



Wolkite University

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WOLKITE UNIVERSITY

COLLEGE OF HEALTH AND MEDICAL SCIENCE

DEPARTMENT OF MEDICAL LABORATORY SCIENCE

**PREVALENCE OF DIABETES MELLITUS AND ASSOCIATED RISK FACTORS
AMONG DIABETES SUSPECTED PATIENTS IN WOLKITE UNIVERSITY
SPECIALIZED HOSPITAL OF GURAGE ZONE, SNNPR, ETHIOPIA**

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August, 2021

WOLKITE ETHIOPIA

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List of Abbreviation

BMI -Body mass index

DM -Diabetes Mellitus

FBS -Fasting Blood Sugar

GDM -Gestational Diabetes Mellitus

IDDM -Insulin Dependent Diabetes Mellitus

IDF -International Diabetes Federation

IDFA -International Diabetes Federation and Association

MRDM -Malnutrition Related Diabetes Mellitus

NIDDM -Non-Insulin Dependent Diabetes Mellitus

OGTT -Oral Glucose Tolerance Test

RBS -Random Blood Sugar

T1DM -Type 1 Diabetes Mellitus

T2DM -Type 2 Diabetes Mellitus

WHO -World Health Organization

WKUSH -Wolkite University Specialized Hospital

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Abstract

Background: -Diabetes mellitus is a global public health problem, and its burden is rising, particularly in developing countries. However, limited data is available from sub-Saharan African communities to assess and monitor the disease burden.

Objective: - This study aimed to determine the prevalence and associated factors of diabetes in WKUSH, July, 2021

Methods: - A hospital-based cross-sectional study was conducted among 194 randomly selected DM patients in WKUSH. The study participants were recruited by convenient sampling technique. A face-to-face interview using a structured questionnaire was administered by trained nurses. Anthropometry, blood pressure and fasting blood glucose levels was measured.

Result: - From a total of 194 study participants 102(52.6%) were males and 92(47.4%) were females. The respondent rate was 93.3%. The majority of respondents were living in rural area 133(68.6%), and in urban area 61(31.4%). The prevalence of DM from this study was 24.23%. age, sex, body mass index, physical activity and blood pressure were associated risk factors of Diabetes mellitus.

Conclusion: - The finding of this study showed that the higher prevalence of DM on clinically suspected cases of DM in WKUSH from July, 2021 was 24.23%.

Chapter One

1.1 Background

Diabetes mellitus (DM) is a metabolic disorder characterized by chronic hyperglycemia that causes carbohydrate, protein and fat metabolism disorders. It is resulting from an absolute or relative deficiency of insulin. [1]

It is a complex group of diseases with multiple causal factors. Of these factors; abnormality in glucose production, Beta Cell Dysfunction and genetic susceptibility were among the commonly stated. In addition, age, sex, alcohol intake, smoking, hypertension, family history, physical inactivity, and level of lipid profile were commonly identified factors causing diabetes. [2]

Type 1 Diabetes or Insulin Dependent Diabetes Mellitus (IDDM):- Type 1 diabetes mellitus (T1DM) is a disorder of glucose homeostasis characterized by autoimmune destruction of the insulin-producing pancreatic b-cell that progressively leads to insulin deficiency and resultant hyperglycemia. [3]

Type 2 diabetes or non-insulin dependent diabetes mellitus (NIDDM):- Type 2 diabetes has been known as non-insulin-dependent diabetes mellitus (NIDDM) or late onset diabetes. It is predominantly insulin resistance with relative insulin deficiency and accounts 90 – 95% of total diabetic case. [4]

Type of DM is gestational diabetes mellitus which is glucose intolerance that develops and first becomes recognized during pregnancy. The pathogenesis of GDM still remains largely unknown; nonetheless studies have shown involvement of dysregulation and defects in the insulin signaling pathway, resulting in reduced glucose uptake and transport in skeletal muscles and adipocytes [5].

The aim of this study is to assess prevalence of DM and associated factors among DM suspected patients in Wolkite University Specialized Hospital.

