

*Full Length Research Paper*

# Awareness of diabetes mellitus among Saudi non-diabetic population in Al-Qassim region, Saudi Arabia

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An understanding of the level of public awareness of disease conditions is helpful for health educators to plan for future programmes. This descriptive cross-sectional study was conducted for the very first time in the central region of Saudi Arabia; to evaluate the awareness level of diabetes mellitus among non-diabetic population. A total of 2007 Saudi citizens from all 11 provinces of Al-Qassim region were evaluated. The participants' response rate was 91.23% and each participant was asked to answer a total of 21 questions from a pre-piloted questionnaire. Statistical analysis was done utilizing SPSS version 13.0. The mean age ( $\pm$ SD) and age range of the study participants were  $26.6 \pm 10.2$  and 15 to 68 years respectively, and the gender ratio was 1.6 male: 1.0 female. Out of the participants, 77.4% aged between 15 and 33 years. The diabetes knowledge score among the study subjects was 67.4%, whereas general knowledge regarding the disease, risk factors, symptoms and complications were 71.1, 63.4, 80.8 and 47.7% respectively. Furthermore, relatives and friends, in addition to media, were the major sources of information (73.8 and 47.1% respectively). Logistic regression analysis revealed that, males were nearly twice more likely to have better knowledge of disease as compared with females (OR 0.569; 95% CI 0.471 to 0.687). About two thirds of the study subjects believed that, diabetes is a curable disease. Moreover, the study revealed the serious unawareness of diabetes associated secondary complications. Only 19.1% of participants were found to have knowledge about diabetes from the healthcare professionals. This indicates that, there is need of more efforts for educating general population about diabetes and its associated secondary complications.

**Key words:** Awareness, knowledge, diabetes mellitus, non-diabetic, young population, Al-Qassim region.

## INTRODUCTION

Diabetes mellitus (DM) remains to be an expanding global health crisis, from 30 million people affected 10 years ago to about 135 million today, and an estimated 300 million by 2025 (Hjelm et al., 2003). In Saudi Arabia, DM has become more evident in the last two decades as a result of dramatic changes in the life style (Ammari, 2004). The prevalence of DM in Saudi Arabia is now considered one of the highest in the world reaching as high as 23.7% (Alwakeel et al., 2009). DM is one of the five leading causes of death worldwide (Caliskan et al., 2006). Moreover; individuals with diabetes are at higher risk of heart disease, stroke, high blood pressure, blindness, kidney disease, nervous system disease,

amputations, dental disease, and complications of pregnancy (Akinci et al., 2003).

Knowledge and awareness about DM, its risk factors, complications and management are important aspects for better control and better quality of life (Wild et al., 2004; Angeles-Lierenas et al., 2005). Many sufferers become aware that they have diabetes, only when they develop one of its life-threatening 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 educate the public about diabetes through various forms of media (Wee et al., 2002). Still in Al-Qassim region, it is not known how much the public actually know about diabetes and its associated secondary complications. This study aimed to assess the level of awareness of DM among non-diabetic individuals in Al-Qassim region, Kingdom of Saudi Arabia (KSA). The deficiencies and/or the misconceptions can be

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identified in the related areas. Based on the outcomes of the study, the authorities will be able to decide about the need to increase the level of awareness among the non-diabetic individuals. As prevention is better than cure, awareness is always helpful to reduce the incidence of earlier onset of DM and its associated complications. This should be very helpful to reduce the additional burden of the disease to the nation, as in KSA; DM is one the major public health issue.

## **MATERIALS AND METHODS**

### **Study design and population**

This cross-sectional community-based study was conducted throughout the Al-Qassim region which lies approximately at the centre of the Arabian Peninsula. Al-Qassim region has been divided into 11 provinces, Buraida, Onaiza, Al-Rass, Al-muthnab, Al-Bekaria, Al-Badaei, Al-Asyah, Al-Nabhania, Oyon Jawa, Riad Khobara, and Al-Shamasia. The study samples were collected from each province, size of which depended upon the population structure of each province as per the 2004 census (Department of Statistics, 2004). The sample size was calculated to estimate the proportion of subjects having adequate knowledge with 95% confidence. Since this was not available for Al-Qassim region, it was assumed that in each province, 50% of the subjects had adequate knowledge in order to get maximum sample size. A multi-stage random cluster technique was employed for sampling.

