

# Prevalence and associated risk factors for type 2 diabetes mellitus among adults ( $\geq 40$ years of age) in Jigjiga City, Somali region, Eastern Ethiopia.

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## Abstract

**Background:** Diabetes mellitus (DM) is a common metabolic disorder resulting from defects in insulin action, production, or both. There are mainly two types of diabetes; Type 1 diabetes is immune-mediated and requires daily administration of insulin. The other common type is type 2 diabetes and characterized by insulin resistance or relative insulin deficiency. Type 2 diabetes is the most common form and comprises of 90% of people with diabetes around the world. National data on prevalence and incidence of diabetes are rising. The situation of diabetes in the study area is not well documented, but report from health institutions indicated that, the presence of increased diabetic cases in the study areas. Main objective of this study to assess the prevalence and associated risk factors for type 2 diabetes mellitus among adults ( $\geq 40$  years of age) in Jigjiga town.

**Method:** A cross-sectional community based quantitative study was conducted from December to March in 2016, using structured questionnaire and glucose and anthropometric measurement. Data were entered in to a computer using Epi-data, transferred to SPSS version 16 software packages for analysis using export data step in Epi-data software package.

**Result:** Overall study participants, 175 (31.5 %) had abnormally elevated blood sugar level, of whom 45 (8.57 %) were diabetic and 130 (22.48%) had high blood glucose level but do not define diabetes. There was a statistically significant association between diabetes mellitus and positive family history (AOR: 2.90(CI: 1.37, 6.11), older age group (AOR: 3.41(CI: 1.05, 11.05), dietary preference (AOR: 3.51(CI: 1.43, 8.63) and hypertension (AOR: 5.62(CI: 2.60, 11.76).

**Conclusion:** Prevalence of diabetes is higher among older age, those with positive family history, and those whom their dietary preference is sweet test and whole fat dairy products and hypertensive respondents. In our study the prevalence of type 2 diabetes mellitus is high compared to report from Ethiopia. Behavioral Change Communication and Information Education Communication through media outlets should be recommended in the study area regarding to preventable and modifiable risk factor for type 2 diabetes mellitus.

**Keywords:** type2; Diabetes; prevalence; risk factors; Somali region; eastern Ethiopia

## I. Introduction.

Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. (1). Depending on the etiology of the DM, factors contributing to hyperglycemia include reduced insulin secretion, decreased glucose utilization, and increased glucose production (2). There are mainly two types of diabetes; Type 1 diabetes is immune-mediated and requires

daily administration of insulin. The other common type is type 2 diabetes and characterized by insulin resistance or relative insulin deficiency (2).

Three hundred million people have diabetes, mostly type 2 (that is 6.6% of the adult population) (3). Each year the number is increasing by 7 million, by 2030, 438 million people will have diabetes (7.8% of the adult population), that is, a rise of 54% in 20 years, this is more than the populations of Mexico, United States and Canada combined together (4). WHO estimates that 15 million people are blind as a result of diabetes, the majority of them are in low- and middle-income countries (5).

In sub-Saharan African countries, 12.1 million adults are estimated to have diabetes, but only 15% of people with diabetes have been diagnosed. By 2030, it is estimated that 23.9 million adults in sub-Saharan Africa will have diabetes. Over the next years, it is predicted that sub-Saharan Africa will have the highest growth in the number of people with diabetes of any region in the world (6). Risk factors for type II diabetes include family history, advanced age, physical inactivity, ethnicity and history of gestational diabetes. Genetics and environmental factors are the main contributors to type-2 diabetes. Physical inactivity, weight gain and obesity also have high risk for the development of type II diabetes (7). The International Diabetes Federation (IDF) estimates that the peak age for onset of diabetes in 2010 is 40–59 years, but by 2030, highest prevalence will be in the oldest age-group (60–79 years). A positive family history of diabetes is an independent risk factor for the disease, as reported in studies from Guinea (8) and rural South Africa (9).

According to WHO, the prevalence of diabetes mellitus is increasing in developing countries due to population growth, aging, unhealthy diets, obesity and sedentary lifestyles (10). In sub-Saharan Africa, diabetes has a significant burden, that which is expected to increase in the coming years (11). Similarly, in Ethiopia, cross sectional study conducted in Jimma town from December 1- June 30, 2006, indicated that 20.2% subjects have abnormally elevated blood sugar; and only 5.3% have clinically overt diabetes (12).

The situation of diabetes in the study area is not well documented, but report from health institutions indicated that, the presence of increased diabetic cases in the study areas (Somali region, health bureau, 2011 annual disease report, and also the information about risk factors associated with this increment of diabetic cases is scarce. So this gap initiated the principle investigator to conduct a research acknowledging the risk factors associated with these diabetes mellitus. the objective of this study was

to assess the prevalence and associated risk factors for type 2 diabetes mellitus among adults ( $\geq 40$  years of age) in Jigjiga town, Somali region, Eastern Ethiopia, from December, 2015-March, 2016.

