Open Access Journal
RESEARCHERID
THOMSON REUTERS
International Journal of Medical Research and Pharmaceutical Sciences
Volume 7 (Issue 12): December 2020 ISSN: 2394-9414
DOI- Impact Factor- 4.174

ASSESSMENT OF RISK FACTORS FOR TYPE II DIABETES MELLITUS ON PATIENTS ATTENDING AT THREE HOSPITALS IN WOLAITA ZONE, SOUTH ETHIOPIA

Tamene Naba
Wolaita Sodo University, College of Health Sciences, School of Medicine, Physiology Unit, Sodo Ethiopia

Keywords:
Diabetes mellitus, chronic metabolic, etc.

Abstract

Background: Diabetes mellitus is one of the most common chronic metabolic disorders of carbohydrates, proteins, and fat in almost all countries, and it continues to be increased in magnitude.

Objective: The main aim of this study was to assess risk factors for type II diabetes mellitus in patients attending the three Hospitals of Wolaita Zone.

Methods: A cross-sectional study was conducted from July 1 to August 15, 2011, in three Hospitals of Wolaita Zone using the purposive sampling technique until the required sample size of 348 was achieved. Patients with type II diabetes mellitus were selected based on the sample size determination technique for a single population. The data were collected using a semi-structured questionnaire. The data were analyzed using SPSS version 16.0. Frequencies and graphs were used to describe selected variables.

Results: 348 study subjects have participated in the study. As per the age distributions, 188 (54 %) of study participants were found to be above the age of 50 years. The mean ± SD age of type II patients was 51.9±13.6 and age range between 19 years and 83 years. Hundred and seventy- nine (51.4%) of the study participants were males. With concern to educational levels, 86 (24.7%) of the study participants have completed primary school (grade 1-4) followed by illiterates 75 (21.6%). Regarding income, 106 (30.5%) of type II diabetic patients have a monthly income of more than 1500 ETB.

Conclusions and Recommendation: A high proportion of risk factors observed in type II diabetes mellitus were being male, older age group greater than 50, overweight, and with higher monthly income. The risk rate of type II diabetes mellitus was higher among urban residents and the primary level of education. Most of the diabetic cases had BMI >25 kg/m^2 which is a risk factor for the development of type II Diabetes. Chronic disease prevention and control programs, such as health education and promotion of regular physical exercise should be established to decrease the high prevalence of some of the modifiable risk factors like overweight and sedentary lifestyle observed in this study.

Introduction

Diabetes mellitus (DM) is a syndrome characterized by a state of chronic hyperglycemia cause disturbance of carbohydrate, fat, and protein metabolism, associated with an absolute or relative deficiency in insulin secretion or insulin action (1). As per the World Health Organization, diabetes mellitus (DM) is a heterogeneous metabolic disorder characterized by the common features of chronic hyperglycemia with disturbance of carbohydrate, fat, and protein metabolism (2).

Diabetes, more properly called diabetes mellitus, is a group of diseases involving the inability to produce or use insulin, and resulting in elevated plasma glucose (blood sugar) level and classified into three categories. First, type I diabetes

Open Access Journal
RESEARCHERID
THOMSON REUTERS
International Journal of Medical Research and Pharmaceutical Sciences
Volume 7 (Issue 12): December 2020 ISSN: 2394-9414
DOI- Impact Factor- 4.174

mellitus, Juvenile or insulin-dependent diabetes, involves the inability to produce from the outset. It generally has an early age of onset, is probably irreversible, and accounts for 5-10 percent of all cases. Second, type II, adult-onset, or non-insulin-dependent diabetes, is 90-95 percent of all cases. Third, gestational diabetes occurs in 2-5 percent of all pregnancies in the U.S. This form of diabetes is not necessarily permanent, but it can predispose both mothers and children to type II diabetes (3-6).