### **Data collection**

The data was collected from July 2009 to March 2010. A total of 2007 Saudi citizens participated in this study. Inclusion criteria for the study subjects were Saudi citizen, age  $\geq 15$  years, neither having been diagnosed as diabetes nor using any hypoglycaemic medication. Data was collected using pre-piloted questionnaires during the visits to homes and public places that is Estarahes (party lounges), markets. The questionnaire contained a series of questions related to participant's demographic characteristics (5 questions) and awareness of DM including general knowledge (5 questions), risk factors (3 questions), symptoms (4 questions), and complications (3 questions). Additionally, participant's sources of information on diabetes were recorded. The questions were translated into Arabic language for better understanding of the participants. All the questions were closed-ended with the only possible answer of yes, no, or unsure.

### **Ethical consideration**

Ethical approval was obtained from the Ethics and Research Committee of Qassim University. 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 (5, 3, 4, 3 respectively); then it was expressed as mean  $\pm$  standard deviation (SD) and also as percentage of total score in each. The calculation of the mean diabetes knowledge score was based on the total marks 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 good knowledge on DM.

## **RESULTS**

### **Demographic data of participants**

2200 questionnaires were distributed; with a response rate of 91.23%. Males represented 61.83% of the participants. The age of more than three-quarter of the participants was below 34 years. Males were approximately twice educated as secondary or higher education compared to females (52.1 vs. 26.6%). Large percentage of females were uneducated, while students represented almost half of the participants. The demographic data is represented in Table 1.

### **General knowledge of public about DM in Al-Qassim region**

As shown in Table 2, the mean ( $\pm$ SD) diabetes knowledge score of all participants was  $10.11 \pm 1.02$  out of a total score of 15. The performance about the general knowledge of DM was good. However, only 31.3% subjects answered that diabetes is a non-curable disease, although all participants (100%) had heard about DM. General knowledge of DM was evaluated by asking the following questions: Have you heard about DM?; Is DM a curable disease?; Is DM a condition of high blood sugar?; Is DM an infectious disease?; Is DM a disease related to insulin? The percentages of correct responses regarding DM general knowledge 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 for diabetes was 63.4 and 80.8% respectively. The questions raised to evaluate the knowledge of risk factors and symptoms were: Is DM an inherited disease? May obesity lead to DM? Is the risk of having DM more common after 40 years? Is constant feeling of thirst a symptom of DM? Is frequent urination a symptom of DM? Is slow healing of cuts a symptom of DM? Is tiredness and weakness a symptom of DM? The percentages of correct responses for the seven questions regarding risk factors and symptoms were 71.9, 62.3, 55.9, 90.0, 83.5, 75.4, and 74.2% respectively. Regarding knowledge about complications of DM, the score was the worst (47.7%) concerning kidney problems (40.5%), and

**Table 1.** Demographic characteristics of participants (n = 2007) (values expressed as number (%)).

Gender	Males number (%) 1241 (61.83)	Females number (%) 766 (38.17)	Total 2007
Age years			
15-23	618 (30.8 )	377 (18.8)	995
24-33	357 (17.8 )	202 (10.1)	559
34-44	168 (08.4 )	118 (05.9)	286
45-54	073 (03.6)	053 (02.6)	126
55-64	018 (00.9)	011 (00.5)	029
≥ 65	007 (00.3)	005 (00.2)	012
Level of education			
illiterate	007 (00.3)	055 (26.6)	062
Primary	021 (01.0)	038 (01.9)	059
Intermediate	168 (08.4)	137 (06.8)	305
Secondary	437 (21.8)	202 (10.1)	639
University	545 (27.2)	311 (15.5)	856
postgraduate	063 (03.1)	023 (01.1)	086
Occupation			
Student	624 (31.1 )	384 (19.1)	1008
Private/Gov Job	449 (22.4)	126 (06.3)	0575
Health Professional	055 (02.7)	007 (00.3)	0062
Housewives	000 (00.0)	232 (11.6)	0232
Retired/workers/others	106 (05.3)	024 (01.2)	0130

**Table 2.** The mean diabetes knowledge score and the mean scores for general knowledge, risk factors, symptoms, and complications of DM in Al-Qassim region (n = 2007), (values expressed as Mean ± SD and as percentage).