## II. METHODS

The study was carried out in Jigjiga town. Jigjiga town is the administrative city of the Somali regional state located at a distance of 636 kms away from Addis-Ababa, eastern part of Ethiopia. Across-sectional community based quantitative study was carried out in Jigjiga city from February to march. Sample size was estimated by using the formula of sample size determination using single population proportion employing

prevalence of diabetes that at first time conducted in jimma town, southwestern Ethiopia (7). The prevalence was estimated to be 25.5% (diabetes (5.3%) plus pre-diabetes (20.2)). A total of 525 persons will be studied.

Multi-stage sampling method was used, by considering jigjiga town, which consist of ten kebeles, three kebeles were selected from these ten kebeles. In cases where there was more than one eligible individual in the selected household, a lottery method was used to pick one and in the event that there is no eligible person in the selected household, the next door was visited. The study has used four types of instruments: questionnaire, anthropometric measurement, blood pressure measurement and fasting blood glucose test.

Blood samples were drawn by glucometer device for the determination of fasting plasma glucose level. In the case of fasting plasma glucose (FPG)  $\geq 126$ mg /dL a second determination was performed one week later. In addition, subjects with previous history or who were taking oral hypoglycemic agents or insulin was considered to have DM. Subjects with known diabetes were not tested for FPG. The data were collected; completeness and consistency have been checked manually. It was sorted, coded and entered in to a computer using Epi-data. it was transferred to SPSS version 16 software packages for analysis using export data step in Epi-data software package. Frequency distributions will also be generated in which the outliers and missed data will be identified before subjecting the data to analysis using SPSS Version 16. Descriptive statistics (frequency and percentage) was calculated.

The proportion of diabetes among study subjects was determined according to their fasting plasma glucose as a normal (70-99 m/dl), pre-diabetes (100-125m/dl) and diabetes ( $>125$  m/dl) based on WHO blood glucose cut-off point. Cross tabulation and chi-square testing was used to determine the existence of a significant association between socio-demographic and other important variables associated with diabetes. Odds ratio with a 95% confidence interval was calculated to measure the strength of association between dependent and independent variables. To ascertain the association; variables found to be significant ( $P \leq 0.2$ ) in the bivariate analysis was used to construct a multivariable models. Finally, Logistic regression analysis was done to control possible confounders and to determine factors that may be significantly associated with diabetes. For multivariable analysis statistical significance was considered with two sides P-value of 0.05.

The Institutional Research Ethics Review Committee of the Jigjiga University approved the study. An official letter of agreement was obtained from Somali Regional State health bureau, and jigjiga city administration health office.

## Result

Socio demographic factors associated with diabetes are shown in Table 2. The prevalence of diabetes increases as age group of the respondents' increases, in crude analysis age categories of 60-79 and 80 and above was significantly associated with diabetes. More prevalence of diabetes was observed among females (9.0%). Diabetes was more among married (8.7%) than single (6.1%) respondents. Diabetes prevalence was

(9.8%), for Somali, (6.8%) for Amhara. Diabetes prevalence was (10%) for illiterate, (10.1) able to read and write, (7.4) elementary school but somewhat lower prevalence with secondary and above respondents (5.1%) but this difference is not significant.

**Table 1 socio demographic factors associated type 2 diabetes mellitus among adults in Jigjiga town, eastern Ethiopia, 2016(n=525)**

Characteristics		Diabetic No.(%)	Not diabetic No.(%)	Crude OR (95%)	p-value
Age	40-59	16(4.5)	342(95.5)	1	1
	60-79	22(16.8)	109(83.2)	<b>4.314(2.2, 8.51)*</b>	<b>0.000*</b>
	>= 80	7(19.4)	29(80.6)	<b>5.159(2.0, 13.6)*</b>	<b>0.001*</b>
Sex	Male	20(8.1)	228(91.9)	1	1
	Female	25(9.0)	252(91.0)	1.13(0.612, 2.1)	0.7
Education	cannot read and write	25(10.0)	225(90)	2.067(0.77, 5.56)	0.151
	Able to read and write	7(10.1)	62(89.9)	2.100(0.64, 6.92)	0.222
	Elementary school	8(7.4)	100(92.6)	1.48(0.470, 4.711)	0.499
	Secondary and above	5(5.1)	93(94.9)	1	1
Occupation	housewife	12(10.2)	106(89.8)	1.46(0.62, 3.44)	0.385
	Un-employed	9(14.3)	54(85.7)	2.15(0.84, 5.48)	0.108
	Daily laborer	11(7.2)	142(92.8)	1	1
	Merchant	4(4.3)	89(95.7)	.580(0.18, 1.87)	0.364
	Government employee	9(9.7)	84(90.3)	1.383(0.55, 3.48)	0.490
	Others	0(0.0)	5(100)	-	1.00
Income	<1000	8(8.0)	92(92.0)	1	1
	1000-3000	30(7.8)	353(92.2)	0.977(0.434, 2.203)	0.956
	3001-6000	4(16.0)	21(84.0)	2.190(0.603, 7.961)	0.234
	>6000	3(17.6)	14(82.4)	2.464(0.58,10.41)	0.220

\*P-value < 0.05, Variables with P-value ≤ 0.2 were included in the logistic regression model.