1.2 Statement of the Problem

Globally, the prevalence of DM was 8.5% in 2016, and it is estimated to be one adult in ten will have diabetes in the world by 2035. Sub Saharan Africa (SSA) countries are expected to experience the worldwide fastest increase in the number of people living with type 2 diabetes. It is estimated that developing countries including Ethiopia will bear 77% of the global burden of the DM epidemic in the 21st century. In SSA, the challenge posed by DM is even more overwhelming since diabetes will have to share scarce resources with infectious diseases and malnutrition [7]. The World Health Organization (WHO) estimated that the prevalence of diabetes in Kenya will rise from 3.3% in 2000 to 4.5% by 2025. [8]

Ethiopia is one of the nation's continually affected by the disease. According to the 2017 report of IDF, the number of adults aged 20–79 years living with diabetes in the country was 2.567 million (5.2%). And, the whole diabetes-related death was 30,972 accounts for 1% of the mortalities. According to WHO, Ethiopia had a profile, 3.8% (4.0% amongst males and 3.6% amongst females) of the population had diabetes morbidity in the year of 2016. Some of the factors associated with the incidence of diabetes encompassed: being overweight and obese, older age, having tertiary educational level poor physical activity, having a family history of DM, low fruit and vegetable consumption, cigarette smoking, and alcohol consumption waist to hip ratio (WHR) and being hypertensive. [9]

Therefore, this study aims to assess the prevalence and associated risk factors on suspected patients of diabetes mellitus and the generated evidence that will benefit the people in several ways. For instance, the findings will be used by the health system as a baseline for planning, budgeting and resource allocation.

1.3 Significance of the Study

This study will be helps to analyze the prevalence of DM and associated risk factor of the DM on the DM suspected individual at Wolkite University Specialized Hospital. And also it will be provide significance information about the diabetic disorder, the risk factor that are associated with DM and its appropriate treatment methods for the patient who are attend Wolkite university specialized Hospital. The result of this study will be disseminated to responsible body such as Gurage zone Health Office, Physician Office of the Hospital to minimize the prevalence of DM.

Chapter two

2. Literature Review

Diabetes mellitus (DM) is a metabolic disorder of multiple etiologies, characterized by chronic hyperglycemia with disturbances of carbohydrate, fat, and protein metabolism resulting from defects in insulin secretion, action or both. [10]

According IDF report in 2019 463(9.3%) millions of people were living diabetes in the world with those people 19 million were in low- and middle-income countries. And also according this IDF report the prevalence of diabetes mellitus in African Region were 3.9% in 2019. [11]

A cross-sectional study was conducted among Yaoundé Central Prison inmates from January to July 2017, this prison is located in Yaoundé, the city capital of Cameroon (sub-Saharan Africa) in this study 437 inmates were participated among this participant, the prevalence of diabetes was 41(9.4%). The prevalence of diabetes higher in this prison could be related to poor feeding condition and sedentary lifestyle. [12]

A cross-sectional study was conducted among people living with type 2 diabetes who were on follow-up from January 01 to 31, 2019 at Yekatit 12 Hospital, in this study 354 individuals participated among this participants more than half (49.9% -57.1%) of the people living with diabetes due to poor diabetes self-care practice. [13]

An institution-based cross-sectional study was carried out from June to July 2016 in Addis Ababa Public Health Facilities, a total of 758 individuals were selected from that overall prevalence of diabetes mellitus was 14.8% among those individuals the prevalence of males and females were 18.35% and 16.62% respectively. On that study higher prevalence of diabetes mellitus was observed due to such Factors; age, alcohol drinking, HDL, triglycerides, and vagarious physical activity were associated with diabetes mellitus. [14]

A community-based cross-sectional study was conducted on all adult population above 18 years in Hawassa Zuria Woreda from January, 1 to February 15, 2019. 519 adults were participated in that study from that participated individual DM prevalence was found to be 64 (12.4%). Of these, the proportion of previously undiagnosed DM was 48 (75%). and the associated factors to DM include obesity, being a smoker, being hypertensive, high waist circumference and high triglyceride levels. [9]

