to insulin?	201 (72.5%)	77 (27.5%)
	Knowledge of risk factors	**Yes**	**No**
1	Is diabetes an inherited disease?	200 (71.9%)	78 (28.1%)
2	Do obesity lead to diabetes?	173 (62.3%)	105 (37.7%)
3	Is the risk of having diabetes more common after 40 years?	156 (55.9%)	122 (44.1%)
	Knowledge of symptoms	**Yes**	**No**
1	Is a constant feeling of thirst a symptom of diabetes?	250 (90.0%)	28 (10.0%)
2	Is frequent urination a symptom of diabetes?	232 (83.5%)	46 (16.5%)
3	Is slow healing of cuts a symptom of diabetes?	209 (75.4%)	69 (24.6%)
4	Is tiredness and weakness a symptom of diabetes?	206 (74.2%)	72 (25.8%)
	Knowledge of complications	**Yes**	**No**
1	Kidney problems	112 (40.5%)	166 (59.5%)
2	Cardiovascular diseases	115 (41.2%)	163 (58.8%)
3	Eye complications	171 (61.7%)	107 (38.3%)

Association of demographic variables with sound knowledge

In table 3, odd ratios were calculated to assess the association between demographic variables (gender, age, educational level, and occupation) and adequate knowledge (mean score 10 out of 15). Data showed that males were nearly twice as likely to have sound knowledge of diabetes compared to females (OR 0.569; 95% CI 0.471 to 0.687). Moreover, age and level of education seem to have had a positive effect on increased awareness/perception of diabetes. The analysis also revealed that those who were involved in the health professional services were 6.97 times more likely to have sound knowledge of diabetes (OR 6.968; 95% CI 3.282 to 14.791), followed by housewives and employees.

Category		Odds ratio (OR)	95% Cl
Gender	Male (reference category)	1	
	Female	0.569	0.471 - 0.687
Age	15 - 23 (reference category)	1	
	24 - 33	2.416	1.944 - 3.003
	34 - 44	3.962	2.917 - 5.382
	45 - 54	4.105	2.635 - 6.395
	55 - Above	2.705	1.365 - 5.362
Education Level	University or higher	1	
	Secondary	0.423	0.343 - 0.520
	Intermediate	0.356	0.273 - 0.464
Occupation	Student (reference category)	1	
	Employee (private/govt.)	2.537	2.039 - 3.157
	Health Professional	6.968	3.282 - 14.791
	Housewives	2.710	1.981 - 3.707
	Retired/workers	1.749	1.209 - 2.541

Table 3: *Logistic regression model for factors associated with sound knowledge of DM among participants.*

Sources of Information

Relatives and friends, in addition to media, represented the major sources of information on diabetes (73.8 and 47.1%, respectively), while healthcare professionals have the least contribution (19.1%). Participants' sources of information on diabetes have been illustrated in figure 1.

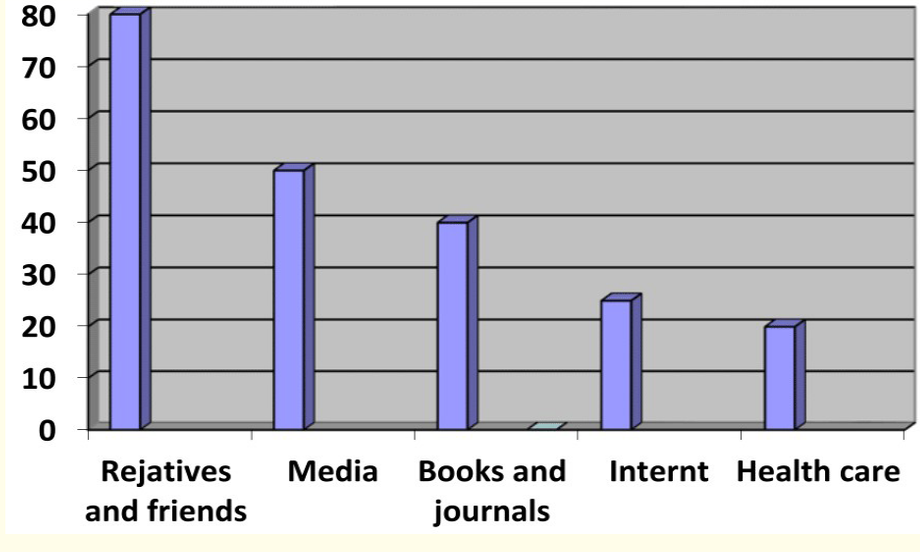

Figure 1: *Percentage of participants for each source of information on Diabetes.*

Discussion

The present study was specifically designed to evaluate the general perception of knowledge of nondiabetic individuals in the city of Riyadh the Kingdom of Saudi Arabia. The prevalence of diabetes is very high in this nation [14,15]. A major issue with this disease is that

people are unaware of illness and among the risk factor reduced compliance with the healthy life style and intake of sweets is a major predisposing factor [16]. This study demonstrates that the overall mean diabetes knowledge score was 10.11 (± SD) 1.02 ± out of a total score of 15. This adequate level of knowledge may be attributed to the level of education of participants in this study, as 74.5% of them had either secondary or university education. Logistic regression analysis confirmed the association between level of education and increased knowledge of diabetes.

