



**RISK FACTORS OF TYPE 2 DIABETES MELLITUS AMONG 35 YEARS AND ABOVE  
URBAN POPULATION OF BURAIDAH CITY**

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**ABSTRACT**

**Background:** Type 2 Diabetes Mellitus exhibits iceberg phenomenon of the disease. In Saudi Arabia many studies revealed that prevalence of Diabetes mellitus in rural areas and urban areas was 19% and 25% respectively. There is a need to identify some risk factors like obesity, smoking and hypertension and its associations reflections leads to quality of life of diabetic individuals. **Objectives:** 1. To identify the demographic variables in relation to type 2 diabetes mellitus and to find the health related risk factors associated with type 2 diabetes mellitus. **Materials & Methods:** A cross sectional institutional based record review study conducted at primary health centres of Buraidah from December 2017 to May 2018 among the 35 years and above age group individuals after getting institutional ethical committee clearance. Data entered in SPSS 21.0 Version and necessary statistical tests like simple proportions, chi square tests were applied. **Results:** Out of 300 study population, there was 97.7% were Saudi nationality and only 2.3% were from other nationalities. In the study population, about 59.3% were giving diabetes family history and hypertension family history about 7.3%. In the study population, about 7% (21/300) were having smoking habit and 50% of them were females and smoking habit among females was very less. In the study population, about 11.3% (32/282) were having BMI < or = 25 BMI and 88.7% were having BMI > 25 BMI in the study population. **Conclusions:** Based on the results, Smoking prevalence among the diabetic population was reported less may be due to 50% of the sample from females. Body mass index, family history of diabetes was noticed high in the study group. There is a need to identify the risk factors before onset of diabetes through screening programs and also after onset of the diabetes and indirectly saving country economy by minimising the diabetic complications in the community.

**KEYWORDS:** Age, sex, Occupation, BMI, Family History, smoking.

**INTRODUCTION**

Diabetes Mellitus has become global public health problem. The World Health Organization has ranked Saudi Arabia as having the second highest rate of diabetes in the Middle East (7th highest in the world) with an estimated population of 7 million living with diabetes and more than 3 million with pre-diabetes. The study conducted in the Saudi Arabia and published in the year 2017 in Current Diabetes revision forum revealed that certain major challenges of Diabetes Disease. This presents a pressing public health problem. Several challenges in diabetes management need to be tackled in Saudi Arabia, including the growing prevalence (chiefly among children and young adults), micro-and macro vascular complications, lifestyle changes, late diagnosis,

poor awareness and high treatment costs. Over the last two decades, the Saudi population saw an increase in the expenses in healthcare and treatment of diabetes by more than 500%. In 2014, the health care budget was 180 billion (Saudi Riyal) of which 17 billion was spent on all Saudis, with an approximate 25 billion on the entire Saudi diabetic population. This implies that the direct expense of diabetes is costing Saudi Arabia around 13.9% of the total health expenditure.<sup>[1]</sup>

The prevalence of type 2 diabetes is rapidly rising all over the world and challenging health problems of the 21st century. Globally as of 2013, an estimated 382 million people or 8.3% of adults, are estimated to have diabetes, out of which about 46% were undiagnosed.

About 80% live in low and middle income countries. This will raise the global burden of diabetes mellitus to above 592 million by 2035. The largest increases will take place in the regions where developing economies are predominant with greatest number of cases being expected in India and China.<sup>[2,3]</sup>

Approximately 5.1 million people aged between 20 and 79 years died from diabetes in 2013, accounting for 8.4% of global all cause mortality among people in this age group. Close to half (48%) of deaths due to diabetes are in people under the age of 60. The highest number of deaths due to diabetes occurred in countries with the largest numbers of people with the disease: China, India, USA, and the Russian Federation.<sup>[2,4]</sup>

Therefore, unless a comprehensive epidemic control program/ multidisciplinary approach is stringently enforced, the diabetes mellitus burden on Saudi Arabia will probably increase to very serious levels and also in many other countries. It is crucial to implement improved health and health-related quality of life of those with diabetes, thus minimizing the social and personal expenses for diabetes care in Saudi Arabia. In this study we discuss the significant and major threats posed by diabetes mellitus to the Saudi population and recommend essential possible solutions to delay/ prevent this formidable issue.<sup>[1]</sup>

In view of the above findings the present study was undertaken to know the risk factors of type 2 diabetes mellitus among Primary Health Care Centres of Urban Area of Buraidah city, Al Qassim province in Kingdom of Saudi Arabia.