Community-based cross-sectional study was conducted among 634 in SSNPR, Hosanna town among those adult's overall prevalence of diabetes mellitus was found to be 5.7%. 6.5% among the males and 4.6% among the females. The risk factors for prevalence were alcohol use, spending on average more than 8 hours per day sitting, abnormal BMI and hypertension. [15]

Chapter three

3. Objectives

3.1 General Objectives

To assess the prevalence and associated risk factors of diabetes mellitus among diabetes suspected patients in WKUSH.

3.2 Specific Objectives

- ✓ To determine the prevalence of diabetes mellitus among diabetes patients in WKUSH.

- ✓ To determine the associated risk factors of Diabetes mellitus among suspected patients in WKUSH.

Chapter four

4. Materials and Methods

4.1 Study area

The study was conducted in WKUSH,2021

4.2 Study Design and Study Period

Hospital based Cross sectional study design was conducted in June to August 2021 on the prevalence of DM and associated risk factors among diabetes patients in WKUSH.

4.3 Source Population

All outpatients who came to the WKUSH.

4.4 Study Population

All diabetes suspected individual was attended WKUSH.

4.5 study subject

All diabetes suspected individuals who were sent to WKUSH laboratory for fasting blood sugar test.

4.6 SAMPLE SIZE

Total sample size was determined by using single population proportion formula with 95% confidence interval and marginal error (d) of 5%. The p value was 14.8% among 7585 individuals, Addis Ababa public health facilities, 2016[14].

The sample size is calculated by using the formula: -

$$n=z^2 \times pq/d^2$$

Where, n=sample size

z=confidence level which is 95% & it is 1.96

P= estimate of the prevalence diabetes mellitus patients of the population 14.8% (0.148).

q=1-p= 0.852

d=margin of error 5%= 0.05

$$n = \left(\frac{1.96}{0.05} \right)^2 \times 0.148 \times 0.852 = 194$$

4.7 Sampling Technique

Convenient sampling technique was used to select 194 study participants from diabetes suspected individual who attended in WKUSH.

4.8 Study Variable

4.8.1 Dependent Variable: -

- ❖ Diabetes mellitus

4.8.2 Independent Variable: -

- | | |
|----------------------|----------------------|
| -Age | -Sex |
| -Smoking habit | - Nutritional status |
| -Alcohol consumption | - Physical activity |
| -BMI | - Religious status |
| -Blood pressure | - Ethnicity |
| -Occupation | -Economy |
| -Marital status | Educational status |

