Prevalence of Dysglycemia and associated factors in Jimma Town, SW Ethiopia: A community based Cross-sectional study.

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Prevalence of Dysglycemia (T2DM and IFG) and associated factors in Jimma Town, SW Ethiopia: A community based Cross-sectional study.

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ABSTRACT

Background: Type 2 Diabetes, which accounts for ~90–95% of those with diabetes, remains largely undiagnosed and has long asymptomatic period before patients present with complications. Patients with type 2 diabetes are typically older than 40 years and frequently obese. Most frequently the diagnosis of type 2 diabetes is made after routine blood testing in asymptomatic persons. ADA guideline recommends routine screening for adults older than 40 years and at earlier age in those with risk factors.

Objective: To assess the prevalence of Dysglycemia (T2DM and IFG) and associated factors for Adults older than 40yrs living in Jimma Town, southwest Ethiopia.

Method: A cross-sectional study was conducted using WHO STEPWISE tool for surveillance of NCDs. Data was collected by face-to-face interview and measurement of Anthropometry, Blood pressure and Fasting Blood sugar using pre-tested questionnaire and analyzed using SPSS 20. Logistic regression was used to identify associated factors with Dysglycemia and the result was presented by text, tables and figures.

Results: The overall prevalence of Dysglycemia is 18.6% (49/264) among adults older than 40yrs.T2DM accounts for 5.7% (15/264) and IFG for 12.9% (34/264). Physical inactivity [COR =2.5, 95%CI (1.2, 5.36)], and waist circumference [COR=2.98, 95%CI (1.5, 5.9)] are positively associated with dysglycemia. Presence of family history of DM [AOR=2.45, 95%CI (1.08, 5.52)] , Being Overweight [AOR=3.8, 95%CI(1.84, 7.95)] and Obese [AOR=7.78, 95%CI(2.90, 20.91)] are Independent predictors of dysglycemia.

Conclusion: In this study, there was high prevalence of Dysglycemia. Physical inactivity and central obesity (Waist circumference) are positively associated with dysglycemia, while having family history of DM, or Higher BMI (Overweight or Obese) are risk factors for dysglycemia.

Key words. Dysglycemia, Fasting Blood Sugar, central obesity, Body Mass Index, Risk factors.

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LIST OF ACRONOMYS AND ABBREVIATIONS

ADA	American diabetic association
AOR	Adjusted Odds ratio
BMI	Body mass index
BP	Blood pressure
COR	Crude Odds ratio
DBP	Diastolic Blood pressure
DM	Diabetes Mellitus
FBS	Fasting blood sugar
GDM	Gestational Diabetes Mellitus
Ht	Height
HTN	Hypertension
IGT	Impaired Glucose tolerance
JUSH	Jimma university specialized hospital
NCD	Non-communicable disease
OGTT	Oral glucose tolerance test
RBS	Random blood sugar
SBP	Systolic Blood pressure
SSA	
WHO	World health organization
WC	Waist circumference
Wt	Weight

CHAPTER 1

1.1-Background

Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of different organs, especially the eyes, kidneys, nerves, heart, and blood vessels. Several pathogenic processes are involved in the development of diabetes. These range from autoimmune destruction of the pancreatic β-cells with consequent insulin deficiency to abnormalities that result in resistance to insulin action. The basis of the abnormalities in carbohydrate, fat, and protein metabolism in diabetes is deficient action of insulin on target tissues. Deficient insulin action results from inadequate insulin secretion and/or diminished tissue responses to insulin at one or more points in the complex pathways of hormone action. Impairment of insulin secretion and defects in insulin action frequently coexist in the same patient, and it is often unclear which abnormality, if either alone, is the primary cause of the hyperglycemia. (1, 2)

Type 2 Diabetes , which accounts for ~90–95% of those with diabetes, previously referred to as non–insulin-dependent diabetes, type 2 diabetes, or adult-onset diabetes, encompasses individuals who have insulin resistance and usually have relative (rather than absolute) insulin deficiency. Most patients with this form of diabetes are obese, and obesity itself causes some degree of insulin resistance in different racial/ethnic subgroups. It is often associated with a strong genetic predisposition. (3**)**

Patients with type 2 diabetes are typically older than 40 years and frequently obese. Most frequently the diagnosis of type 2 diabetes is made after routine blood testing in asymptomatic persons. In fact, in light of the large number of asymptomatic individuals with undiagnosed hyperglycemia in the United States, routine glucose testing is recommended for everyone older than 45 years of age.(4)