#### AIMS AND OBJECTIVES

1. To study the demographic variables in relation to type 2 diabetes mellitus.
2. To study the health-related risk factors associated with type 2 diabetes mellitus.

#### MATERIALS AND METHODS

**Study Design and Setting:** This was a record based cross sectional study was carried out in 10 selected PHCC in Buraidah city, out of 44 PHC centers functioning under of Ministry of Health. These records are a well established medical record system, having health data of each and every patient in the form of file.

**Study period:** This study was conducted during the period of 6 months from 1st December to May 2018.

**Target Population:** All diabetic type 2 patients above 35 years old age in the primary health care centers in Buraidah city.

**Sample Size:** Sample size was calculated based on the previous prevalence studies in Saudi Arabia. prevalence of the previous study taken as 25% and by using following appropriate sample size calculation method.

Meta-analysis of prevalence of Diabetes Mellitus in Saudi Arabia was 25 per cent. This prevalence is considered to find out the sample size.

The formula used for the calculation of the sample size

$$N = 4PQ / L^2$$

Where, N is the required sample size

P is the prevalence of diabetes mellitus = 25%

Q is equal to 100 - P

Allowable error is = 20% of Prevalence

So, we calculate the sample size based on the formulae

$$N = \frac{4PQ}{L^2}$$

$$= 300$$

Using the above formula, the sample size estimate was 300.

**Sampling method:** 10 primary health centres were selected randomly out of 44 PHCC functioning in the Buraidah. Hence sampling method was Simple random sampling method.

Systematic random sampling method was used for the collection of sample in this study. Sampling interval was calculated by dividing the sample frame population with required sample size, so every 2<sup>th</sup> individual was taken in to the study from the available records.

**Sampling procedure:** 10 PHC centers were selected out of 44 PHC centers in Buraidah city based on the locations which were 2 in the north, 2 in the south, 2 in the west, 2 in the east, and 2 in the center of Buraidah city. After selection of concerned Primary health care centre, visited to director health care centre, in charge of record room in Primary health care centre. Explained about study importance and objectives. After getting formal consent, visited to file room, above 35 yrs files from the Type 2 Diabetes Mellitus files were segregated both male and female sections. After that requirement of sample in each PHCC was about 30. Based on the availability of files and requirement of sample, systematic random sample was used for the individual files till the requirement of sample files. Systematic random sampling method was used for the collection of sample in this study. Sampling interval was calculated by dividing the sample frame population with required sample size, so every 2<sup>th</sup> individual, some PHCC every 3<sup>rd</sup> or 4<sup>th</sup> was taken in to the study from the available records and also depends upon the number of required sample availability. Diagnosed and registered diabetic type 2 patients, aged more than or equal to 35 years in the respective PHC centers, during six months data collection period i.e. from 1<sup>st</sup> December 2017 to May 2018. Diabetic patients with type 1 and all patients aged below 35 years old were excluded from the study.

**Inclusion Criteria:** All the type 2 Diabetes Mellitus above 35 years age group people who registered in the Primary Health care centres.

**Pilot test:** The questionnaire was admitted and data was collected from 40 individual record files as pilot study. After pilot study reviewed with Family Medicine consultants and necessary modification done. Subsequently started the collection of information from the concerned primary health care centres record room files as per the protocol guidelines till I get the required sample size. The main purpose of the pilot study to test the technical feasibility to conduct the study smoothly.

**Ethical clearance:** National Committee of BioEthics (NCBE) at king Abdulaziz city of science and technology (KACST), accorded ethical clearance for this

study and IEC certificate was obtained from the Regional Ethics committee, Al Qassim region.

#### DATA ANALYSIS

Statistical analysis was done by using the statistical software spss -21.0 version. The frequency distributions of age, sex, nationality, marital status, family size, occupation, family history, smoking, Body Mass Index, Blood Pressure, were recorded and presented. Necessary statistical tests like simple proportions and chi square test and fisher exact test were applied at 95% confidence limits.

