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# Awareness regarding diabetes mellitus' risk factors and preventive measures among Saudi adult population in Riyadh

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***Abstract:*** *Objectives: The aim of the current study was to evaluate the awareness regarding diabetes mellitus' risk factors and preventive measures among Saudi adult population in Riyadh.*
*Methods: A descriptive design was used in this study, with a convenient sample of 315 Saudi adults older than 20 years and resident of Riyadh were participated in the study. Data was collected through a questionnaire that consisted of 4 sections, the first was about the demographic data (age, sex, educational level, and family history of the disease). The second section focused on general knowledge regarding Diabetes Mellitus, and had 11 questions like the definition of diabetes and the types of it... etc., with total score of 11. The third section was about the risk factors which had 15 questions (family history, obesity… etc.) with total score of 15. And the last section was covered the preventive measures (exercise, healthy diet), and also had 10 questions with total score of 10. The total score for all sections is 36, and the greater the score the highest the awareness of the subject.*
*Results: The study includes 315 participants with mean age 33.75±11.28, the majority of them being females. More than half of the participants had a family history of diabetes (69.2%). The mean ± SD of general knowledge about diabetes mellitus, knowledge regarding risk factors, and knowledge of the preventive measures are (8.85 ± 1.82 out of 11, 7.87±2.6 out of 15, 6.73±2.1 out of 10 respectively). The study results showed a high significant relationship between the awareness regarding the general knowledge, risk factors, and preventive measures of diabetes mellitus with F value of 3.41, and P value of .005.*
*Conclusion: There was a significant relationship between the educational level and the awareness regarding general knowledge, risk factors, and preventive measures of diabetes mellitus. The participants had general knowledge about diabetes mellitus, preventive measures (8.85±1.82, 6.73±2.1) respectively, but lack knowledge regarding diabetes mellitus' risk factors (7.87±2.6).*

***Keywords:*** *Awareness, Diabetes mellitus, Saudi Adult*

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## I. Introduction

Diabetes mellitus is one of the chronic diseases that affect the quality of life and has large health costs around the world [1]. The prevalence of diabetes in 2014 around the world was 9% of adults 18 years and older, also in 2012, diabetes mellitus directly caused death of 1.5 million worldwide [2]. It is expected that the prevalence of diabetes mellitus will increase dramatically by 2030 worldwide, and the increasing rate will occur more in the Middle East countries [3]. One of the highest prevalence of diabetes mellitus around the world is Saudi Arabia reaching 23.7% [4]. As reported by the international diabetes federation, there were 3.4 million cases of diabetes mellitus in Saudi Arabia in 2015 [5].

Diabetes mellitus is a chronic disease that needs a long-term treatment and medications and it costs a lot. The estimated cost of treating diabetes and prevent complications worldwide is $465 billion in 2011. By 2030, this number is expected to exceed some $595 billion. The cost per person is $5063 in high-income countries and $271 in low- and middle-income countries [6].Current cost of diabetes mellitus in Saudi Arabia, by estimation, is 17 billion SAR, and if we add the undiagnosed the cost will rise to 27 billion SAR. Also, if those with glucose intolerance become diabetic, the cost will be 43 billion SAR in the future [7].

Diabetes mellitus is a defect in the insulin secretion because of metabolic disease that effects the B-cells function, located in the pancreas, resulting in increased level of glucose in the blood [8]. It is a silence disease that will affect the body slowly and the victim will not notice until it become a life threatening [9]. Many newly diagnosed patients already showing signs of micro- and macro-vascular complications, it is because the disease was undetected for 4 to 7 years [10]. Diabetes Mellitus has been considered the main principle of death primarily as result of increasing rate of CVD (MI, PVD, and stroke) among diabetic clients [11].

With the increasing prevalence of diabetes mellitus, people does not fully understand the importance of behavioral risk factors in causing diabetes [12]. There are some risk factors correlated with the development of diabetes, for example, eating behaviors, physical activity, obesity [13].and socioeconomic factors [14].The rapid economic development, increased urbanization, and the transition have been creating these factors, dietary and lifestyle changes, which lead to elevated in the prevalence of chronic disease [2].In the last 20 years, there was a dramatic change in the Saudi Arabia lifestyle, which is why the DM had been more apparent [15]. In addition, cultural and environmental factors are affecting the behavior changes in life style to manage the disease [16]. Along with decreasing the quality of life, diabetes mellitus and its complication also reduce the ability to work [17].