The data is consistent with previous studies from other parts of the world that showed an association between level of education and an increase in diabetes knowledge [17,18]. Despite the overall good understanding of diabetes, critical knowledge gaps and misconceptions relevant to the disease have been identified for targeted health education efforts. Although approximately three-quarters of the participants were between 15 and 33 years old with secondary or university education, a substantial proportion (83%) of participants believed that diabetes is an infectious disease.

In fact, diabetes is a chronic disease that requires ongoing monitoring and treatment [19]. A cross sectional study by Sabra., *et al*. conducted in Eastern Saudi Arabia among primary health care center attendees that a quarter of participants (n = 1030, of whom 92% were Saudi) revealed general misconceptions among diabetes treatment. The Saudi's people suffering from diabetes have a general belief that once the blood sugar level is controlled, there is no need for the continuation of disease management and treatment [20]. As diabetes get unnoticed among several individuals in the early days, and such misconceptions can further exacerbate the people who are suffering from this disease besides encouraging the healthy persons or the one in the early stage of sickness to avoid proper managements of the disease. This scenario may lead to an increased number of diabetic cases over the coming years in the region, especially due to increasing urbanization and general changes in behavior patterns and sedentary lifestyles. Saudi Arabia has experienced a rapid growth in wealth over a relatively short period of time as a consequence of the financial gains rendered by the oil industry, paralleled with swift industrialization and urbanization [21].

The knowledge of risk factors and symptoms of diabetes was 63.4 and 80.8%, respectively. Our findings are in contrary to a previous study from the same region that suggested: "the lack of knowledge of risk factors of diabetes in Eastern Saudi Arabia" [22]. A better understanding relevant to the symptoms of diabetes observed in this study imply a high prevalence of the disease among the Saudi population in this region. Intriguingly, the respondents of this study in spite of having a sound knowledge of risk factors and symptoms of diabetes manifested significant knowledge gaps and misconceptions regarding the complications associated with this disease (47.7%) among a Saudi non-diabetic population in the eastern part of Al-Riyadh city. Only 41.2% of participants were aware that one of the complications of diabetes is high blood pressure. In fact, hypertension is a common comorbid condition, occurring at least twice as frequently in patients with diabetes as in the non-diabetic population [23].

Based on this lack of knowledge regarding hypertension as a complication of diabetes, it could be expected that the population has limited awareness of the fact that diabetic patients may develop a silent form of myocardial infarction (MI). Hence, the control of blood pressure is equally important as the control of blood sugar in type 2 diabetes [24].

It is important to mention here that in spite of ample knowledge relevant to the diabetes people pay relatively lesser attention to complications of diabetes like eye disorders [25,26], kidneys malfunctioning [27-29] and cardiovascular ailments [30,31]. The clinicians have to educate patients about the complications of diabetes and so is the critical role of the public health department. Unfortunately, similar findings have been reported from other countries in this region like Pakistan [32]. It was observed Pakistani diabetic patients suffering from the disease are almost unaware of the complications linked to this illness (~88%). This situation is alarming particularly for the countries having a high prevalence of diabetes. Other countries like Malaysia and India have recognized the need for efforts in educating the general population about complications of DM was reported in India and Malaysia [33].

Regarding the sources of information about diabetes among the participants, health care professionals represented the lowest percentage in contributing towards public health relevant knowledge (19.1%). Almost the same proportion (17.8%) was reported by Sabra., *et al*. from Eastern Saudi Arabia [20]. Enhanced awareness about diabetes and associated complications can help in better care for the people suffering from this disease as well as the family and friends who are not having this disease, however, can help their loved ones in disease management. Echoing with this idea a study concludes that "there is a serious gap in the provision of essential educational services to the majority of people with diabetes in the region" mainly Saudi Arabia [20]. Primary health care (PHC) is the first level of professional contact in the community and forms the cornerstone strategy for the attainment of a level of health that will permit a socially and economically productive life [34].

This highlights the need for strengthening efforts towards educating the general population about diabetes within the public health centers. This may be achieved by using audiovisual aids, as well as posters showing patients with diabetes complications and their consequences, such as lower limb amputation, blindness, and renal dialysis. Thus, the general population (whenever they visit PHC) will be confronted with the ugly face of diabetes.

Conclusions

To the best of our knowledge, this is the first report to examine the knowledge and perception of diabetes among Saudi non-diabetic population in the eastern part of Riyadh city. Our data shows that the non-diabetic population in the east part of Al-Riyadh city have enough general knowledge of diabetes regarding risk factors, symptoms, etc. However, they are not very well aware of the secondary complications associated with diabetes. Furthermore, the majority of the young population hold the misconception that diabetes can be cured.

Therefore, our study suggests integrated efforts for increasing knowledge of diabetes and its associated secondary complications, in particular among the youth.

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