**Table. 1. Socio demographic variables in relation to Diabetes mellitus individuals in the study population.**

Age	Number	Percentage
35-44 yrs	44	14.7%
45-54 yrs	85	28.3%
55-64 yrs	113	37.7%
> 65 yrs	58	19.3%
Total	300	100%
<b>Sex</b>		
Male	150	50%
Female	150	50%
Total	300	100%
<b>Nationality</b>		
Saudi	293	97.7%
Non Saudi	07	2.3%
Total	300	100%
<b>Occupation</b>		
Office work	44	14.7%
Field work	27	9.0%
Business	11	3.7%
House wives	98	32.7%
Retired	42	14.0%
Unemployed	58	19.3%
Others specify	09	3.0%
Not available	11	3.7%
<b>Family size</b>		
Single	06	2.0%
2-5 members	58	19.3%
6-10 members	140	46.7%
> 10 members	35	11.7%
Not available	61	20.3%
Total	300	100%

Table 1 revealed that in the study population, about 37.7% were in the age group of 55-64 years and 19.3 % were in the age group of > 65 years age group. In the study population, about 50% were males and 50% females were selected. Out of 300 study population, there was 97.7% were Saudi nationality and only 2.3% were from other nationalities. In the 300 Diabetic study population, 32.7% were from house wife occupation, 19.3% were from unemployed, 14.7% were from office work, 14% were from retired occupation and about 3.7% were not revealed their occupation. Out of 300 Diabetic study population, about 46.7% were having 6-10 family members, 19.3% were having 2-5 family members, and

20.3% individuals were not mentioned their occupation in their records.

**Table. 2: Family history of Diabetes among Diabetic individuals.**

Family history	Number	Percentage
Father	49	16.3%
Mother	67	22.3%
Both Parents	75	25%
No family history	109	36.3%
Total	300	100%

Table 2 depicts that out of 300 diabetes population, about 25% of study population giving both parents having diabetes. 22.3% were giving mothers alone having diabetes and 16.3% were giving father alone diabetes history.

**Table 3: Smoking habit, frequency and duration with Diabetes Mellitus patients in study population.**

Smoking	Diabetes without complications	Diabetes with complications	Total	P value
Yes	20 (95.2%)	1 (4.8%)	21 (100%)	P-0.67
No	259 (92.8%)	20 (7.2%)	279 (100%)	
Total	279 (93%)	21 (7%)	300 (100%)	
Smoking Frequency				P value
1-5 cigars/day	1 (100%)	0 (0%)	1 (100%)	P- 0.01
6-10 cigars/day	1 (50%)	1 (50%)	2 (100%)	
> 10 cigars/day	16 (100%)	0 (0%)	16 (100%)	
Total	18 (94.7%)	1 (5.3%)	19 (100%)	
Smoking duration				P value
1-5 yrs	1 (100%)	0 (0%)	1 (100%)	P - 0.01.
6-10 yrs	1 (50%)	1 (50%)	2 (100%)	
> 10 yrs	16 (100%)	0 (0%)	16 (100%)	
Total	18(94.7%)	1(5.3%)	19 (100%)	

Table 3 revealed that in the study population, about 7% (21/300) were having smoking habit and 50% of them were females and smoking habit among females was very less. Among the smokers, 95.2% were not having any diabetes complications. Out of 300 study population, 7% (21/3000) were having smoking habit. Of which 19 members mentioned their frequency of smoking. Among

the smokers, 84.7% (16/19) of the smokers were smoking > 10 cigars per day. Out of 300 study population, 7% (21/3000) were having smoking habit. Of which 19 members mentioned their duration of smoking. Among the smokers, 84.7% (16/19) of the smokers were smoking > 10 years duration of smoking.

**Table 4: Body Mass Index in relation to Diabetes study population.**

BMI	DM without complications	DM with Complications	Total	P value
< 18.5	1 (100%)	0 (0%)	1 (100%)	P-0.5
18.5 - 25	27 (87%)	4 (23%)	31 (100%)	
26-30	86 (95.5%)	4 (4.5%)	90 (100%)	
31-35	95 (92.2%)	8 (7.8%)	103 (100%)	
36-40	41 (93.1%)	3 (6.9%)	44 (100%)	
>40	13 (100%)	0 (0%)	13 (100%)	
Not available	16 (88.8%)	2 (11.2%)	18 (100%)	
Total	279 (93%)	21 (7%)	300 (100%)	
BMI (n-282).				P value
< or =25	28 (87.5%)	4 (12.5%)	32 (100%)	P-0.167
> 25	235 (94%)	15 (6%)	250 (100%)	
Total	263 (93.2%)	19 (6.8%)	282 (100%)	

Table 4 highlighted that among the study population, 0% percent Diabetes complications were observed among BMI <18.5 and BMI > 40 study group as the sample is less than to diabetes with complications study group was less sample. 23% of Diabetes complications were observed between BMI 18.5 to 25 group of study population. In the study population, about 11.3% (32/282) were having BMI < or = 25 BMI and 88.7% were having BMI > 25 BMI in the study population. About 12.5% of Diabetes complications were observed in the BMI < 25 group and only 6% of Diabetes complications were observed among the population of > 25 BMI group.