Family history, ethnicity, age, obesity, and physical inactivity are related to type II diabetes mellitus (7). Type II, previously defined as non-insulin-dependent diabetes mellitus (NIDDM) (7). Diabetes can be diagnosed by three methods: first, fasting plasma glucose test with a value of 126 mg/dL or greater. Second, a non-fasting plasma glucose value of 200 mg/dL or greater in people with symptoms of diabetes, and third an abnormal oral glucose tolerance test with a 2-hour glucose value of 200 mg/dL or greater. Each testis in the above is showing any indication of diabetes mellitus every day. The diabetic diagnoses test is changed in 1997 (8).

Diabetes is a serious disease that can have a significant impact on the health, quality of life, and life expectancy of individuals, as well as on the health-care system. Compared with people without diabetes, diabetic patients have a higher hospitalization rate, longer hospital stays, and increased ambulatory care visits (9).

The study conducted on 365 subjects in the southern part of Ethiopia in 2010 indicated 199 (50.4%) were diabetes and 196 (49.6%) were non-diabetic nearly equal proportion.

Among the diabetics, 152 (76.4%) had type I diabetes mellitus and 47 (23.4%) had type II diabetes mellitus (10).

When diabetes is not well managed, it results in serious complications including heart disease, stroke, blindness, kidney disease, nerve damage, and amputations leading to disability and premature mortality. There is also a substantial financial cost to diabetes care as well as costs to the lives of people with diabetes (11).

Methods And Materials

Study Area and Period
A facility-based cross-sectional study was conducted from July 1 to August 15, 2011, at three Hospitals in Wolaita Zone.

Sample Size Determination and Sampling
Source Population: Diabetic patients registered at three Hospitals in Wolaita Zone.
Study Population: **All type II diabetic patients who were on follow-up at the diabetic clinics of three Hospitals in Wolaita Zone registered until August 15, 2011.**

Inclusion and Exclusion Criteria
Inclusion Criteria:
- Only those patients with a pre-hospital diagnosis of type II DM as reported by General Practitioners.
- Those who were willing to participate in the interview.

Exclusion Criteria:
- Those patients who were unwilling for the interview.
- Patients with type I diabetes.

Sample size determination
A 29 % expected prevalence of type II diabetes in the diabetic clinics of Addis Ababa was considered based on data from studies on relatively similar populations in Addis Ababa (12). No current data are available on the prevalence of

Open Access Journal
RESEARCHERID
THOMSON REUTERS
International Journal of Medical Research and Pharmaceutical Sciences
Volume 7 (Issue 12): December 2020 ISSN: 2394-9414
DOI- Impact Factor- 4.174

diabetes at three Hospitals in Wolaita Zone. The actual sample size was calculated using the following single population proportion formula.

$n= (Z_{\alpha/2})^2 X\ P\ (1-P) \div d^2$

Where

n= required sample size

z=1.96 (95% confidence level for two side)

p= 29 %(proportion of type 2 diabetes mellitus)

d= margin of error (5%)

Therefore the value of n was calculated as follows

$n= (1.96)^2 x0.29\ (1-0.29) \div 0.05^2$

$=316.4\approx 316$

Non-responsive rate 10% of contingency was used.

n= 348

Sampling Technique

The study was conducted using purposive sampling techniques until the required sample size was attained. Those study participants who refused to participate in the study were considered non-respondents and the next. Three trained data collectors (nurses) and two supervisors were assigned to each health facility. After identifying the study participants, the data collectors have informed the aim of the study, confidentiality issues, and informed consent to all of the study participants; the interviewer-administered data collection method was employed in selected type II diabetic patients. The principal investigator and the supervisor were supervising collected data and checked their completeness.

Data collection instrument and processing

Questionnaire

A standardized interview based on a structured questionnaire was carried out by five public health workers who were well-trained interview techniques and all questionnaire details, Information was obtained from the interview including a history of a family, sex, age groups, body built, food habits, income, educational level, physical activity levels, blood pressure, and residence.

II. Weight Scale

- The weight of the patients was measured.
- The height of patient of patients was measured.

BMI was calculated and classified as follows (13).