1.2-STATEMENT OF THE PROBLEM

Type 2 DM is frequently remains undetected for long time and many patients with newly detected diabetes have complications at the time of diagnosis that underlines the importance of detecting undiagnosedd diabetes as early as possible and there is a good evidence that screening tests can detect T2DM during the early stages and early detection of individuals at risk of diabetes could be exteremly benefiacial..The substantial burden, both human and societal, that accompanies type 2 diabetes and the difficulty in treating it effectively once it has developed make it an appropriate target for prevention. Further, the existence of a defined state of increased risk, pre-diabetes (i.e., impaired glucose tolerance and impaired fasting glucose), allows identification of patients who are most likely to benefit (1, 2)

Undiagnosed T2DM is common, accounting for almost 20% of diabetes cases in the United States. Subjects at high risk for diabetes and with undiagnosed T2DM are at significantly increased risk for coronary heart disease, stroke, and peripheral vascular disease. Delay in the diagnosis of T2DM causes an increase in micro vascular and macro vascular disease. In addition, affected individuals have a greater likelihood of having dyslipidemia, hypertension, and obesity. Therefore, it is important for the clinician to screen for diabetes in a cost-effective manner in subjects who demonstrate major risk factors for diabetes (14)

Regarding Epidemiology in Africa The International Diabetes Federation (IDF) estimates that 19.8 million people have diabetes where approximately 75% are still undiagnosed. Countries with the highest estimated numbers of persons with diabetes include Nigeria (3.9million), South Africa (2.6 million), Ethiopia (1.9 million), and Tanzania (1.7 million) (3)

In Ethiopia, DM is the one of the most common non-communicable disease responsible for a number of serious health problems and complications. Studies are indicating that non-communicable diseases, such as DM are becoming major public health problems in the country. Hence, due attention should be given to DM through increasing public awareness on the diseases and even plan mass screening programs for DM.The actual prevalence of DM in Ethiopia could be as high as 8% as suggested by some institution-based studies, aside from what is projected by IDF in 2012 . Although strong nationwide surveillances have not been conducted, the DM expansion rate is growing in alarming rate, and so are associated morbidity and mortality rates.(7,8)

CHAPTER 2

2.1–Literature review

Type 2 diabetes is one of the most common chronic diseases, affecting more than 25 million people in the United States and an estimated 366 million worldwide. The prevalence of type 2 diabetes has been increasing in the United States, from approximately 3% of the population in 1995 to more than 9% in 2012. This increase is in part due to demographic shifts (i.e., the aging of the population), but incidence rates are also increasing and parallel the rise of overweight and obesity as well as increasingly sedentary lifestyles. Although type 2 diabetes is being increasingly recognized in obese adolescents and young adults, older age remains a major risk factor for type 2 diabetes. More than one quarter of adults aged 65 years and older have diabetes, and another 50% have glucose or HbA1c levels in the impaired or pre-diabetic range.*(2)*

The global prevalence of diabetes in adults (20-79 years old) ,according to a report published in 2013 by the IDF, was 8.3% (382 million people), with 14 million more men than women (198 million men *vs* 184 million women), the majority between the ages 40 and 59 years and the number is expected to rise beyond 592 million by 2035 with a 10.1% global prevalence. With 175 million cases still undiagnosed, the number of people currently suffering from diabetes exceeds half a billion. An additional 21 million women are diagnosed with hyperglycemia during pregnancy. The Middle East and North Africa region has the highest prevalence of diabetes (10.9%). However, Western Pacific region has the highest number of adults diagnosed with diabetes (138.2 millions) and has also countries with the highest prevalence. Low- and middle-income countries encompass 80% of the cases, "where the epidemic is gathering pace at alarming rates" (3)

Sub-Saharan Africa (SSA) has a disproportionate burden of both infectious and chronic diseases compared with other world regions. Current disease estimates for SSA are based on sparse data, but projections indicate increases in non-communicable diseases (NCDs) caused by demographic and epidemiologic transitions (5, 6)

The prevalence of diabetes in Tanzania and Uganda, two SSA countries with comparable socioeconomic status, is estimated at 7.8% (Tanzania) and 4.1% (Uganda), while impaired glucose tolerance is estimated at 9.1% in Tanzania and 6.6% in Uganda (1). The estimated number of undiagnosed patients is 469.3 per 1,000 and 1281.7 per 1,000 in Uganda and Tanzania, respectively *(3).*

The distribution of T1DM, and T2DM in Ethiopia, shows regional variations, T1DM is more dominant in rural parts, whereas T2DM is more common in small and big cities of the country style shift of the people into" modern" life.(7,9).