4.8.3 Conceptual Frame Work

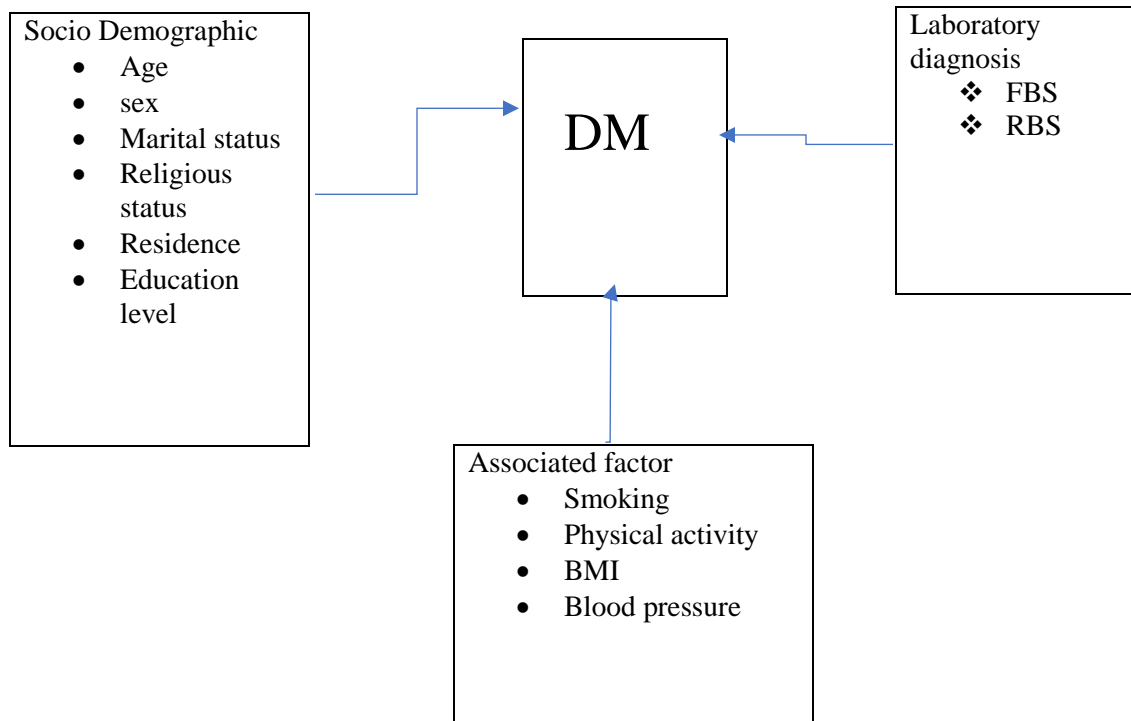


Fig: - 1 conceptual work frame showing association between sociodemographic variables and other associated factor with respect to diabetic Mellitus.

4.9 Inclusion and Exclusion criteria

Inclusion criteria

- Fasting blood sugar (FBS)
- Unknown diabetes or suspected to diabetes

Exclusion criteria

- Known diabetes
- Individuals will send for RBS because amounts glucose level in serum affected after meal.
- Individuals was taken medication before two weeks.

4.10 Operational Definition

Fasting blood sugar: -This test checks your fasting blood glucose levels. Fasting means after not having anything to eat or drink (except water) for at least 8 hours before the test.

Random blood sugar: This test is a blood check for glucose level at any time of the day when you have severe diabetes symptoms. Were also maintained in addition to keep their response confidentially.

4.11 Data Collection and Sample Processing

4.11.1 Data Collection

Data on socio demographic variables such as age, sex, smoking, occupation, etc. was gathered by interviewing the patient using structured questionnaire.

Physical measurements: -Blood pressures, body mass index (BMI) were collected by trained nurses.

Blood pressure measurement: History of hypertension considered to be positive when individuals diagnosed to have hypertension. Blood pressure (BP) w was measured in sitting position on the right arm using mercury sphygmomanometer. Two readings were taken 5 minutes apart, and the mean was taken as the final BP reading. Hypertension defined as systolic BP of ≥ 140 mmHg or diastolic BP of ≥ 90 mmHg. [16]

Anthropometric measurements: Height was measured by using a stadiometer, standing upright on a flat surface. Body weight was measured while wearing light clothes by an adjust scale. Calculate Body mass index (BMI) by it's by the formula: weight in kilograms divided by height in meters squared. BMI defined <18.5kg/m² underweight, 18.5-24.9 kg/m² normal, and 25-29.9 kg/m² overweight and >30 kg/m² obesity. [17]

Biochemical measurements: 3ml venous blood using plain vacationer tubes was obtain an overnight fast (\geq 8hrs) the blood samples were left leave at room temperature to allow clotting for 15-20 minutes and centrifuged at 3000 rpm for 10 minutes. Then sera were transferred into 2 ml Epp end or tubes and stored at +4°C for 1-2 hours and levels of glucose, were measured using enzymatic glucose oxidase by chemistry analyzer. The diagnosis of DM was based on the WHO 2006 with fasting blood glucose of over \geq 126 mg/dl being diagnostic for DM. [18]

4.12 Sample Processing

2ml of venous blood was collected after at least 8 hours fasting in to serum separator tube. Optionally capillary blood was determined by glucometer during automated chemistry analyzer failure.