- Underweight < 18.5 kg m-1
- Normal 18.5 – 24.9 kg m-1
- Overweight 25.0 – 29.9 kg m-1
- Obese ≥30.0 kg m-1

III. Sphygmomanometers

- Patients were announced to avoid having meals at least thirty minutes before BP measurements.
- A cuff that is attached to a manometer (sphygmomanometer) was wrapped around the upper arm and was inflated until the brachial artery is completely occluded.
- The diaphragm of the stethoscope is placed over the brachial artery distal to the cuff. First, the systolic pressure was estimated by palpitation method end the cuff was then allowed to deflate slowly.
- When the cuff reaches systolic pressure, a clear tapping sound was heard in time with the heartbeat. As the cuff deflates further, the sounds became quiet but became louder again before disappearing altogether. The sound disappearing point is diastolic pressure.
- Blood pressure was measured 3 times

Open Access Journal
RESEARCHERID
THOMSON REUTERS
International Journal of Medical Research and Pharmaceutical Sciences
Volume 7 (Issue 12): December 2020 ISSN: 2394-9414
DOI- Impact Factor- 4.174

- The standard clinical mercury sphygmomanometer use to measure blood pressure on the right arm, the subject seated after 10 minutes rest. Hypertension was diagnosed according to WHO criteria [100] if systolic pressure was greater or equals to 140 mmHg or diastolic pressure greater or equals to 90 mmHg.

Data Analysis
The collected data were subjected to statistical analysis. The collected data were coded, checked for completeness and missing value, entered, and analyzed by using SPSS version 16.0. Frequencies and graphs were used to describe selected variables.

Operational Definitions of Terms
Risk Factor: Characteristic, or exposure of Subjects, which increases the likelihood of growing the disease of interest.

Fasting Blood Glucose: The person has undergone an overnight fast from any food or drink (excluding water or clear, plain tea) to measure blood glucose for at least 8 hours.

Obesity: A body mass index (BMI) ≥30.0 kg m-1.

Overweight: A BMI ≥25.0 but less than 30.0 kg m-1.

Normal Fasting Glucose: A capillary whole blood fasting glucose level <5.6 mmol l-1 (100mg dl-1).

Hypertension: The average of casual systolic blood pressure readings ≥140 mmHg and/or diastolic pressure readings ≥ 90mmHg.

Sedentary Lifestyle (Physical inactivity): In this study is measured as a response of being always or usually engaged in light/leisure activities for most days of the week or a response of sometimes/never engagement in moderate to intense physical activity.

Vigorous (physical activity) -Outside work for most days of the week that would add up to at least three hours (14).

Positive Family History of Diabetes: Is a reported history of diabetes in the father, mother, full brother or sister, or the respondent.

Heavy Alcohol Consumption: Refers to the average consumption of more than 3 standard alcoholic drinks per day for men (≈30gm of alcohol) or >2 alcoholic drinks (or20 gm alcohol) for women. A standard alcoholic drink is the equivalent of one glass/can/bottle (330ml) of regular beer (with 3% ethanol), one glass (100ml) of wine (10% ethanol), or one glass or measure (40ml) of distilled spirit, each of which adds up to about 10g of ethanol per drink (14).

Cigarette Smoking: Refers to those who have smoked 1–14, 15–24, and ≥25 cigarettes/d, medium, high, very high smokers respectively.

Results

Socio-demographic Characteristics
A total of 348 study participants were interviewed during the study period. The response rate was 90%. Among 348 patients involved in the study majority, 179 (51.4%) were males. As per the age distributions, 188 (54 %) of study participants were in an age group greater than 50 years. The mean ± SD age of type II patients was 51.9±13.6 and range between 19 years and 83 years. Regarding the marital status of the respondents, 303 (87.1%) of them were married. Among the respondents, 209 (60.1%) of them were Wolaita by ethnicity; followed by Gurage 50 (14.4%).