### Prevalence of type 2 diabetes mellitus in the study area

Overall study participants, 175 (31.5 %) had abnormally elevated blood sugar level (Fig.1). Of whom 45 (8.57 %) were diabetic and 130(22.48%) had high blood glucose level but do not define diabetes.

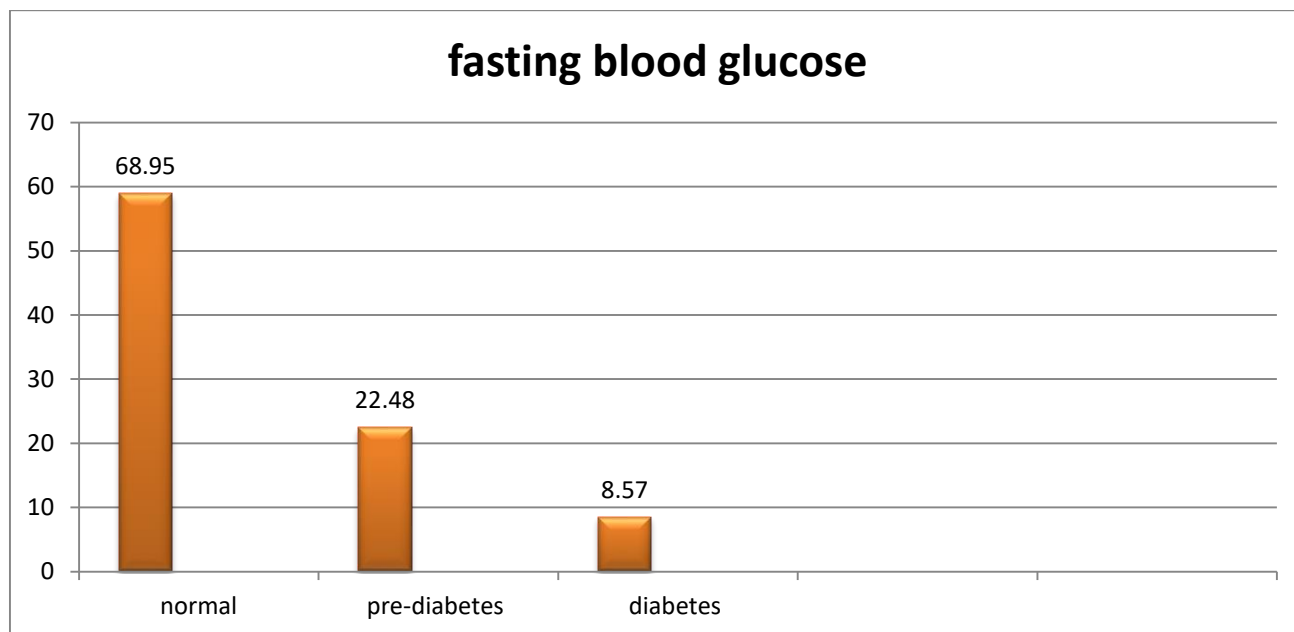


Figure.3. Prevalence of type 2 diabetes mellitus among adults in jigjiga town.

### Factors associated with diabetes.

Age, income, occupation, educational level, family history, dietary pattern, physical activity, body mass index, hypertension, chat chewing, cigarette smoking, were included in the logistic regression model. logistic regression model was used for adjusting to control the confounding variables in the multivariate analysis. Bivariate analysis showed that age, family history, dietary pattern, body mass index (BMI), physical activity, and hypertension have relative showed statistically significant associations with diabetes. But in multivariate analysis only age, family history of diabetes, dietary preference and hypertension remain statistically significant (table 2).