There is no enough data on the prevalence, awareness, treatment and control of diabetes mellitus [18].Along with the Shortage of facilities for screening of diabetes mellitus and knowing the high-risk groups, not knowing the symptoms and risk factors will hinder the early detection of the disease [19]. In the future, this silent public health problem would force realistic challenges on the healthcare system, also would affect the economy of most developing nations [20]. If the disease is not well controlled, the individuals may develop some complications that lead to increasing the morbidity and mortality [21]. It will lead to many complications like damage to the eye, kidneys, and nerves [22].

For a better control and better quality of life, knowledge and perception about diabetes mellitus, its risk factors, and preventive measures are important [23].There is a clear evidence that increasing physical activity, balancing the body weight, being under healthy or diabetic diet, and using medications are possible options to prevent or delay diabetes. Hence, an important step to stop the increasing rate of the diabetes mellitus is to raise the public awareness about the disease [3].The first step for primary and secondary prevention is knowing the different aspects of the disease. Health care providers can plan the countermeasures for the disease if they know the public's level of knowledge [24].

Because of the shortage in the specialized centers, the needs for the prevention and control have been necessary [25].The health education should encourage going to specialized centers for management and follow-up, also enabling early detection and treatment of complications [26]. Public education should result into diet modification, increased physical exercise and lifestyle changes, along with encouraging weight loss [27].The purpose of the educational programs is to help people assess themselves and recognize their risk factors for developing diabetes mellitus, give them motivation to have proper treatment, and make them independent [28].So the aim of this study is to assess the awareness regarding diabetes mellitus' risk factors and preventive measures among Saudi adult population in Riyadh.

### I.1. Significance of the Study:

One of the highest prevalence of diabetes mellitus around the world is Saudi Arabia reaching 23.7% [4].as reported by the international diabetes federation [5].there were 3.4 million cases of diabetes in Saudi Arabia in 2015. And, because of the limited researches regarding diabetes mellitus in Saudi Arabia, the base of the campaigns weak. Also, there is a lack of institution specialized for diabetes clients. So, to figure out a solution for the high incidence of diabetes mellitus in Saudi Arabia there is a need to assess the awareness regarding diabetes mellitus' risk factors and preventive measures among Saudi adult population in Riyadh.

## II. Material and Methods

**Aim of the study:** to assess the level of awareness regarding diabetes mellitus' risk factors and preventive measures among Saudi adult population in Riyadh.

**Objectives:** to evaluate the awareness regarding diabetes mellitus' risk factors and preventive measures among Saudi adult population in Riyadh and use this result to set new campaigns and increase the institutions specialized for diabetes.

**Research Questions:** what is the level of awareness regarding diabetes mellitus' risk factors and preventive measures among Saudi adult population in Riyadh?

### 2.1. Design

A descriptive study design was used to achieve the aim of the study. A descriptive study is one in which information is collected without changing the environment (i.e., nothing is manipulated) or any study that is not truly experimental. Sometimes these are referred to as "correlational" or "observational" studies (The Office of Human Research Protections).

### 2.2. Setting

The current study was conducted through questioner which was distributed online via google document, and was posted in social media (Twitter, Path, and WhatsApp). Also data was collected from different shopping malls, general markets & gardens.

**2.3. Sample:**
A convenience sample of 315 Saudi were recruited in the current study according to the following inclusion criteria.

- Adult , with an aged range between 20 – 60 years
- Male or female
- Live in Riyadh
- Able to read and write
- Willing to participate in the study
- not engaged in any health profession

**Sample size:** It was calculated using confidence interval of 5 in 5000000 populations, it resulted in 384 sample size, by using this site http://www.surveysystem.com/sscalc.htm.

**2.4. Data collection tools:**

The researchers developed a questionnaire by modifying previous surveys and doing a look-over on the recent updates of the risk factors and preventive measures to accomplish the most recent and accurate information that fit the population in Riyadh. The questionnaire consists of 4 sections, the first is about the demographic data (age, sex, educational level, and family history of the disease). The second is about general knowledge regarding Diabetes Mellitus, and it has 11 questions like the definition of diabetes and the types of it... etc., with total score of 11. The third section is about the risk factors; it has 15 questions (family history, obesity… etc.) with total score of 15. And the last section is about the preventive measures (exercise, healthy diet), and it also has 10 questions with total score of 10. The total score for all sections is 36, and the greater the score the highest the awareness of the subject.

**Validity and Reliability:** Validity is a measure of the truth or accuracy of the finding obtained from a study. Reliability ensure that the research tool is standardized and applied consistently ach time it is implemented [29].The content validity of the tools was assessed by 3 experts in the field and suggested modifications were done. The reliability of the tools also assessed using test retest method, and pilot study with 20 subjects was done to assess the feasibility of the tools and the final update done accordingly with exclusion of the pilot from the study.