Open Access Journal
RESEARCHERID
THOMSON REUTERS
International Journal of Medical Research and Pharmaceutical Sciences
Volume 7 (Issue 12): December 2020 ISSN: 2394-9414
DOI- Impact Factor- 4.174

Protestantism was the predominant religion which accounted for 170 (48.9%) followed by Orthodox 110 (31.6%). Concerning educational status, 86 (24.7%) have completed primary school (grade 1-4) followed by illiterates 86 (24.7%).

Table 1A: Socio-Demography Characteristics of Type II Diabetic Patients at Three Hospitals in the Wolaita Zone, South Ethiopia, 2011

Socio-Demographic Characteristics (Respondents)	Frequency	Percent (%)
Sex		
Male	179	51.4
Female	169	48.6
Age		
Mean, SD		51.9±13.6
18-30	22	6.3
31-40	50	14.4
41-50	88	25.3
>50	188	**54.0**
Religion		
Orthodox	110	31.6
Protestant	170	**48.9**
Catholic	12	3.4
Muslim	56	16.1
Ethnicity		
Wolaita	209	**60.1**
Oromo	20	5.7
Gurage	50	14.4
Amara	32	9.2
Hadia	15	4.3
Others*	22	6.3
Marital status		
Single	20	5.7
Married	303	**87.1**
Divorced	5	1.5
Widowed	20	5.7
Educational status		
MSc. and above	5	1.4
First Degree	35	10.1
Diploma	19	5.4
High school (9-12)	61	17.5
Primary School (5-8)	67	19.3

Open Access Journal
RESEARCHERID
THOMSON REUTERS
International Journal of Medical Research and Pharmaceutical Sciences
Volume 7 (Issue 12): December 2020 ISSN: 2394-9414
DOI- Impact Factor- 4.174

Primary School (1-4)	86	**24.7**
Illiterate	75	21.6

***Others=** Silte, Kanbata, Gamo, Dawuro, Tigre

As per the income, 106 (30.5%) of type II diabetic patients have earned a monthly income of more than 1500 ETB. More than half of type II patients, 277 (79.6%) were urban residents. The majorities 301 (86.5%) of patients were no family history of diabetes mellitus. As far as occupational status is concerned, 119 (34.2%) of the respondents were housewives, followed by Government employees 109 (34.2%). As shown in **Table 1B**, the majority 169 (48.6%) of study participants were found to be normotensive.

Table 1B: Socio-Demography Characteristics of Type II Diabetic Patients at Three Hospitals in the Wolaita Zone, South Ethiopia, 2011

Socio-Demographic Characteristics (Respondents)	Frequency	Percent (%)
Income per month		
< 200 Birr	25	7.2
200-499	57	16.4
500-999 Birr	70	20
1000-1499 Birr	90	25.9
≥1500	106	**30.5**
Residence		
Urban	277	79.6
Rural	71	20.4
Family's history		
Yes	47	13.5
No	301	86.5
Occupation		
Merchant	65	18.7
Housewife	119	**34.2**
Gov. Employee	109	31.3
Farmers	28	8.0
Others**	27	7.8
Blood Pressure		
Hypotensive	34	9.7
Normotensive	169	48.6
Hypertensive	145	41.7

Others** Waiter, Carpenter, Construction Worker, Daily labors and guard

Frequency Distribution of Lifestyle Factors Affecting the Incidence of Type II Diabetic Patients

Open Access Journal
RESEARCHERID
THOMSON REUTERS
International Journal of Medical Research and Pharmaceutical Sciences
Volume 7 (Issue 12): December 2020 ISSN: 2394-9414
DOI- Impact Factor- 4.174

Table 2 showed that the value of BMI and the level of physical activities of the study participants. Among the total study participants, 17 (4.9%) were underweight, 135 (38.8%) were having an average BMI. About 196 (56.3%) of type II patients were overweight and obese**.**

Regarding physical activities, 291 (83.7%) of the patients were having sedentary life followed by vigorous physical activities 57 (16.3%).