After sample collection, the sample was centrifuged to separate plasma from whole blood and glucose analysis will be done on the same day.

Glucometer: most glucometer today used an electrochemical method; test strips contain a capillary that sucks UN reproducible amount of blood. The total charge passing through the electrode is proportional to amount of glucose in blood that react with the enzyme.

Mindray chemistry analyze; which is enzymatic methods used for long term monitoring of glucose level. Mindray enzymatic method for Hb1c testing applied on chemistry analyzers can achieve reliable performance.

4.13 Data Processing and Analyzing

Data was processed and analyzed using SPSS statistical tool and the variable had p-value analyses on chi-square. On the analysis reliable interpretation of result and discussion was made by comparing this study finding with other possible studies. Statically significant associations were $p \leq 0.05$.

4.14 Data Quality Control

To check the quality of our test initial quality control sample was run together with the patient sample. The questionnaire was checked for completeness and lab investigation done by following the standard operational procedures.

4.15 Ethical Consideration

Before data collection, Ethical clearance letter was obtained from Wolkite University College of medicine and health science department medical laboratory and dispatch to WKUSH. The respondents were informed and their oral consent was obtained. The respondents have the right to refuse or with draw from participating.

5. RESULTS

5.1 Socio demographic Characteristics

From a total of 194 study participants 102(52.6%) were males and 92(47.4%) were females. The respondent rate was 93.3%. The majority of respondents were living in rural area 133(68.6%), and in urban area 61(31.4%). About 68(35.1%) were single, and 126(64.9%) were married. Most of the study subjects 164(84.5%) were literate and about 110(56.7%) were employed. About 109(56.2%) were do not engage in physical activity and 85(43.8%) were do. On the other hands among study participants 45(23.2%) were have the habit of smoking cigarette and 149(76.8%) were not and about 54(27.8%) have a habit of drinking alcohol where us 104(72.2%) have not. The socio-demographic and behavioral characteristics of the study participants were summarized in Table 1.

Table1: - Frequency distribution of the socio-demographic and behavioral characteristics of the study participants (n=194) in Wolkite University Specialized Hospital, Aug, 2021.

S.no.	Variables	Category	Frequency	Percentage
1	sex	Male	102	52.6
		Female	92	47.4
		Total	194	100
2.	Age	10-19	29	14.9
		20-29	25	10.8
		30-39	38	19.6
		40-49	68	35.1
		50-59	24	12.4
		60-69	8	4.1
		≥70	6	3.1
		Total	194	100

3.	Religion	Christianity	126	64.9
		Muslim	68	35.1
		Total	194	100
4.	Marital status	single	68	35.1
		Married	126	64.9
		Total	194	100
5.	Educational status	Illiterate	30	15.5
		Literates	164	84.5
		Total	194	100
6	Residence	Rural	133	68.6
		Urban	61	31.4
		Total	194	100
7	Occupational status	Non employed	84	43.3
		Employed	110	56.7
		Total	194	100
8	Physical activity	Yes	85	43.8
		No	109	56.2
		Total	194	100
9	Alcohol consumption	Yes	54	27.8
		No	104	72.2
		Total	194	100
10	Smoking Cigarettes	Yes	45	23.2
		No	149	76.8
		Total	194	100
11	BMI	Under weight	28	14.4
		Normal	121	62.4
		Over weight	39	20.1
		Obesity	6	3.1

		Total	194	100
12	BP	Hypertension	14	7.2
		Non hypertension	180	92.8
		Total	194	100

Out of 194 study participants 47(24.23%) were diabetics from those 14 (13.7%) were males and 33 (35.9%) were females. 5(62.5%) were under the age group of 60-69 years, 15(24.6%) diabetic were live in urban and 32(24.1%) were rural. 12(40 %) were illiterate and 35 (21.4%) were literate ,17(25%) were Muslim and 30 (23.8%) were Christianity. 13 (19.1%) were single and 34(27%) were married, and 25 (22.7%) were employed and 22(26.2%) were non employed. 5(17.9%) were under weight,17(14%) were normal,21(53.8) were overweight and 4(66.7%) were obesity.37(20.6%) were non hypertensive, and 10(71.4%) were hypertensive. 8(17%) were smoke cigarette, and 39(26.2%) were non-smoker. 17(31%) were alcohol consumer, and 30(24%) were non-alcoholic. 27(18.3%) were engaged physical activity, and 20(31.8%) were have no do. **Summarized in Table: -2**

Table: -2 Chi-square analysis of prevalence of Diabetes Mellitus with related to different associated risk factors in Wolkite University Specialized Hospital July, 2021.

