RESEARCH ARTICLE

DIABETES MELLITUS AMONG ADULT MALE POPULATION OF ARAR CITY, NORTHERN SAUDI ARABIA.

Nagah Mohamed Aboel-Fetoh1, Ahmed Naser El-shibany2, Mohanna Jabhan Alenezi3, Khaled Alnashmi Alanazi3, Abdullah Musari Alanazi3, Thamer Owaid Alanazi3, Abdul Rahman Mazki Alanazi3 and Fayez Sulobi Alenezi3, Khalud Falah M Alanezi4 and Anfalnayirhajaj Alanazi4

1. Associate professor, Community Medicine Department, Faculty of Medicine, Sohag University, Sohag, Egypt and Faculty of Medicine, Northern border University, Arar, KSA.
2. Assistant Lecturer, Community Medicine Department, Faculty of Medicine, Sohag University, Sohag, Egypt.
3. Intern, Faculty of Medicine, Northern border University, Arar, KSA.
4. Final year student, Faculty of Medicine, Northern border University, Arar, KSA.

Manuscript Info

Manuscript History

Received: 21 November 2016
Final Accepted: 21 December 2016
Published: January 2017

Key words:-
Arar city; prevalence; Diabetes Mellitus; adult males; risk factors; Saudi Arabia.

Abstract

Background: There is increase in the prevalence of diabetes in Saudi Arabian population, due to significant changes in cultural factors, in addition to changes in dietary habits and socio-economic factors in addition to the high prevalence of physical inactivity.

Objective: The aim of this study is to measure the prevalence of Diabetes Mellitus, and to identify some of the associated risk factors in adult educated and employed males of Arar city, Northern Saudi Arabia.

Participants and methods: A cross-sectional study was carried out in Arar city, during the period from January to February 2016. A total of 325 educated and employed male Saudi nationals aged ≥30 years were included in the study. Data were collected by means of personal interview with the participants using a predesigned questionnaire covering the medical history of diabetes, age, family history of diabetes and physical activity. Anthropometric examination included height and weight measurements and calculation of body mass index (BMI). Blood sample is drawn under complete aseptic conditions to determine random blood glucose level. Person considered diabetic if random blood sugar was ≥200 ml/dl

Results: The prevalence of Diabetes Mellitus among adult educated and employed males of Arar city was 14.8 %. There is high statistically significant difference between different age groups of the participants as regard diabetes (P value < 0.001) but here is no statistically significant difference between obese and non obese (P value > 0.05). There is also highly significant relation between the family history of diabetes and diabetes (P value < 0.001). Diabetes was found in 17.8% and 9.8% of physically inactive and physically active participants respectively and there is statistically significant relation between diabetes and physical activity (P value < 0.05).

Corresponding Author:- Nagah Mohamed Aboel-Fetoh.
Address:- Associate professor, Community Medicine Department, Faculty of Medicine, Sohag University, Sohag, Egypt and Faculty of Medicine, Northern border University, Arar, KSA.
Conclusion and recommendations: The prevalence of diabetes is relatively high among the male Arar city, Northern Saudi Arabia population and represents a major clinical and public health problem. Factors such as aging, family history of DM and physical activity are associated with diabetes. National prevention programs to prevent diabetes and address the modifiable risk factors should be implemented.

INTRODUCTION:
A major international study collating and analyzing worldwide data on diabetes found that the number of adults with this disease has doubled since 1980, reaching up to 347 million in 2008 [1]. Another significantly large study, which assessed obesity as a diabetes risk factor across five continents, showed more than 60% of men and 50% of women being overweight or obese, thereby contributing immensely to this global health problem [2].

A prominent example of a country with a sharp increase in its diabetes prevalence rate as a result of rapid economic and cultural change is the Kingdom of Saudi Arabia. Over the last four decades, the data in Saudi Arabia show an ever increasing prevalence of physical inactivity, unhealthy dietary habits and sedentary behavior in its population [3], which in turn resulted in Saudi Arabia being ranked as the third country in the world with the highest prevalence of diabetes [4].

The prevalence of diabetes in Saudi Arabia increased from 4.3% in 19876 to 23.7% in 2004 [5]. This increase has been attributed to significant changes in cultural factors, such as increase in affluence, which unmasks an increase in the genetic or ethnic propensity for diabetes, in addition to changes in dietary habits with the substitution of animal products and refined foods [6], alongwith the socio-economic factors. This is in addition tothe high prevalence of physical inactivity among Saudi Arabian population that reached 96.1% [7] and ranged from 43.3% to 99.5% [8].

Study objective:
The aim of this study is to measure prevalence of diabetes, and to identify some of the associated risk factors in adult educated and employed male population of Arar city, Northern Saudi Arabia.