Table 2: Frequency Distribution of Lifestyle Factors Affecting the Incidence of Type II Diabetic Patients at Three Hospitals in the Wolaita Zone, South Ethiopia, 2011

Lifestyle Characteristics	Frequency	Percent
BMI		
< 18.5	17	4.9
18.5-24.9	135	38.8
25-29.9	118	33.9
>30	78	22.4
Exercise		
Sedentary Life	291	83.7
Physical Activities	57	16.3

Frequency Distribution of the Effects of Dietary Habit on Type II Diabetic Patients

As per the dietary habit, 45 (12.9%) of the study participants usually ate vegetables followed by eating fruit 21 (6.1%). Most 282 (81%) of study participants usually ate sugar and oil excess. The frequency of eating fruits among type II diabetic patients found that 229 (65.8%) ate fruits occasionally followed by eating fruits once a day 61 (17.5%). **(Table 3**

Table 3: The Effects of Dietary Habit on Type II Diabetic Patients at Three Hospitals in the Wolaita Zone, South Ethiopia, 2011

Dietary Habit	Frequency	Percent
Diet		
Vegetables	45	12.9
Fruit	21	6.1
Sugar and Oil Excess	282	81
Frequency of eating fruit		
Never	34	9.8
Occasional	229	65.8
Once a day	61	17.5
2-4 times per day	24	6.9

Open Access Journal
RESEARCHERID
THOMSON REUTERS
International Journal of Medical Research and Pharmaceutical Sciences
Volume 7 (Issue 12): December 2020 ISSN: 2394-9414
DOI- Impact Factor- 4.174

Frequency Distribution of effect of Substance Use on Type II Diabetic Patients

Among 348 participants 311 (89.4%) were non-smokers. Only a few participants 37 (10.6%) were cigarette smokers. Of these about 40 (11.5%) were daily smokers followed by occasional smokers 34 (9.8%). Regarding khat chewing, 74 (21.3%) of type II patients were found to be khat chewers. Most 40 (11.5%) were chewed daily. About 31 (8.9%) of type II patients were chewing two times per week followed by those who chew three times per month 3 (0.9%). About 32 (9.2%) were started chewing khat for more than two years. About 170 (48.9%) of study participants were alcohol drinkers. Of these most, 86 (24.7%) drunk daily followed by drinking two times per week 72 (20.8%). The majority 94 (27.0%) of study participants were drink more than three standard drink. **(Table 4)**

Table 4: Frequency Distribution of Effect of Substance Use on Type II Diabetic Patients at Three Hospitals in the Wolaita Zone, South Ethiopia, 2011

Substance Use	Frequency	Percent
Smoking Cigarettes		
Yes	37	10.6
No	311	89.4
The Number of Cigarettes Per Day		
1-14	15	40.5
15-25	10	27.1
>25	12	32.4
Chew Khat		
Yes	74	21.3
No, I have Never	274	**78.7**
Frequency of Chewing Khat		
Daily	40	**11.5**
Occupational	34	9.8
Duration of Starting chewing Khat		
One Month	5	1.4
One Year	13	3.7
Two Year	24	6.9
More Than Two Years	32	**9.2**
Drink Alcohol		
Yes	170	48.9
No	178	51.1
Frequency of Drinking Alcohol		
Daily		
Two Times Per week	86	**24.7**
Three Times Per month	72	20.8

Open Access Journal
RESEARCHERID
THOMSON REUTERS
International Journal of Medical Research and Pharmaceutical Sciences
Volume 7 (Issue 12): December 2020 ISSN: 2394-9414
DOI- Impact Factor- 4.174

No. Alcohol Drinking per Day		
One Standard*	4	1.1
Two Standard Drink**	18	5.2
Three Standard Drink**	54	15.5
More than three standard drink	94	**27.0**

*Mild Alcohol Consumption =One standard drink per day
**Moderate Alcohol Consumption= Two standard drink per day+ Three standard drink per day
*** Heavy Alcohol Consumption= More than three standard drink per day

Discussions

The distribution of type II diabetes mellitus among male and female patients was found to be different. According to the finding of the present study, type II DM is more prevalent among males than in females. This finding is in agreement with the study conducted in India by Muhammad K *et al*., 2010, which showed a higher prevalence (53.3%) rate among males than a relatively lower prevalence of 46.6 % among females (15). The above study supports our finding. The possible explanation for this could be because males are more exposed to risk factors for DM.