There are some community based, institution based and hospital based studies that assess the magnitude of DM and associated risk factors in our country.

Two community-based studies on population prevalence of diabetes were found. A study with urban and rural sampled population in the Southern region estimated the prevalence of diabetes mellitus (type 1 and 2) to be 4.9% among adults aged 18 years and above The second study, with urban sampled population in the Oromia region, estimated the prevalence of type 2 diabetes mellitus to be 5.3% among adults aged 40 years and above (8)

The prevalence of diabetes mellitus was 5.1% in urban populations and 2.1 % in rural populations. The majority of identified diabetic cases (69%) were not diagnosed prior to the survey and the highest proportions of undiagnosed cases were noted among rural population 19 (82.6%) and 34 (63%) were urban population. Family history of diabetes, older age, and physical inactivity were significantly associated with diabetes mellitus in urban population. While frequent alcohol consummation was significantly associated with diabetes mellitus in rural population (10)

A Cross-sectional study in selected institutions at Bishoftu town was conducted from December 2012 to February 2013. 422 volunteers proportionally from five institutions were involved. The overall prevalence of undiagnosed DM in the study was 5% [95% CI: 3-7%]. Though not statistically significant undiagnosed DM was higher in males (5.7% vs. 3.7%, $P>0.05$). Increased occurrence of undiagnosed DM was observed with increasing age but again not statistically significant ($P>0.05$). Univariate analysis showed undiagnosed DM was significantly associated ($P<0.05$) with body mass index, waist circumference, alcohol

consumption, history of hypertension and high triglyceride level. Predictors for undiagnosed DM in the study were high waist circumference (P=0.001, OR: 7.70 95% CI: 2.31-25.67) and history of hypertension (P=0.009 OR: 3.74 95% CI: 1.39-10.03) after adjusting age, family history of DM, and body mass index. (11)

A cross sectional community based study in Jimma town showed the blood glucose level of 28 out of 526 participants was in diabetic range making the prevalence of Type II diabetes to be 5.3% and 81 (15.4%) had elevated blood glucose level (100-126 mg/dl). After oral glucose Tolerance test was performed for those with elevated blood glucose level, 3(0.57%) had Diabetes, 37 (7%) impaired glucose tolerance test and 41 (7.8%) impaired fasting blood Glucose. The combined prevalence of impaired fasting glucose and glucose tolerance was 14.8% There was a statistically significant association between diabetes mellitus and male sex, older age group and, being overweight ($p<0.05$). The prevalence of diabetes mellitus, impaired glucose tolerance test and impaired fasting glucose were higher among older age groups, those with higher monthly income, overweight/obese, and in males. The magnitude of Type2DM was comparable to reports from other developing Countries. However, large proportion of the study participants had pre-diabetic conditions. Type2DM was associated with being overweight, male sex, older age group and with higher household monthly income (12)

Presently, diabetes, particularly Type 2, has no known single cause; indeed some factors are known to influence the risk of its development. Among the known factors, advancing age, obesity and sedentary lifestyle probably play the most important part in the development of Type 2 diabetes in most populations.

Age: In many populations worldwide, the incidence of Type 2 diabetes is generally low before age 30 years, but gradually increases during adult life and is highest in old age populations. In the 3rd NHANES Survey of 1988-94, researchers in the USA found that the prevalence of diabetes increased from 1-2% among persons in the age group 20-39 years, to 18-20% in the age group 60-74 years; the prevalence peaked at ages 75 years and above. 30 Researchers, on the general norm observed in most hospital and community-based studies in developing countries,

have also shown that the age factor is critical in determining the incidence and prevalence of Type 2 diabetes. However, while the prevalence is highest among persons aged 65 years and above in developed countries, this is true for the ages 45-60 years in most developing countries. (18, 19).

Obesity: Obesity is strongly related to dietary habits and sedentary lifestyles, and is a widely recognized risk factor for Type 2 diabetes. Its prevalence varies greatly from region to region and among different communities within the regions. In recent years, the disease has been on the increase worldwide, at an alarming rate (20).

Studies in both developing and developed countries have documented rates that range from 3.1% to 12% in males and 1.5% to 32% in females Once regarded as a condition of affluent societies, obesity is now said to co-exist with under nutrition in many poor and developing countries. In addition, among urban and suburban populations of some of the newly industrialized countries and those currently undergoing economic transition, prevalence rates are nearly as high as those observed in the industrialized countries. For example, in Nigeria, obesity rates of 8.3% for men and 35% for women were documented in a study, as reported in the WHO Statistics Quarterly Publication of 1993 (21).