**Table 2 Summary of logistic regression analysis of Factors Associated with type 2 diabetes mellitus among adults in jigjiga town, eastern Ethiopia, 2016(n=525).**

Characteristics	Diabetic No (%)	Not diabetic No.(%)	Crude OR (95%)	Adjusted OR(95%CI)
<b>Age</b>				
40-59	16(4.5)	342(95.5)	1	1
60-79	22(16.8)	109(83.2)	4.314(2.2, 8.51)	<b>3.87(1.79, 8.39)*</b>
Above 80	7(19.4)	29(80.6)	5.159(2.0, 13.6)	<b>3.41(1.05, 11.05)*</b>
<b>Family history</b>				
Yes	21(21.9)	75(78.1)	<b>4.53(2.40, 8.57)*</b>	<b>2.90(1.37, 6.11)*</b>

No	24(5.8)	389(94.2)	1	1
Do not know	0(0.0)	16(100)	-	-
<b>Dietary pattern</b>				
Sweet test and whole fat diets	38(14.0)	233(86.0)	<b>5.75(2.52, 13.14)*</b>	<b>3.51(1.43, 8.63)*</b>
Not sweet test diets, fruits and vegetable	7(2.8)	247(97.2)	1	1
<b>Physical activity</b>				
Low	31(17.9)	142(82.)	<b>8.9(1.18, 67.57)*</b>	4.30(0.55 37.5)
Moderate	13(4.2)	297(95.8)	1.79(0.23, 14.10)	0.96(0.11, 8.6)
Heavy	1(2.4)	41(97.6)	1	1
<b>Hypertension</b>				
Yes	29(25.7)	83(74.3)	<b>8.65(4.49,16.64)*</b>	<b>5.62(2.60, 11.76)*</b>
No	16(3.9)	396(96.1)	1	

\*P-value < 0.05, statistically significant (P-value <0.05) 95% CI was considered for the final model.

## DISCUSSION

Diabetes and other chronic diseases hit Africa in particular, where the health system does not reach a considerable portion of the population and has a focus on emergencies and infectious diseases. This study shows that 8.57 % of study participants were diabetic, this also revealed that there is a statistically significant association between diabetes mellitus and positive family history (AOR: 2.90(CI: 1.37, 6.11), older age group (AOR: 3.41(CI: 1.05, 11.05), dietary preference (AOR: 3.51(CI: 1.43, 8.63) and hypertension (AOR: 5.62(CI: 2.60, 11.76).

In our study, prevalence of diabetes is 8.58% among study population. This rate is higher than that of global estimates of diabetes in 2010 which was 6.4% (13).this might be due to the study participants for the global estimates of diabetes were younger than our study. This rate is also higher than a research conducted in Jimma town in 2007 in which prevalence of diabetes was 5.3% (7). But the prevalence of diabetes found in this study agrees with report from Ethiopian Jews who have been migrated to Israel in which prevalence of diabetes was 8.9 % (14). The prevalence of diabetes found in this study is comparable to the findings of other community-based studies in developing countries: a cross sectional study conducted in Nigeria (7.9% (15), Cape Town (8.0%) (16), South Africa 9.6% (17), Cameron (10.1%) (18), North Sudan (12.1%) (19) and Bangladesh (8.5%) (20).

In addition to, this study exhibits that there is linkage between age and diabetes among study population and finds that increase prevalence level with the increase of age categories: (40-59(4.5%), 60-79(16.8) and 80 and above (19.4)). Differences in the prevalence among the various age categories were statistically

significance (AOR: 3.41(CI1.05, 11.05), This may be due to worsening of insulin resistance with age and increasing longevity of diabetic patients due to antidiabetic drugs. This study is consistent with cross sectional community studies conducted in Jimma in which the age was significantly associated with diabetes (P=0.004) (10), and Kinshasa (17). Finding of this study is also agreed with study conducted in Jordan (21), Kashmir (22).

Our research also revealed higher prevalence of diabetes among respondents with positive family history (21.9%) compared to who are not positive family history (5.8%). Difference in the prevalence among respondents with family history is statistically significance (AOR: 2.90(1.37, 6.11). This is may be attributed to evidence from influence of genes on the development of T2DM which has emerged from multiple sources. This result is consistent with cross sectional studies from Kinshasa Hinterland (17) Kashmir (22). this study is also comparable to data from multiple laboratories that have been conducted in united states of America (23), study conducted in Iran, (24).

Furthermore, the current study revealed that higher consumption of fruits and vegetable was associated with reduced risk of type 2 diabetes. The possible mechanisms suggested are that insoluble fibre intake was consistently associated with improved insulin sensitivity and decreases risk of type 2 diabetes. The study is consistent with study from USA (25), study conducted in Congo (17) and the study is line with studies conducted in turkey, (26), Ghana (27), and USA (28).

### **Conclusion and recommendation**

Prevalence of diabetes is higher among older age, those with positive family history, and those whom their dietary preference is sweet test and whole fat dairy products and hypertensive respondents. In our study the prevalence of type 2 diabetes mellitus is high compared to report from Ethiopia. Behavioral Change Communication and Information Education Communication should be recommended in the study area regarding to preventable and modifiable risk factor for type 2 diabetes mellitus, such central obesity, physical inactivity, and unhealthy diets by life style modifications (regular physical exercise, reduction of central obesity, health diets regular monitoring of blood pressure and continuous checking of blood glucose).

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