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

high blood pressure (41.2%), while knowledge concerned about complication with eye problems was 61.7%.

### Association of demographic variables with good knowledge

In Table 3, odd ratios were calculated to assess 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 more likely to have good knowledge on DM compared to females (OR 0.569; 95% CI 0.471 to 0.687). Moreover, increasing age as well as having high education seem to have positive effect on

increasing awareness about DM. Analysis also revealed that, those who involved in health professional services were 6.97 times more likely to have good knowledge of DM (OR 6.968; 95% CI 3.282 to 14.791) followed by housewives and employees.

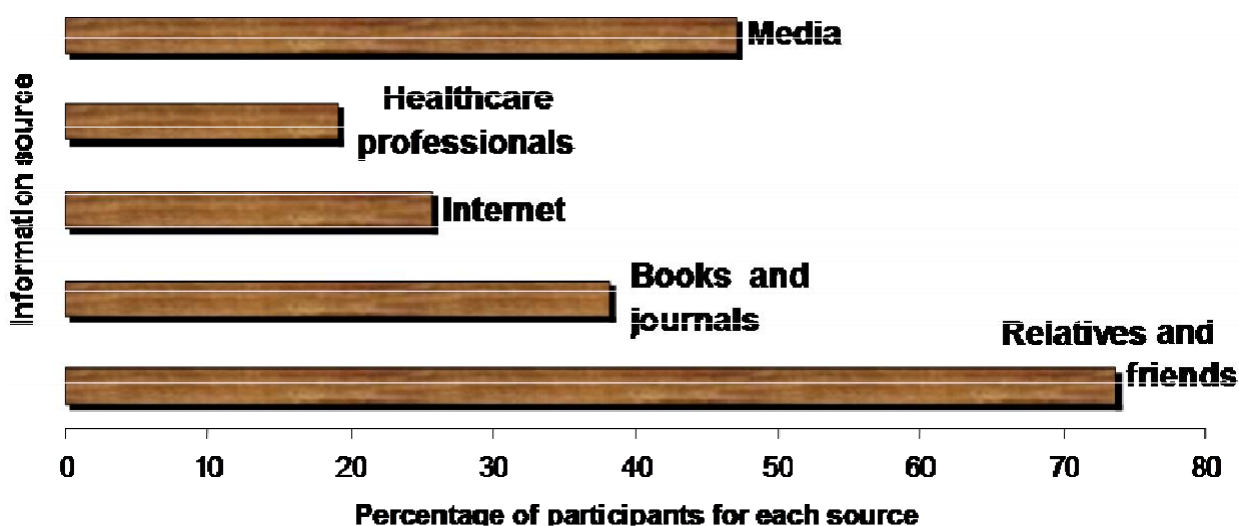
### Sources of information

Relatives and friends, in addition to media represented the major sources of information on diabetes (73.8 and 47.1% respectively), while healthcare professionals represented the lowest source of knowledge (19.1%). Participants' sources of DM information in Al-Qassim region have been illustrated in Figure 1.

**Table 3.** Logistic regression model for factors associated with good knowledge\* of DM among participants in Al-Qassim region (n = 2007).

Category		OR	95% CI
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	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
	Primary	0.158	0.088 – 0.286
	Illiterate	0.202	0.117 – 0.351
Occupation	Student (reference category)	1	
	Employee (private/govern.)	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

\*Considered good knowledge if the mean score  $\geq 10$  out of 15. Abbreviations: OR= odd ratio; CI: confidence interval.