**Table 5: Blood pressure status in relation to Diabetes Mellitus (n-298).**

Blood Pressure	Diabetes without complications	Diabetes with complications	Total
Normal	95 (93.1%)	7 (6.9%)	102 (34.2%)
Pre hypertension	112 (95.7%)	5 (4.3%)	117 (39.2%)
Stage I Hypertension	63 (88.7%)	8 (11.3%)	71 (23.8%)
Stage II Hypertension	7 (87.5%)	1 (12.5%)	8 (2.7%)
Total	277 (92.9%)	21 (7.1%)	298 (100%)

Table 5 depicts that in the study population there was about 34.2% (102/298) were normal tension individuals, 39.2% (117/298) were pre hypertension individuals and 26.5% were hypertension individuals.

## DISCUSSION

The present study was a Primary health Care centre based cross sectional record review study conducted at different health care centres of Buraidah city, Al Qassim region of Saudi Arabia during the period from December 2017 to May 2018, aimed at identifying the risk factors of type 2 diabetes mellitus and other health related factors associations with Type 2 Diabetes Mellitus.

In the present study prevalence of diabetes mellitus was found among the age group 35-64 yrs gradually. It was observed that the prevalence of diabetes mellitus increases as the age advances. Similar results were observed in a study done by Ramachandran A, Snehalatha C *et al*<sup>[5]</sup> in a study of the elderly population, age > 60 years, highlighted the high prevalence of diabetes and IGT, with increasing age. Ramachandram A, Snehalatha C *et al*<sup>[6]</sup> (2001) concluded that prevalence of diabetes mellitus does not have any gender difference.

In present study population, about 59.3% were giving diabetes family history. About 26.3% were not having no family history of diabetes mellitus. Out of 300 diabetes population, about 25% of study population giving both parents having diabetes. 22.3% were giving mothers alone having diabetes and 16.3% were giving father alone diabetes history.

Similar findings are observed in the study done by Majgi SM *et al* (2012)<sup>7</sup> in Puducherry. Ramachandran A *et al*<sup>[8]</sup> showed that genetic predisposition to type 2 diabetes is evident from the high familial aggregation of the disease. Asian Indians have strong familial aggregation of diabetes with high prevalence of diabetes among the first degree relatives and vertical transmission through two or more generations. Ramachandran A, Snehalatha C *et al*<sup>[6]</sup> carried out a population based study in Chennai observed that a positive family history of diabetes was present in 24.7% of subjects.

De Silva SN, Weerasuriya N *et al*<sup>[9]</sup> conducted a hospital based study in Department of Medicine, Faculty of Medical Sciences, Nugegoda, Sri Lanka with an excess of maternal transmission of Type 2 diabetes mellitus has been reported in Europid populations, but not in South India. A survey was carried out in 1000 (502 male) people with Type 2 Diabetes to establish whether there is an excess of maternal transmission and familial aggregation in a Sri Lankan population. Thirty-seven percent reported parents with diabetes, 46.9% had no

parents with diabetes, 16.1% did not know the diabetes status of at least one parent and there was no diabetes in the other. Diabetes in siblings and children was more common in those with mothers who had diabetes (53.8% and 4.5%) when compared with those in whom fathers had diabetes (42.4% and 1.6%). They concluded that familial aggregation and excess maternal transmission were observed in people with Type 2 diabetes in Sri Lanka.<sup>[9]</sup> Onyemere KU, Lipton RB *et al*<sup>[10]</sup> carried out a community based study in USA with an objective of the role of parental diabetes mellitus (DM) in the development of type 2 DM among children and adolescents from high-risk ethnic groups. They concluded that a positive parental history of DM appears to be more strongly related to childhood type 2 than to type 1 DM, whether this is a reflection of genetic or behavioural factors is yet unclear.<sup>[9]</sup>

In the present study, among diabetic subjects who were having positive family history 40.2% were having one parent family history and 59.8% were having both parents family history. Viswanathan M, McCarthy MI *et al*<sup>[11]</sup> in their study of analysis of family history in the type 2 diabetes patients attending the Diabetes Research Centre, Madras, India showed the prevalence of diabetes among off spring with one diabetic parent and both parents were 36% and 62% respectively and the prevalence of diabetes increased with increasing family history of diabetes.

In the present study population, about 7% (21/300) were having smoking habit and 50% of them were females and smoking habit among females was very less. Among the smokers, 95.2% were not having any diabetes complications. Among the smokers, 84.7% (16/19) of the smokers were smoking > 10 cigars per day. Among the smokers, 84.7% (16/19) of the smokers were smoking > 10 years duration of smoking.