Some other studies are contradicted to the present finding, which showed a higher prevalence in females than males (16). In addition to the above results, there are also other studies which showed that a similar prevalence between males and females (17-19). The women enrolled in this study were mainly housewives whereas men were working outside the home and household income is mostly controlled by men. These factors may have influenced the difference in diabetes prevalence.

In this study 188 (54.0%) of the study, participants belonged to the age group of >50 years. This result is in agreement with the study conducted in India by Muhammad K which showed that the majority of the study participants belong to the age group of 60 and above (15). However, this is contradicted with the study conducted by Shobha M *et al*, where they found that majority of patients belonged to the age group 46 to 50 years of age (20). But they specified that there is an increased onset of diabetes among the younger age group in Indians.

In this study majority of participants, 303 (87.1%) were married. A similar study conducted in Gahana by Philip Q et al showed that marital status was strongly associated with DM2 (21). As per the distribution of education, 86 (24.7%) were the primary level of education (grade 1-4). About 5(1.4%) were MSc holders and above. This is in agreement with the study conducted by Satpute D et al, 2008; showed that diabetes particularly affects the high prevalence rate in the people with lower educational levels in Bolivia and Jamaica (22, 23). This is because education is a very important factor to control the feeding style to minimize the development type of II diabetes mellitus.

The distribution income as far as concerned, 106 (30.5%) were grouped earned monthly income under high- income categories and 25 (7.2 %) were grouped under low-income categories. This is in agreement with the study conducted in Turkey in 2000, which showed that a higher percentage of diabetes mellitus high under high- income categories (24). The possible explanation is may be due to more consumption of non-vegetable food who had earned monthly income greater than 1500 ETB. A similar study is conducted Philip Q et in Ghana Showed that socio-demographical characteristics such as occupation, level of education, marital status, religion were independent significant associations to DM2 (21).

Out of the total type II diabetic patients who visited the hospitals' majority of 277 (79.6 %) were urban residents and 71 (20.4%) were rural residents. This is in line with the study conducted by Aboderin in 2001, which showed a high percentage of type II diabetes in an urban area (25, 26). The possible reasons for the high prevalence of type II diabetes in the urban area may be due to the easy availability of non- vegetable-rich food and low working habit in the urban.

Open Access Journal
RESEARCHERID
THOMSON REUTERS
International Journal of Medical Research and Pharmaceutical Sciences
Volume 7 (Issue 12): December 2020 ISSN: 2394-9414
DOI- Impact Factor- 4.174

Most of the study participants 301 (86.5%) were not had a family history of diabetes. This study is opposing the finding of Muhammad K *et al.,* 2010 conducted in India, which showed that the majority (69.4%) of the respondents were having a family history of type II diabetes mellitus (15). This difference is because the respondents were not well informed about the diabetic history of their family.

Out of the total type II diabetic patients 196 (56.3%) were having BMI >25 kg/m^2, 17 (4.9%) of type II patients were < 18.5kg/m^2. This is in agreement with another study (27), which reported that type II diabetes is high in obese and overweight type study participants. This is because there are fewer insulin receptors, especially in the liver, adipose tissue, and skeletal muscle in obese than in lean subjects.

In the present study, 57 (16.3%) of the diabetic patients were doing physical activities, the rest 291 (83.7%) participants were not involved in physical activities. This is supported by other studies (28, 29), which revealed a high percentage of diabetes among low physical activity participants. Another study was done by Perry I et al, 1995, showed that Physical inactivity is a well-known risk factor for type II diabetes. The risk of diabetes is reduced by 50% among men who take moderately vigorous exercise (30). Lack of physical activity and unhealthy dietary habits are important modifiable risk factors for diabetes. The highest percentage of type II diabetes among the lower levels of physical activity is because regular physical exercise reduces the risk of development of DM by regulating resistance in a target tissue, reducing body weight may also increase the number of receptors in the target tissue.