**Figure 1.** Participants' sources of information about DM in Al-Qassim region (n = 2007).

## DISCUSSION

The present study demonstrates that the overall mean ( $\pm$ SD) diabetes knowledge score in Al-Qassim region was  $10.11 \pm 1.02$  out of a total score of 15. This adequate 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 that, this association between level of education and the increase in knowledge of DM. The data is consistent with previous studies from other parts of the world, that showed the association between level

of education and the increase in DM knowledge (Kamel et al., 1999; Caliskan et al., 2006; Powell et al., 2007; Al Shafae et al., 2008). Despite the overall good knowledge of DM, areas of deficiency and misconception have been identified for targeted health education effort. Although approximately three-quarter of the participants were between 15 and 33 years old with secondary or university education, a substantial proportion (68.7%) of participants believed that diabetes can be cured.

In fact, DM is a chronic disease that requires ongoing monitoring and treatment (Grandy et al., 2008). Recently, Sabra et al. (2010) have reported in their cross-sectional study conducted in Eastern Saudi Arabia among primary health care centres attendees, that a quarter of the attendees ( $n = 1030$ , of whom 92% were Saudi) held the misconception that, treatment should be stopped if diabetes is well controlled for months. This misconception for the majority may lead to an increased number of diabetics over the next years in the region, especially due to increasing urbanisation and general changes in behaviour patterns and sedentary lifestyles. Saudi Arabia has experienced a rapid increase 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 (Al-Daghri et al., 2007; Al-Attas et al., 2009).

The knowledge of risk factors and symptoms of DM was 63.4 and 80.8% respectively. This result is in contrast to Aljouidi and Taha (2009) who reported "the lack of knowledge of risk factors of DM in Eastern Saudi Arabia". The underestimation of the risk factor level in Aljouidi and Taha study may be due to the usage of open-ended questions. Moreover, the good knowledge on the symptoms of DM in this study, may imply the high prevalence of DM among Saudi population in Al-Qassim region. Unlike good knowledge on risk factors and symptoms of DM, this study revealed serious levels of unawareness about the complications of DM (47.7%) among Saudi non-diabetic population in Al-Qassim region. Only 41.2% of participants showed to have knowledge 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 DM as in the non-diabetic population (Feldstein et al., 2002). This lack of knowledge regarding hypertension as a complication of DM, may lead to expect the limited knowledge about the fact that diabetic patients may develop a silent form of myocardial infarction (MI). Hence, the control of blood pressure is at least as important, if not more important, as the control of blood sugar in type 2 diabetes (Stewart et al., 2005).

Awareness about complications of DM was found to be similarly low in Pakistan. Ulvi et al. (2009) reported that, approximately 88% of respondents in that study were unable to say that, they had any idea as to what the complications of diabetes might be. Moreover, this demand for required efforts to educate general population

about complications of DM was reported from India and Malaysia (Murugesan et al., 2007; Yun et al., 2007). Regarding the sources of information about DM among the participants, the healthcare professionals represented the lowest percent (19.1%). Around the same percentage (17.8%) was reported by Sabra et al. (2010) from Eastern Saudi Arabia. In support of this view, Al -Rubeaan (2003) claimed that "there is a serious gap in the provision of basic educational services to the majority of people with diabetes in the region". Primary health care (PHC) is the first level of professional contact in the community and forms the corner-stone strategy for the attainment of level of health, that will permit socially and economically productive life (Oparah and Arigbe-Osula, 2002). This highlights the need for more efforts about educating general population about DM within the PHC. This may be achieved by using audio-visual aids, as well as posters showing patients with diabetes complications and their consequences such as lower limb amputation, blindness, and renal dialysis. Thus, it will be clear to the general population (whenever they visit PHC) to see the ugly face of DM.

## Conclusions

This is the first report to show the knowledge of diabetes among Saudi non-diabetic population in Al-Qassim region. Our data shows that, non-diabetic population in Al-Qassim region has enough knowledge of the general knowledge of diabetes regarding risk factors, symptoms, etc. However, they are not very well aware of the diabetes associated secondary complications. Furthermore, the majority of young age population have the misconception that diabetes can be cured. Therefore, our study suggests that more efforts should be made to increase the knowledge of diabetes and its associated secondary complications especially among young population.

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