Sedentary lifestyle: Lack of physical activity and unhealthy dietary habits are important modifiable risk factors for diabetes. In the United States Hispanic Health and Nutrition Examination Survey (HANES) of 1982-84, lack of physical exercise was suggested as being significantly related to the prevalence of obesity and Type 2 diabetes among the Hispanic-white American population. Some studies within and outside Africa have also reported that the prevalence of Type 2 diabetes and hypertension is consistently lower in populations with higher levels of habitual physical activity than in urban populations with more sedentary lifestyles. It has been postulated that, regular physical exercise serves in decreasing the risk of development of diabetes by preventing insulin resistance in target tissues and is therefore a protective factor for Type 2 diabetes (22, 23).

Alcohol Consumption: Alcohol consumption, especially heavy ‘binge’ drinking (which implies occasional, over-consumption of alcohol), has also been suggested as an important risk factor for Type 2 diabetes. Excessive alcohol consumption can adversely affect the liver and pancreas, and increase excess abdominal adiposity through increased caloric intake

Comparative studies on diabetes prevalence in developing countries (including Africa) h shown that urban residents generally had higher rates of Type 2 diabetes than rural dwellers due to higher prevalence of sedentary lifestyles; obesity; stress and unhealthy dietary habits (24,25).

Smoking may also have a role in the development of type 2 diabetes (26). Furthermore, one study in smokers with newly diagnosed type 2 diabetes found that smoking cessation was associated with amelioration of metabolic parameters and reduced blood pressure and albuminuria at 1 year (27).

Diabetes screening may be conducted with HbA1c level, fasting glucose concentration, or oral glucose tolerance test, with the choice of test depending on the clinical setting and the preference of the patient. (***2)***

Another important issue is the use of venous blood (plasma) Versus Capillary (whole blood) for testing. Both WHO and ADA define IFG, IGT or RBS in terms of venous blood

On literatures, An Experimental Study involving 12 subjects comparing Capillary vs venous glucose in fasting and postprandial sates has documented the following result

There is no significant difference between the fasting venous blood glucose value (87.4±0.4 mg/dL) and the fasting capillary blood glucose (91.6±4.4 mg/dL)

There is significant difference between the postprandial venous blood glucose concentration and the postprandial capillary blood glucose concentration, both of which reach the maximum levels at 30 min (postprandial venous blood glucose value=122.0±1.2 mg/dL; postprandial capillary blood glucose value=163.8±1.3 mg/dL), with glucose solution ingested by subjects;

The mean capillary blood glucose concentration is higher than the mean venous blood glucose concentration by 35%;

The correlation coefficient $r=0.875$($p<0.001$) suggests statistical discrepancy and positive correlation between two groups of blood glucose concentrations which imply the venous blood glucose concentration is a better indicator to clinically test blood glucose due to higher stability and fewer interference factors.(16)

This minimum difference between the fasting capillary blood glucose concentration and the fasting venous blood glucose concentration is similar to other literatures (15)

According to WHO Recommendations, in asymptomatic subjects, performing the test on one occasion is not enough to establish the diagnosis (***i.e. basis to treat diabetes).*** This must be confirmed by carrying out at least one further test on a subsequent day. And According to ADA Guidelines a FBG level of >= 126mg/dl is diagnostic, but it should be repeated in the absence of unequivocal hyperglycemia (14).

However there are important differences between defining diabetes to identify an individual with diabetes and the consequent clinical and social implications of this diagnosis and defining diabetes for epidemiological purposes. In the former the diagnosis requires careful substantiation with retesting on another day unless the person is symptomatic and the plasma glucose is unequivocally elevated whereas in epidemiological studies repeat testing is rarely performed. When repeat testing is performed, approximately 75% of people with diabetes detected in epidemiological studies are confirmed to have clinical diabetes (32)