**2.5. Pilot study**
A pilot study was done with 35 Saudi adults to assess the instrument's feasibility and applicability and to test needed time for filling the tools. Required modifications were done accordingly and those people were excluded from the study.

**2.6. Ethical considerations**

An explanation of the study was given along with a consent contain the title, aim and authors of the study. All participants were not forced to participate nor seduced by prizes after completing the questioner, and their identities are anonymous. Also, all the data gathered is used for the purpose of the research, and researchers are the only one who are allowed to look at the information.

**2.7. Procedure for data collection:**

After testing the validity and reliability of the tools the researcher created an online version via google documents, which was feature in all google accounts, and made all the questions required so that no question will be missed. Then, when it was posted in social media the researchers asked certain people to spread it in their account and also the researchers went to the shopping malls, gardens & general markets in different setting in Riyadh city to access more participants. The researchers approached any Saudi people that looked older than twenty and explained to them the study and made sure they were not engaged in any health profession, and waited for about 10 minutes for them to complete the questionnaire and the researchers checked if they answered all questions. Data were collected in the period between February and March, 2016.

**2.8. Statistical analysis:**

Data was entered and analyzed using Statistical Package for Social Science software (SPSS version 22); Data related descriptive statistics were summarized using mean as an average, standard deviation as a measure of dispersion of result around the mean. Also frequency and percentage of for each variable studied. The alpha level of .05 was utilized for all tests of significance. The internal consistency of the study tools was conducted using Cronbach alpha.

## III. Results

**Table 1: Socio-demographic information (NO. = 315)**

| variables | | No. | % |
|---|---|---|---|
| **A.1** | Age mean ±SD 33.57±11.28 | | |
| **A.2** | Gender:<br>• Female<br>• Male | <br>• 247<br>• 68 | <br>• 78.4<br>• 21.6 |
| **A.3** | Educational level:<br>• Illiterate<br>• Elementary-high school<br>• Diploma<br>• Bachelor<br>• Master degree<br>• PhD | <br>• 3<br>• 50<br>• 46<br>• 183<br>• 19<br>• 14 | <br>• 1<br>• 15.9<br>• 14.6<br>• 58.1<br>• 6<br>• 4.4 |
| **A.4** | Family history:<br>• Yes<br>• No | <br>• 218<br>• 97 | <br>• 69.2<br>• 30.8 |

Table 1: Showed the socio-demographic Information of the participants, the study includes 315 participants, the mean age is 33.75±11.28 with the majority of them being females (78.4%) , also the educational level of most of the participants were bachelor degree (58.1%) and the least were illiterate (1%). The table also showed that more than half of the participants have a family history of diabetes (69.2%).

| **Table 2: General knowledge about DM (NO. = 315)** | | **Correct Answer** | | **Wrong Answer** | |
|---|---|---|---|---|---|
| | | NO. | % | NO. | % |
| **B.1** | Diabetes is an increase of the sugar level in blood. (True) | 241 | 76.5 | 74 | 23.5 |
| **B.2** | Diabetes is shortage of insulin in blood. (True) | 241 | 76.5 | 74 | 23.5 |
| **B.3** | Diabetes is a condition in which the body doesn't react to insulin. (True) | 162 | 51.4 | 153 | 48.6 |
| **B.4** | Diabetes is infectious disease. (False) | 305 | 96.8 | 10 | 3.2 |
| **B.5** | Diabetes is not controllable. (False) | 265 | 84.1 | 50 | 15.9 |
| **B.6** | Diabetes occur in children, adolescents, and adults. (True) | 309 | 98.1 | 6 | 1.9 |
| **B.7** | Insulin is a hormone that control the sugar level in the blood. (True) | 269 | 85.4 | 46 | 14.6 |
| **B.8** | Insulin can be a drug prescribed for diabetic patient. (True) | 273 | 86.7 | 42 | 13.3 |
| **B.9** | Diabetes is a chronic disease. (True) | 254 | 80.6 | 61 | 19.4 |
| **B.10** | Retinopathy is one of the complication of diabetes mellitus such as (glaucoma and cataracts). (True) | 248 | 78.7 | 67 | 21.3 |
| **B.11** | There are different type of diabetes. (True) | 221 | 70.2 | 94 | 29.8 |
| **Total Mean ± SD** | | 8.85 ± 1.82 | | | |

Table 2: Concerned with the General knowledge about DM. and showed that the mean score of general knowledge about diabetes mellitus of all participant was 8.85 ± 1.82 out of 11, the majority of the participants knew that diabetes occur in children, adolescents, and adults, diabetes is not an infectious disease, diabetes is controllable (98.1%, 96.8%, and 84.1% respectively). While around half of the participants (48.6%) didn't know that "DM is a condition in which the body doesn't react to insulin".