In this study majority of 282 (81%) participants usually ate sugar and oil excess. This finding is supported by other studies that report a high prevalence of type II diabetes among non-vegetarian (31). The possible justification of the high percentage of type II diabetes mellitus among eating sugar and oil excess is due to the high accumulation of fats in the body. Carbohydrate and fat-rich foods increase insulin resistance by an accumulation of fat which exposes the participants to the development of type II diabetes mellitus.

The distribution of drinking alcohol, 94 (27%) of the study participants were heavy drunker and 4 (1.1%) were mild drunker. There is a study that supports this result (32). A possible explanation of the high distribution of type II diabetes mellitus among type II diabetes mellitus is might be due to heavy consumption of alcohol damaging beta cells in the pancreas.

Conclusions and Recommendations

A high proportion of risk factors observed in type II diabetes mellitus were being male, older age group greater than 50, overweight, and with higher monthly income. The rate of type II diabetes mellitus was higher among urban residents. Most of the diabetic cases had BMI >25 kg/m^2 which is a risk factor for the development of type II Diabetes. Dietary habits like eating excess oil and sugar were found to be risk factors for the development of type II diabetes mellitus. The level of education was found to be a very important factor in controlling diabetes mellitus. Chronic disease prevention and control programs, such as health education and promotion of regular physical exercise should be established to decrease the high prevalence of some of the modifiable risk factors like overweight and sedentary lifestyle observed in this study.

Conflict of interests: No conflict of interest to another author.

References

1. *Joslin's Diabetes Mellitus. Lea and Febiger: A Waverly company; 1994:133. 13th ed.*
2. *Harsh M. Textbook of pathology. Jaypee brothers: New Delhi; 2005:650-3. 5th ed.*
3. *Centers for disease control and prevention (CDC). National Diabetes fact sheet: national estimates and general information on diabetes in the United States. Atlanta, GA: HHS; 1998.*
4. *Reaven G. The role of insulin resistance in human disease. Diabetes Care 1988; 37(12): 1595-1607.*

Open Access Journal
RESEARCHERID
THOMSON REUTERS
International Journal of Medical Research and Pharmaceutical Sciences
Volume 7 (Issue 12): December 2020 ISSN: 2394-9414
DOI- Impact Factor- 4.174