2.2. Conceptual frame work of the study

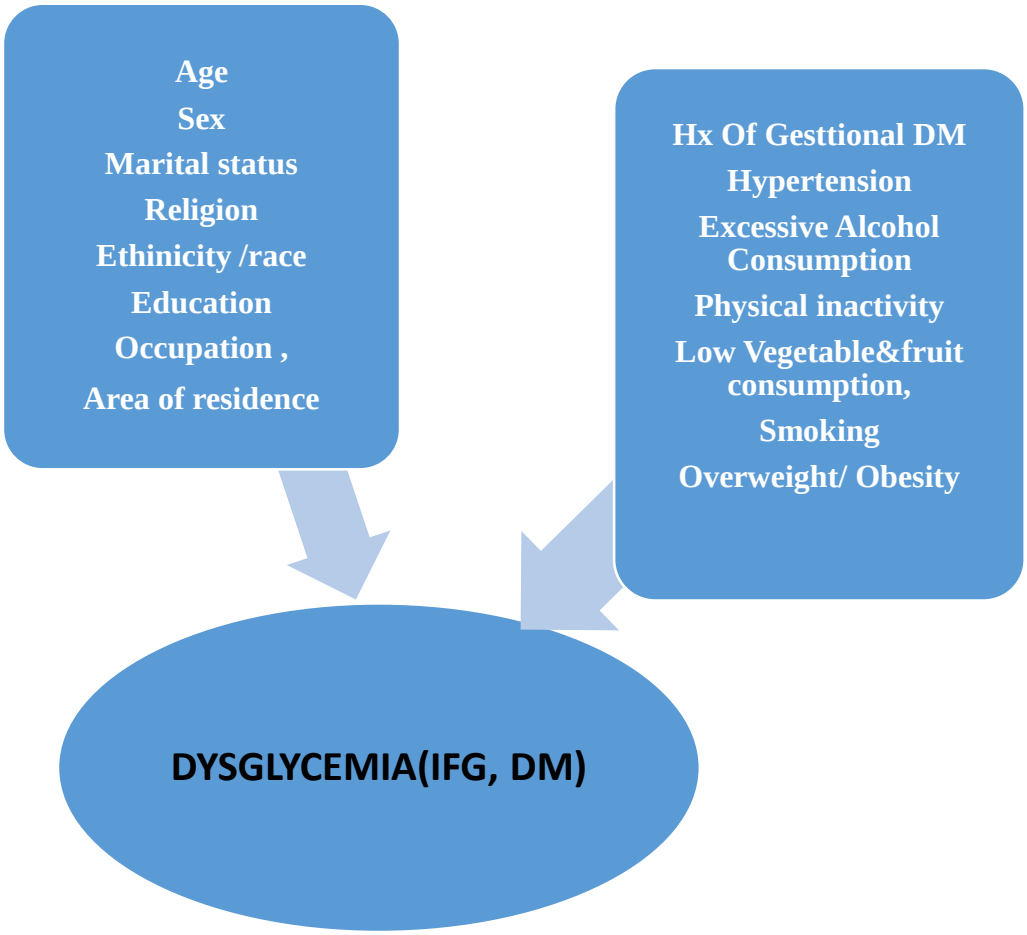

Figure 1 . Conceptual frame work of the study

2.3-significance of the study

Assessing the magnitude of Dysglycemia and associated risk factors will be helpful to influence the practice of Physicians and other health care professionals with regard to screening and prevention of Type-2 DM. It will also assist Develop behavior change and communication (BCC) to the community, Health care professional and other health care stake holders.

It will be an important input for developing local protocols or guidelines for screening individuals found to have the associated risk factors, so that beneficial literature proven and guideline recommended interventions (Lifestyle modifications or Pharmacotherapy) can be undertaken to alter the natural course of the Pre-Diabetic condition

In patients with established DM, earlier diagnosis is beneficial in that patients are enrolled in care before they develop complications and some of the complications can be delayed or even prevented. The results of the study will also pave the way for other larger scale studies that can be conducted at regional or national levels

The findings will be published in peer reviewed journals for a wider dissemination of the impacts to other communities with similar settings.

CHAPTER -3 -OBJECTIVES

3.1-General objective:

- To assess the prevalence of Dysglycemia and associated factors in Jimma Town.

3.2-Specific Objectives

- To describe the socioeconomic characterstics of study population
- Assess prevalence of IFG and T2DM
- Assess prevalence of associated factors and Predictors of dysglycemia.

CHAPTER 4-METHODOLOGY

4.1. Study Area

The study was conducted in the community of Jimma Town, which is located 356km southwest of the Capital Addis Ababa. The town is one of the larger cities located in Oromia region with Estimated population of 120,960 according to 2007 Ethiopian National census and A projected estimate of 177,900 in 2015 (27) .It is divided in n 17 Administrative units(Kebeles).