PARTICIPANTS AND METHODS:
A cross-sectional study was carried out in Arar city, the capital of the Northern Province of KSA, during the period from January to February 2016.

Sampling
A total of 325 educated and employed male Saudi nationals aged ≥30 years were included in the study. Data were collected by means of personal interview with the participants using a predesigned questionnaire covering the following items:

- Medical history of diabetes, age, family history of diabetes and physical activity.
- Anthropometric examination included height and weight measurements with the use of a calibrated balance beam scale and a wall-mounted stadiometer and calculation of body mass index (BMI). Normal weight was defined as 18≤BMI<25 kg/m², overweight as 25≤BMI<30 kg/m² and obesity as BMI≥30 kg/m² [9].
- Blood sample is drawn under complete aseptic conditions to determine random blood glucose level. Person considered diabetic if random blood sugar was ≥200 ml/dl [10]. Any participant suspected as diabetic was advised to visit a nearby primary health care center to complete investigations, start management and follow up.

Ethical considerations
This study was reviewed and approved by the Research Ethics Committee of Faculty of Medicine, Northern Border University. Participants were informed that participation is completely voluntary, and written consent was obtained from each participant before being subjected to the questionnaire and after discussing the objective with the participants. No names were recorded on the questionnaires. Adequate training of data collectors took place to ensure protection of confidentiality, and all questionnaires were kept safe.
Statistical analysis
Collected data were coded and analyzed using statistical package for the social sciences (SPSS, version 15) [11]. The χ²-test was used as a test of significance, and differences were considered significant at P value 0.05 or less.

Results:-
Table (1) shows the background characteristics of studied Participant. The majority of the Participants in the study were between 40 and 50 years of age, and only 2.8% were between 30 and 40 years of age. More than half of participants have no Family History of DM (52%). About 36 % of the participants are obese (BMI >30). About 37.8% recorded physical activity. Blood samples revealed that 14.8 % of the participants showed measured random blood glucose > 160 ml/dl and considered as diabetic.

Table (2) shows the relationship between DM and age group, family history of DM, presence of obesity and physical activity in studied adult males of Arar population. There is high statistically significant difference between different age group of the participants as regard D.M (P value < 0.001). The percentage of diabetes among obese and non obese was 18.6% and 12.6% respectively. But the difference was not significant between obese and non obese regarding D.M (P value >0.05). 25.6% of participants having positive family history of diabetes were diabetic and there is high statistically significant difference (P value <0.001). Diabetes was found in 17.8% and 9.8% of physically inactive and physically active participants respectively. There is statistically significant relation between physical activity of the participants and D.M (P value <0.05).

There is significant weak positive correlation between age and random blood glucose in the studied population (r = 0.286 and P value < 0.001). (Table 3).

Table (1): percentage distribution of DM, age groups, family history of DM, presence of obesity and physical activity in studied adult males of Arar population, KSA, 2016

| Variable                                      | No. | %  |
|-----------------------------------------------|-----|----|
| Diabetes Mellitus                             |     |    |
| Yes (random blood glucose ≥200 ml/dl)         | 48  | 14.8 |
| No (random blood glucose ≤200 ml/dl)         | 277 | 85.2 |
| Mean±SD                                       | 121.6±47.0 |
| Age group                                     |     |    |
| 30-                                           | 9   | 2.8 |
| 40-                                           | 211 | 64.9 |
| 50-                                           | 91  | 28.0 |
| 60+                                           | 14  | 4.3 |
| Mean±SD                                       | 38.0±6.12 |
| Family History of DM                          |     |    |
| Yes                                           | 156 | 48.0 |
| No                                            | 169 | 52.0 |
| Obesity                                       |     |    |
| Yes                                           | 118 | 36.3 |
| No                                            | 207 | 63.7 |
| Physical activity                             |     |    |
| Yes                                           | 123 | 37.8 |
| No                                            | 202 | 62.2 |
Table (2): relationship between DM and age group, family history of DM, presence of obesity and physical activity in studied adult males of Arar population, KSA, 2016

| Agegroup | Diabetes Mellitus (n=325) | Total (n=325) | Chi-Square Value | P value |
|----------|---------------------------|---------------|------------------|--------|
|          | Yes (n=48)                | No (n=277)    |                  |        |
| 30-      | No. 7                     | 3             | 10               | 28.36  | 0.000 |
|          | % 70.0%                   | 30.0%         | 100.0%           |        |
| 40-      | No. 23                    | 188           | 211              | 10.9%  | 89.1% |
|          | % 10.9%                   | 89.1%         | 100.0%           |        |
| 50-      | No. 17                    | 74            | 91               | 18.7%  | 81.3% |
|          | % 18.7%                   | 81.3%         | 100.0%           |        |
| 60+      | No. 1                     | 12            | 13               | 7.7%   | 92.3% |
|          | % 14.8%                   | 85.2%         | 100.0%           |        |
| Total    | No. 48                    | 277           | 325              | 2.21   | 0.094 |
|          | % 14.8%                   | 85.2%         | 100.0%           |        |