5. *Hamiel O, Dolan L, Daniels S, et al. Increased incidence of Non-insulin-dependent diabetes mellitus among adolescents. Journal of Pediatrics 1996:128(1): 608-615.*
6. *Plagemann A, Harder T, Kohihoff R, et al. Glucose tolerance and insulin secretion in children of mothers with presentational IDDM or gestational Diabetes. Diabetologia 1997; 40(9): 1094-1100.*
7. *Centers for Disease Control and Prevention. National diabetes fact sheet: general information and national estimates on diabetes in the United States, 2007.*
8. *American Diabetes Association. Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Diabetes Care 1997; 20:1183-1197*
9. *Centers for Disease Control and Prevention. Surveillance for diabetes mellitus-United States, 1980-1989, MWR 42 (SS-2):1-20, 1993*
10. *Araya G, Mistire W, Dawit Y, et al. Hypertension, obesity and central obesity in diabetics and non-diabetics in Southern Ethiopia. Ethiop. J. Health Dev 2010; 24(2):145-147.*
11. *Stratton I, Adler A, Neil H, et al. Association of glycemia with macrovascular and microvascular complications of Type II diabetes. BMJ 2000; 321; 405–412.*
12. *Khang Y, Lynch J, Kaplan G, et al. "Health inequalities in the Republic of Korea: age- and sex-specific educational differences in the 10 leading causes of death. International Journal of Epidemiology 2004; 33(2): 299–308.*
13. *Gallagher D, et al. How useful is BMI for comparison of body fatness across age, sex, and ethnic groups? American Journal of Epidemiology 1996; 143:228–239.*
14. *WHO. Surveillance of Noncommunicable Disease Risk Factors, the WHO Stepwise Approach. 2001 Geneva: 12-18, 51-79*
15. *Muhammad K, Prasanth N, Dilip C, et al. Assessment of risk factors among type 2 diabetic populations in South Malabar region of Kerala. Arch. Appl. Sci. Res. 2010; 2 (4):313-323.*
16. *Sekikawa A, Eguchi H, Tominaga M, et al. Prevalence of Type II diabetes mellitus and impaired glucose tolerance in a rural area of Japan. The Funagata Diabetes Study. J Diabetes Complications, 2000; 14:78–83.*
17. *Jaber L, Brown M, Hammad A, et al. Epidemiology, of diabetes among Arab Americans. Diabetes Care 2003; 26:308-313*
18. *King H, Djumaeva S, Abdullaev B, et al. Epidemiology of glucose intolerance and associated factors in Uzbekistan: a survey in Sirdaria province. Diabetes Res Clin Pract, 2002; 55:19-27.*
19. *Kelestimur F, Cetin M, Pasaoglu H et al. The prevalence of identification of risk factors for Type II diabetes mellitus and impaired glucose tolerance in Kayseri, Central Anatolia, Turkey. Acta Diabetol, 1999; 36:85-91.*
20. *Shobha D, Sahu A, Swapna M, et al. Indian.J.Comm.Med., **2007**;34: 232 -236*
21. *Philip Q, et al Associated Risk factors Of Type2 Diabetes Mellitus among Adults in the Hohoe Municipality of Ghana. IJMRPS. 2017; 4(5): 35-48*
22. *Larsson H, Berglund G, Lindgarde F, et al. Comparison of ADA and WHO criteria f*
23. *Satpute D, Ingle P, Shimpi RD et al. Int. J. Pharma. Tech. 2008; Res, 1:1 – 21.*
24. *Yusuf Ö, Mualla A, Fahrettin, K.et al. Prevalence of Diabetes Mellitus and Affected Factors in the District of Kayseri Health Group Area. Turk J Med Sci .2000; 30:181–185*
25. *Aboderin I, Kalache A, Ben-Shlomo Y, et al. Life Course Perspectives on Coronary Heart Disease, Stroke and Diabetes: Key Issues and Implications for Policy and Research. Geneva: World Health Organization; 2001.*
26. *Shobhana R, Rama P, Lavanya A, et al. Cost Burden to Diabetic Patients with Foot Complications – A Study from Southern India. JAPI 2000; 48:1147-1150.*
27. *Williams G, Pickup J. Handbook of diabetes. 3rd ed. Blackwell Publishing; 2004*
28. *Flegal K. Prevalence of Diabetes and IGT in Mexican Americans, Cubans and Puerto-Ricans aged 20-74 years. Second Hispanic Health and Nutrition Examination Survey (HANES II), 1982-84. Diabetes Care 1991; 14 (3): 628-638.*

Open Access Journal
RESEARCHERID
THOMSON REUTERS
International Journal of Medical Research and Pharmaceutical Sciences
Volume 7 (Issue 12): December 2020 ISSN: 2394-9414
DOI- Impact Factor- 4.174

29. *WHO Technical Report Series. Prevention of Diabetes Mellitus. Report of a WHO Study Group, 1994 Geneva: 844: 5-18*
30. *Perry I, Wannamethee S, Walker M, et al. Factors for development of NIDDM in middle-aged British men. British Medical Journal 1995; 310: 560-564.*
31. *Alberto, Rajpthak, Swapnil . Public health 2001, 10.*
32. *Obembe A, Sijuwola A, Ayuba L, et al. Excessive alcohol consumption, risk of death, and liver disease. A 5-year hospital review at Jos, Medical Practitioner; 26 (5/6).*