Table 3: Assessed the participants' knowledge regarding risk factors of DM, the mean score was 7.87±2.6 out of 15. Most of the participants knew that Obesity, lack of exercise, presence of family history, and eating unhealthy food (90.5%, 88.9%, 87.6% and 81.3% respectively) are considered risk factors for DM. Although the majority of them didn't know that low birth weight. mental stress, environmental factors like exposure to viral illness (91.1%, 84.1%, and 80.6% respectively) are risk factors for DM. and more than half of them (69.5%, 64.8%, 63.2%, 59.0% and 56.5% respectively) also didn't know that hypertension, smoking, impaired glucose tolerance, high cholesterol level and unhealthy immune system are considered risk factors for DM

| **Table 3:** **knowledge of risk factors of DM (NO. = 315)** | | **Correct answer** | | **Wrong answer** | |
|---|---|---|---|---|---|
| | | No. | % | No. | % |
| **C.1** | Family history. ( True) | 276 | 87.6 | 39 | 12.4 |
| **C.2** | Increasing age.( True) | 198 | 62.9 | 117 | 37.1 |
| **C.3** | Smoking.( True) | 111 | 35.2 | 204 | 64.8 |
| **C.4** | Obesity.( True) | 285 | 90.5 | 30 | 9.5 |
| **C.5** | Regular exercise. ( False) | 280 | 88.9 | 35 | 11.1 |
| **C.6** | Gestational diabetes.( True) | 224 | 71.1 | 91 | 28.9 |
| **C.7** | Low birth weight.( True) | 28 | 8.9 | 287 | 91.1 |
| **C.8** | Mental stress.( True) | 61 | 19.4 | 254 | 80.6 |
| **C.9** | Impaired glucose tolerance.( True) | 116 | 36.8 | 199 | 63.2 |
| **C.10** | Healthy lifestyle. ( False) | 224 | 71.1 | 91 | 28.9 |
| **C.11** | High cholesterol level.( True) | 128 | 40.6 | 186 | 59.0 |
| **C.12** | Hypertension .( True) | 96 | 30.5 | 219 | 69.5 |
| **C.13** | Healthy foods. ( False) | 256 | 81.3 | 59 | 18.7 |
| **C.14** | Environmental factors (exposure to viral illness)( True) | 50 | 15.9 | 265 | 84.1 |
| **C.15** | Healthy immune system. ( False) | 137 | 43.5 | 178 | 56.5 |
| **Mean ±SD** | | 7.87 ±2.6 | | | |

| **Table 4:** **Knowledge regarding the measures of DM preventions (NO. = 315)** | | **Correct answer** | | **Wrong answer** | |
|---|---|---|---|---|---|
| | | No. | % | No. | % |
| **D.1** | Gain Weight.( False) | 212 | 67.3 | 103 | 32.7 |
| **D.2** | Physical activity.( True) | 283 | 89.8 | 32 | 10.2 |
| **D.3** | Healthy diet.( True) | 296 | 94.0 | 19 | 6.0 |
| **D.4** | Ignore stress.( False) | 24 | 7.6 | 291 | 92.4 |
| **D.5** | Quite smoking.( True) | 225 | 71.4 | 89 | 28.3 |
| **D.6** | Regular sleep pattern.( True) | 259 | 82.2 | 56 | 17.8 |
| **D.7** | Test blood sugar regularly.( True) | 280 | 88.9 | 35 | 11.1 |
| **D.8** | Treat the chronic diseases.( True) | 232 | 73.7 | 83 | 26.3 |
| **D.9** | Personal hygiene .( True) | 141 | 44.8 | 174 | 55.2 |
| **D.10** | Live in less contaminated environment.( True) | 159 | 50.5 | 156 | 49.5 |
| **Mean ±SD** | | 6.73 ±2.1 | | | |

Table 4: Showed the knowledge regarding the measures of DM preventions and revealed that the majority of the participants (94.0%, 89.8%, 88.9%, 82.2% respectively) knew that the DM could be prevented by (healthy diet, physical activity, test blood sugar regularly, regular sleep pattern respectively).while the majority of them (92.4%) didn't know that stress management is one of DM preventive measures.