Obesity

|          | Yes (n=22)                | No (n=118)    |                  |        |
|          | 96                        | 118           | 2.21             | 0.094  |
|          | % 18.6%                   | 81.4%         | 100.0%           |        |

Family history of DM

|          | Yes (n=40)                | No (n=156)    |                  |        |
|          | 116                       | 156           | 28.16            | 0.000  |
|          | % 25.6%                   | 74.4%         | 100.0%           |        |

Physical activity

|          | Yes (n=12)                | No (n=111)    |                  |        |
|          | 111                       | 123           | 3.95             | 0.032  |
|          | % 9.8%                    | 90.2%         | 100.0%           |        |

Table (3): Correlation between age and random blood glucose in the studied population

| R        | P value |
|----------|---------|
| 0.286    | 0.000   |

Discussion:
Determining the prevalence of diabetes mellitus is important to allow for rational planning and allocation of resources. Therefore, we designed this study to determine the prevalence of diabetes among adult male Saudi nationals.

This study is a cross-sectional study was carried out in Arar city, the capital of the Northern Province of KSA, during the period from January to February 2016.

A total of 325 male Saudi nationals aged ≥30 years with Mean age (±SD) was 38.0 (±6.1) were selected.

In the present study revealed that the prevalence of Diabetes among adult males of Saudi Arabia was 14.8 %. Our finding is less than that reported by Khalid et al, (2011), the prevalence of diabetes among adult males in KSA was 34.1% [11]. and less than the reported prevalence in Gulf region (25.7%) and Oman (16.1%).[12,13]. Our figure is quite lower than the prevalence found in other Arab countries and other regions of KSA, this is mostly attributed to the relatively health awareness of our target group and the strict health measures and health education adopted by local health authorities in Arar city to prevent and control Diabetes Mellitus.

Our data demonstrate that 18.7% of individuals aged 50-60 years have diabetes. Studies from Saudi Arabia have shown different age-specific prevalence rates of diabetes. Our data demonstrate also an positive correlation between
age and random blood sugar level; the fact that diabetes prevalence increases with age is consistent with the findings in previous studies [11,14].

It is well documented that obesity is a strong risk factor for the development of DM as shown by several studies, however, In this study, the data showed that (36.3%) of Arar men population are obese and that (18.6%) of them are diabetics (P value = 0.094). This finding isn’t in accordance with findings of Daouss et al., 2006 who reported higher prevalence of obesity in diabetics with 80% to 90% of people diagnosed with type 2 diabetes being obese [15]

Both obesity and diabetes are preventable. Previous studies have demonstrated that changes in lifestyle are effective in preventing both diabetes and obesity in high-risk adults with impaired glucose tolerance [16,17].

The current study reported that, diabetes was found in 17.8% and 9.8% of physically inactive and physically active participants respectively. There is statistically significant relation between physical activity of the participants and DM (P value <0.05). Increasing physical activity, improving diet and then sustaining these lifestyle changes can reduce both body weight and risk of diabetes. Health professionals must continue to stress the importance of a balanced diet and physical activity for healthy weight loss [9].

Age, physical activity and family history of DM were major contributors significantly associated with DM. This significant relationship has been found consistently in different populations. In United Arab Emirates [18], the significant risk factors for DM were age, family history of DM and obesity and in Greece, age, obesity, family history of DM, hypertension, and elevated triglyceride levels were significantly associated with the presence of DM [19].

In the Saudi society, men and women must overcome many obstacles to make the best choices for optimal health. The provision of clinical preventive services to identify and control hypertension, elevated cholesterol levels, obesity and diabetes remain important medical priorities nationally. Development and implementation of national programs to promote a balanced diet, increased physical activity and weight control must be national priorities as well.

**Conclusion and recommendations:**
The prevalence of diabetes is relatively high among the male Arar city, Northern Saudi Arabia population and represents a major clinical and public health problem. Factors such as aging, family history of DM and physical activity are associated with diabetes A national prevention programs to prevent diabetes and address the modifiable risk factors should be implemented.

**Acknowledgment:**
The success and final outcome of this research paper required assistance from many people and I am extremely fortunate to have got this all along the completion of this work. My thanks go to Abdalla Mohamed Bakr Ali (1st year medical student, Sohag University, Egypt), Omar TabaanAlenezi, Abdullah Barghash k. Alanazi, Muaz Bilal Wali, Abdullah TbanAlanazi, (Medical students, Northern Border University) and Walaa Mohamed Bakr Ali for their cooperation in different steps of the research.