Variables	Category	Non diabetics	Diabetics	Total (100%)	Chi-square(x ²), Fischer exact test p-value
		Frequency (%)	Frequency (%)		
Sex	Male	88 (86.3%)	14 (13.7%)	102	X²=12.9 P=0.001
	Female	59 (64.1%)	33 (35.9%)	92	
	Total	147 (75.77%)	47 (24.23%)	194	
Age	10-19	23 (79.7%)	6 (20.7%)	29	X²=10.4 P=0.016
	20-29	17 (80.9%)	4 (19.1%)	25	
	30-39	29 (76.3%)	9 (23.7%)	38	

	40-49	15 (62.5%)	9 (37.5%)	68	
	50-59	55 (80.9%)	13 (19.1%)	24	
	60-69	3 (37.5%)	5 (62.5%)	8	
	>70	5 (83.3%)	1 (16.6%)	6	
	Total	147 (75.77%)	47 (24.23%)	194	
Occupation	Employed	85 (77.3%)	25 (22.7%)	110	X²=0.31 P=0.5
	Non employed	62 (73.8%)	22 (26.2%)	84	
	Total	147 (75.77%)	47 (24.23%)	194	
Residence	Rural	101 (75.9%)	32 (24.1%)	133	X²=0.06 P=0.9
	Urban	46 (75.4%)	15 (24.6%)	61	
	Total	147 (75.77%)	47 (24.23%)	194	
Education status	Illiterate	18 (60%)	12 (40%)	30	X²=4.81 P=0.028
	Literate	129 (78.6%)	35 (21.4%)	164	
	Total	147 (75.77%)	47 (24.23%)	194	
Religion	Muslim	51 (75%)	17 (25%)	68	X²=0.34 P=0.85
	Christianity	96 (76.2%)	30 (23.8%)	126	
	Total	147 (75.77%)	47 (24.2%)	194	
Marital status	Single	55 (80.9%)	13 (19.1%)	68	X²=3.48 P=0.3
	Married	92 (73%)	34 (27%)	126	
	Total	147 (75.77%)	47 (24.2%)	194	
BMI	Under weight	23 (82.1%)	5 (17.9%)	28	X²=31.9 P=0.001
	Normal	104 (86%)	17 (14%)	121	
	Over weight	18 (46.2%)	21 (53.8%)	39	
	Obesity	2 (33.3%)	4 (66.7%)	6	

	Total	147 (75.77%)	47 (24.23%)	194	
BP	Non-Hypertension	143 (79.4%)	37 (20.6%)	180	X²=18.3 P=0.001
	Hypertension	4 (28.6%)	10 (71.4%)	10	
	Total	147 (75.77%)	47 (24.23%)	194	
Smoke cigarette	Yes	37 (82.2%)	8(17.8)	45	X²=1.3 P=0.2
	No	110(73.8%)	39(26.2%)	149	
	Total	147(75.77%)	47(24.23%)	194	
Alcohol consume	Yes	37(68.5%)	17(31.5%)	54	X²=2.14 P=0.15
	No	110(75.6%)	30(21.4%)	140	
	Total	147(75.77%)	47(24.23%)	194	
Physical activity	Yes	58(68.2%)	27(18.3%)	85	X²=4.68 P=0.03
	No	89(81.7%)	20(31.8%)	109	
	Total	147(75.77%)	47(24.23%)	194	