This is in accordance and smoking and type 2 diabetes mellitus significant association was found in some studies with the study done by Montonen J *et al*.<sup>[12]</sup> and Majgi SM *et al* (2012)<sup>[7]</sup>, where as in the study done by Ma S, Cutter J *et al*<sup>[13]</sup> found that the smoking has directly proportional to diabetes mellitus and the association was significant.

In the study population, about 11.3% (32/282) were having BMI < or = 25 BMI and 88.7% were having BMI > 25 BMI in the study population. About 12.5% of

Diabetes complications were observed in the BMI < 25 group and only 6% of Diabetes complications were observed among the population of > 25 BMI group. As this study is record based study and complications identified and reported by the PHC doctor may have some bias rather than complications identified by the specialist and sub specialist doctors. Kutty VR, Soman CR et al<sup>[14]</sup> conducted a study in Trivendrum and observed high BMI (>25 kg/m<sup>2</sup>) associated with type 2 diabetes and also with the Misra A, Pandey RM et al<sup>[15]</sup> conducted a study in Delhi. In Ramachandran A, Snehalatha C et al<sup>[6]</sup> (2002) study found the BMI associated with the type 2 diabetes, and Perry IJ<sup>[20]</sup> conducted a study in Ireland and stated that BMI associated with the type 2 diabetes mellitus. Most of the studies revealed that BMI associated with type 2 diabetes. Similar association was found in the study done by Majgi SM et al<sup>7</sup> in Puducherry. Raji A, Seely EW et al<sup>[21]</sup> showed Asian Indians have more total abdominal and visceral fat for any given BMI and increased insulin resistance. Sirajudeen S, Alavudeen, et al<sup>[16]</sup> conducted a study in southern region of Saudi Arabia revealed that body mass index and type 2 diabetes was statistically significant association was found. Khalid A. Alqurashi, Khalid S. Aljabri, and Samia A. Bokhari et al<sup>[17]</sup> conducted a study as prevalence of body mass index versus diabetes mellitus in a Saudi community A cross-sectional study among patients attending a primary care clinic in June 2009. The prevalence of body mass index of  $\geq 25$  was 72.5%. Among patients with diabetes, the prevalence of body mass index of  $\geq 25$  was 85.7% ( $P < .0001$ ). There was a higher prevalence of obesity (body mass index,  $\geq 25$ ) in females (87.7%) as compared to males (83.1%) ( $P = .008$ ).<sup>[17]</sup>

In the study population there was about 34.2% (102/298) were normal tension individuals, 39.2% (117/298) were pre hypertension individuals and 26.5% were hypertension individuals. Ahmed G. Elzubier et al<sup>18</sup> conducted a study in Makkah, Saudi Arabia as hypertension in diabetics registered in primary health care centers in Makkah district, Saudi Arabia. This study aims at studying the magnitude of hypertension in diabetic subjects registered in primary health care centers. A sample of 1039 diabetic subjects registered at the primary health care in urban and rural Makkah region were interviewed. Information gathered included demographic and diabetes-related variables. Blood pressure was determined for 1020 subjects. Study results were shown as Diabetic subjects who had high blood pressure readings amounted to 560 (54.9%), of whom with stage 1, 2, and 3 hypertension formed 25.5%, 7.0% and 2.5%, respectively. Subjects with undetected high blood pressure amounted to 225 (22.1%). There was significant association of high blood pressure and Diabetes mellitus. Similar significant association was found in the studies done by Kutty VR et al.<sup>[14]</sup> A study done by Shanthirani CS et al<sup>[19]</sup> showed the prevalence of hypertension ( $p < 0.001$ ) was higher among the diabetics compared to non-Diabetic group. They concluded that

the prevalence of hypertension appears to be high in this urban South Indian Diabetic population and this calls for urgent steps for its prevention and control. One of the limitation of the study, as this study is a record based study obviously some information from the patient is lacking, no direct interaction and to compare non diabetic patients history, details is lacking. Need large scale similar studies are required to substantiate the present study results. But, sometimes verification of records also will give some information about the present records situation and will be utilized for the improvement of the existing system.

## CONCLUSIONS

Based on the study results, majority of study population in the age group of 55-64 years. Significant association was found between frequency, duration of smoking and family history of diabetes with type 2 diabetes individuals in the study population. There is a need to reduce smoking habit, life style modifications like maintenance of ideal body weight and elimination of certain risk factors are required to reduce the type 2 diabetes in the community.

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Institutional ethical Committee clearance taken.

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