**References:**
1- Al-Hazzaa HM. Prevalence of physical inactivity in. Saudi Arabia: A brief review. *East Mediterr Health J.* 2004; 10: 663–70.
2- Al-Hazzaa H, Abahussain N, Al-Sobayel H, Qahwaji D, Musaiger A. Physical activity, sedentary behaviors and dietary habits among Saudi adolescents relative to age, gender and region. *International Journal of BehavioralNutrition and Physical Activity* [Internet]. 2011; 8(1):140. Available from: http://www.ijbnpa.org/content/8/1/140.
3- Al-Nozha MM, Al-Maatouq MA, Al-Mazrou YY et al. Diabetes mellitus in Saudi Arabia. *Saudi Med J.* 2004; 25: 1603–10.
4- Al-Nozha MM, Al-Hazzaa HM, ArafahMRet al. Prevalence of physical activity and inactivity among Saudis aged 30–70 years. A population-based cross-sectional study. *Saudi Med J.* 2007; 28: 559–68.
5- Amin TT, Al-Sultan AI, Ali A. Overweight and obesity and their relation to dietary habits and sociodemographic characteristics among male primary school children in Al-Hassa, Kingdom of Saudi Arabia. *Eur J Nutr.* 2008; 47: 310–18.

6- Balkau B, Deanfield JE, Després JP et al. International day for the evaluation of abdominal obesity (idea) a study of waist circumference, cardiovascular disease, and diabetes mellitus in 168 000 primary care patients in 63 countries. *Circulation.* 2007; 116: 1942–51.

7- Bennett P. New data, fresh perspectives: Diabetes Atlas [Internet]. 3rd ed. Brussels, Belgium: International Diabetes Federation; 2006 [cited 2014 Nov 6]. Available from: www.idf.org/sites/default/files/attachments/article_495_en.pdf.

8- Danaei G, Finucane MM, Lu Y et al. National, regional, and global trends in fasting plasma glucose and diabetes prevalence since 1980: Systematic analysis of health examination surveys and epidemiological studies with 370 country-years and 2·7 million participants. *Lancet.* 2011; 378: 31–40.

9- WHO Expert Consultation. Appropriate body-mass index for Asian population and its implications for policy and intervention strategies. *Lancet.* 2004;363:157–163. [PubMed]

10- Somannavar S, Ganesan A, Deepa M, Datta M, and Mohan V. Random Capillary Blood Glucose Cut Points for Diabetes and Pre-Diabetes Derived From Community-Based Opportunistic Screening in India. *Diabetes Care.* 2009 Apr; 32(4): 641–643.

11- Khalid A. Alqurashi, Khalid S. Aljabri and Samia A. Bokhari. Prevalence of diabetes mellitus in a Saudi community. *Ann Saudi Med.* 2011 Jan-Feb; 31(1): 19–23.

12- Hamadeh RR. Noncommunicable diseases among the Bahraini population: A review. *East Mediterr Health J.* 2000;6:1091–7. [PubMed]

13- Al-Lawati JA, Al Riyami AM, Mohammed AI, Jousilahti P. Increasing prevalence of diabetes mellitus in Oman. *Diabet Med.* 2002;19:954–7. [PubMed]

14- Wild S, Roglic G, Green A, Kng H. Global prevalence of Diabetes. Estimates for the year 2000 and projections for 2030. *Diabetes Care.* 2004;27:1047–53. [PubMed]

15- Daousi C, Casson IF, Gill GV, MacFarlane IA, Wilding JP, Pinkney JH. Prevalence of obesity in type 2 diabetes in secondary care: Association with cardiovascular risk factors. *Postgrad Med J.* 2006;82:280–4. [PMC free article][PubMed]

16- Tuomilehto J, Lindström J, Eriksson JG, Valle TT, Härmäläinen H, Ilanne-Parikka P, et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *N Engl J Med.* 2001;344:1343–50. [PubMed]

17- Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, et al. Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med.* 2002;346:393–403. [PMC free article][PubMed]

18- H. Saadi, S.G. Carruthers, N. Nagelkerke, F. Al-Maskari, B. Afandi, R. Reed, et al., Prevalence of diabetes mellitus and its complications in a population-based sample in Al Ain, UAE, *Diab. Res. Clin. Pract.* 78 (2007) 369–377.

19- A. Melidonis, S. Tournis, M.G. Kompoti, I. Lentzas, V. Roussou, S. Iaklianou, et al., Increased prevalence of DM in a rural Greek population, *Int. Electron. J. Rural Remote Health Res. Educ. Pract. Policy* 6 (2006) 534.