Prevalence of DM

Out of 194 study participants the prevalence of DM was 47(24.23%) were diabetic. from those the highest prevalence of DM was observed among females 33 (35.9%). Sex has significant associated, since $p=0.001$. age group, 60-69 years has 5(62.5%), age has significant associated, $p=0.016$. on educational status, illiterate was 12(40 %), it has Significant associated, since $p=0.028$. obesity participants 4(66.7%). BMI has significant associated, since p-value less than 0.05, which is **0.001**. Hypertension participants 10(71.4%), BP has significant associated, since $p=0.001$ and from participants no engaging of physical activity 20(31.8%), physical activity has significant associated, since p-value less than 0.05, which is **0.03**. **these summarized from above Table: -2**

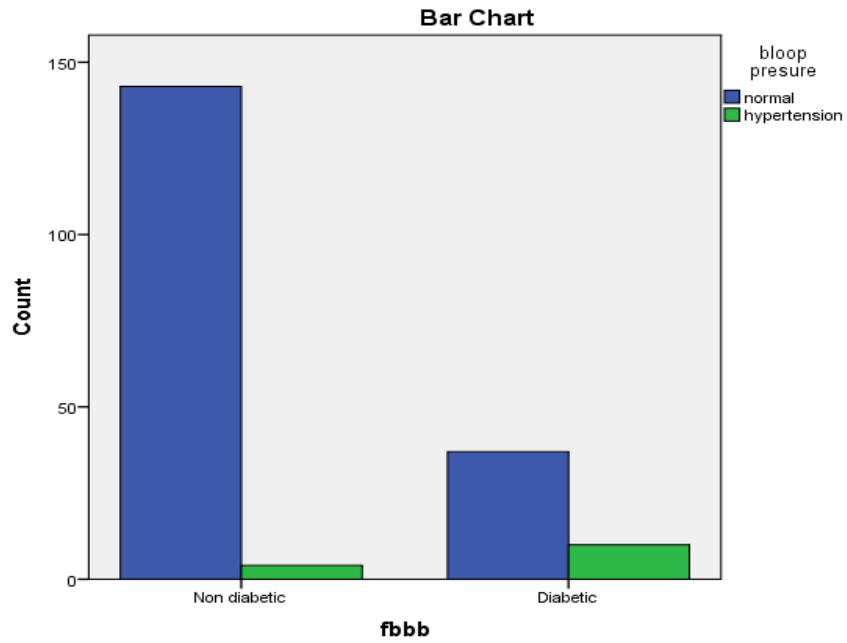


Figure:-2 prevalence of DM with hypertension

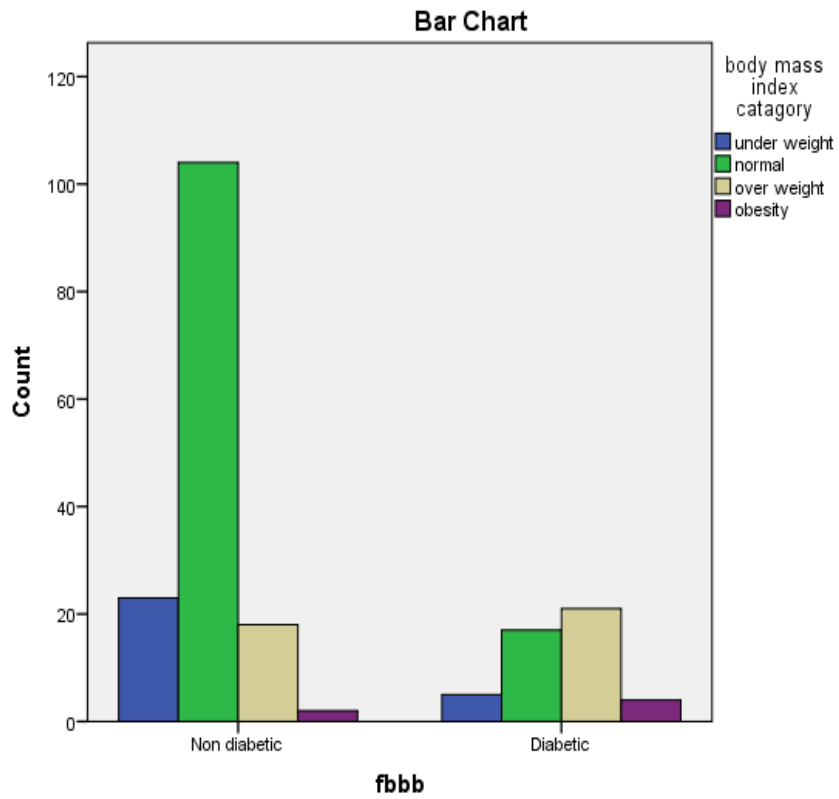


Figure:-3 prevalence of DM with body mass index

DISSCUSION

The prevalence of diabetes in this study was 24.23%, which is highly prevalent than study done other studies previously reported by Seyfu.Y.2020 et al in Hawassa Zuria Woreda, Sidama Region(12.4%).[19] and 6.5 % prevalence of diabetes mellitus done by Aynalem.SB,2016 et al in Mizan Aman town.[20] based on fasting blood glucose levels .The possible reason among the studies participants might be due to the socio-demographic ,difference in sample size and life style of the studied subjects.

In our study BMI was significantly associated with DM. this supported by DM of other study done in Hawassa Zuria Woreda, Sidama region Ethiopia by Seyfu.Y, et al 2020.[19], in Mizan Aman town by Aynalem.SB,2016.[20] in Japan by Sasai.H, Muto.T et.al 2010.[21] the possible reason might be the condition that overweight and obese persons that may be develop Insulin resistance is conveyed by the dysfunction of pancreatic islet β -cells the cells that release insulin to control blood glucose levels. therefore, this is a crucial to the risk and development of DM