| **Table 5:** **The relationship between Educational level and the awareness regarding general knowledge, risk factors, and preventive measures of diabetes mellitus: (No. = 315)** | | | |
|---|---|---|---|
| **Educational Level** | **Mean ± SD*** | F | P |
| **Illiterate** | 16.33 ± 5.85 | 3.41 | .005 |
| **Elementary-High school** | 22.76 ± 4.84 | | |
| **Diploma** | 22.06 ± 5.89 | | |
| **Bachelor** | 23.77 ± 4.75 | | |
| **Master** | 25.57 ± 3.97 | | |
| **PhD** | 25.21 ± 4.70 | | |

**Table 5:** Showed the relationship between educational level and the awareness regarding general knowledge, risk factors, and preventive measures of DM. and revealed that there was a high significant relationship between the awareness regarding the general knowledge, risk factors, and preventive measures of DM, with F value of 3.41, and P value of .005.

## IV. Discussion

This study was undertaken to evaluate the awareness regarding diabetes mellitus' risk factors and preventive measures among Saudi adult population in Riyadh and use this result to set new campaigns and increase the institutions specialized for diabetes.

The general knowledge about DM of all participant was accepted, with the majority of them answered correctly the question "Diabetes occur in children, adolescents, and adults", while Knowledge of the causes of diabetes was low in which less than half of the participants answered wrongly the question "Diabetes is a condition in which the body doesn't react to insulin". This finding is in matched with that of Unadike et al

(2009). Who reported similar response that only few respondents in Uyo (Nigeria), knew that deficiency of insulin can cause diabetes [30]

As regards the participants' knowledge regarding DM risk factors either modifiable or no modifiable , Most of the participants knew that Obesity, lack of exercise, presence of family history, and eating unhealthy food are considered risk factors for DM. Although the majority of them didn't know that low birth weight. Mental stress, environmental factors like exposure to viral illness are considered risk factors for DM. and more than half of them didn't know that hypertension, smoking, impaired glucose tolerance, high cholesterol level and unhealthy immune system are considered risk factors for DM.

Regarding the measures of DM preventions the study revealed that the majority of the participants knew that the DM could be prevented by healthy diet, physical activity, test blood sugar regularly, and regular sleep pattern while the majority didn't know that stress management is one of DM preventive measures. Contradicting observation has been reported from Gambia (2013) to assess the awareness of DM among diabetic patients in the Gambia and revealed that the knowledge regarding DM preventive measures was poor. Definitely, around half of the study participants had no clue on how DM can be prevented while the minority thought that weight loss and exercise were important measures in preventing the DM.[26]

Relationship between educational level and the awareness regarding general knowledge, risk factors, and preventive measures of DM. revealed that there was a high significant relationship between the awareness regarding the general knowledge, risk factors, and preventive measures of DM. This finding is consistent with that of Foma et al. [26], who reported that one of three important predictors of awareness were identified in their study and clarifies that those with formal education after middle school had a better understanding about all aspects of DM than those with either under middle school or with no education at all. Also this findings consistent with that of Muninarayana et al.,[31], who explained in their study that the reason that those with formal education beyond the middle school might have the awareness about DM from their schools or through accessing of internet, magazines or even books. So if any future campaigns are to be conducted to raise the awareness, it should be designed to approach the population according to their educational level.

## V. Conclusion

Diabetes mellitus pretenses a major health care challenge on both dimensions epidemiologically and economically in Kingdom of Saudi Arabia. Diabetes is applicable popular example "where prevention is better than cure". Knowledge is the highest armament in fight against DM because the information helps people to assess their DM risk factors, motivate them to modify the modifiable one as much as they can. However, awareness of this chronic disease among Saudi population still low in many settings. Based in our study results there is an urgent need to raise the Saudi population awareness level of this chronic and silence deadly disease among Saudi population.

## VI. Recommendations

1- Conduction of educational campaigns to promote lifestyles modification as well as dietary prescription and adherence to exercise. Such campaigns should be simplified to allow individuals with low educational level to understand the messages.
2- Make the organizations specialized in diabetes known to the population by letting them participate in public activities.
3- Put an attractive advertisement in the main board on highways.
4- Utilize the social media to distribute info graphics about DM risk factors.
5- Produce video that shows how far this disease is affecting the economic and financial status.
6- Put section in the big markets that contain products suitable for diabetic patients to emphasize how exaggerate the problem is.

## VII. Competing interests

The authors declared that no conflict of interest in the used design, conduction and reporting of the study findings.

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