In our study blood pressure was significantly associated with DM. this supported by DM studies done in Nottingham by Stewart.J, Brown.K, Kendrick,D and Dyas.J et.al 2005[22], in Mexico City by Tsimihodimos.V Gonzalez.C et at 2018.[23] in Gondar, Ethiopia by Akalu.Y, Belsti.Y et al 2020.[24] the possible reason might be, hypertension was risk for insulin resistance develops.

In our study physical activity was significantly associated with DM. this supported by DM studies done in SSNPR, Hosanna town by Dereje N, et al. 2020[15]. in Japan by Hamasaki.H et al.2016.[25], in china by Xu Zhang, Li Fang et al. 2020. the possible reason might be regular increased PA can effectively improve blood glucose control and reduce the complications of T2DM and physical activity increase the metabolic process. This leads to induce utilization of carbohydrate.

Conclusion

The finding of this study showed that the higher prevalence of DM on clinically suspected cases of DM in WKUSH from July, 2021 was 24.23%. age, Sex, educational status, blood pressure, body mass index, and physical activity was the associated factors for DM.

Recommendation

It is important if WKUSH gives morning health education and health information dissemination concerning the consequences of DM and associated risk factors of DM in collaboration with Gurage Zone health bureau and health extension workers.

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7, Occupational status

A) Non employed B) employed

8, Income per month in EBR.

A. Less than 1500 C) 3000-4500
B. 1500-3000 D) Above 4500

Part II Clinical and Behaviors

9, Do you taken any drug in the past two weeks?

A. yes B. No

10, Did you have doing Physical exercise habit?

A) yes B) No

11. Did you have smoking cigarette habit?

A. Yes B. No

12) did you have alcohol drinking habit?

A. Yes B. No

13) A) weight in kilograms (kg) _____

B) Height in Centimeters (cm) _____

C) Body mass index (kg/cm*2)_____

14 Blood Pressure

A) (Systolic/Diastolic) _____

Annex II:- Laboratory Report Format WKUSH

A

Patient card number_____	Date:___/___/___
Sex_____	Identification code:
Age_____	Time of collection_____

B

Test	Result	Refe.range
FBS		