4.2. The study period

The study was conducted from January -August 30, 2017

4.3. Study design

The study is a community based cross sectional study

4.4. Population

4.4.1 Source population

The source population for this study was the population of Jimma Town

4.4.2. Study population

The study population for this study were adults (>=40yrs yrs.) eligible for this study living in Jimma Town

4.5. Inclusion and exclusion criteria

4.5.1. Inclusion criteria

All adults Age >=40yrs, permanent residents of Jimma Town.

4.5.2. Exclusion criteria

- Individuals who are known diabetic on treatment or follow up
- Individuals currently taking any drugs with possible impact on glucose metabolism(ART DRUGS, ORAL CONTRACEPTIVES)
- Pregnant women (by LMP)
- Individuals who cannot give consent due to mental illnesses or other debilitating conditions
- Individuals who refuse to participate in the study

4.6. Sample size and sampling procedure

4.6.1 Sample size

The sample was calculated using a formula for estimation of single population proportion taking prevalence of Hyperglycemia (DM , IFG) from previous study(16) to be 20.7% ., margin of error 5%, and using 95% confidence level.

$n = (Z\alpha/2)^2 p (1-p) / d^2$

$Z\alpha/2$ = standard normal variable at 95% confidence level (1.96).

d= precision (tolerable margin of error)

$n = Z\alpha/2 \ p (1-p)/d2 = (1.96)^2 \ x \ 0.207 (1-0.207)/(.05)2 = 245$ patients

Considering expected non-response rate of 10%, the final sample size is = 245 + 0.10x245=269

4.6.2. Sampling procedure

Multi-staged sampling procedures were applied. First among the kebele in Jimma Town. 8 kebeles (Out of 17) were selected using cluster sampling method. From each kebele households were selected using systematic sampling techniques with specified sampling interval (Every 50^{th} Household in the kebele was selected using an estimated 1700 Households per kebele, and giving about 34 participants per kebele . Then eligible individuals from the households are enrolled in the study In cases where there are more than one eligible individual in a household, a lottery method is used to choose among them, and if there is no eligible individual in a household the next house is visited.

. (See the sketch below)

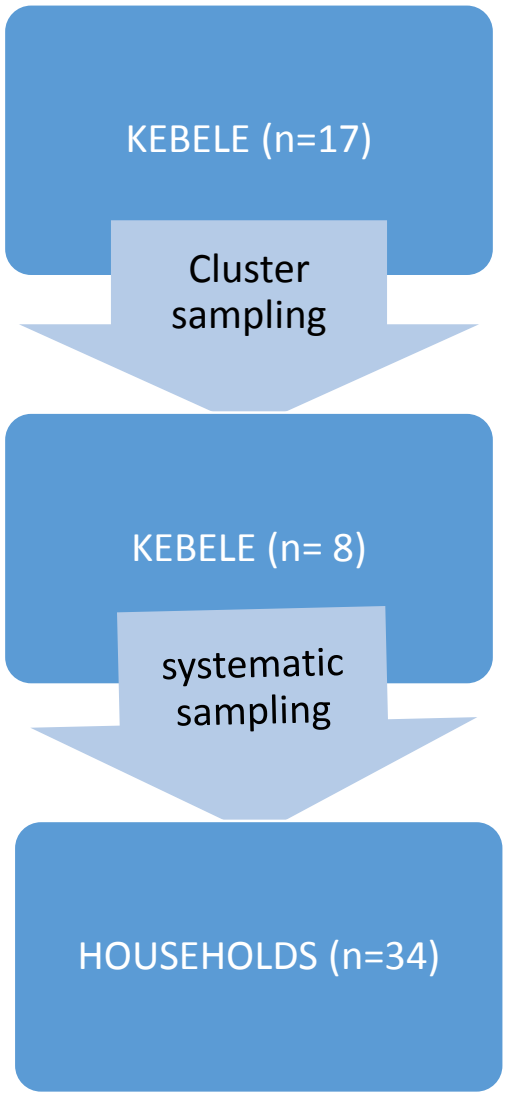

Figure 2 Sketch Showing Sampling procedure

4.7. VARIABLES

4.7.1 DEPENDENT VARIABLE (OUTCOME):

- Dysglycemia

4.7.2 INDEPENDENT VARIABLES

I. Socio-demographic variables:

- Age
- Gender
- Ethnicity
- Religion
- Marital Status
- Occupation
- Educational Status.
- Household Monthly income

II. Risk Factors and Medical history

- Personal history of hypertension.
- Family history of DM
- History of GDM
- *History* of smoking.
- Alcohol consumption.
- Physical Inactivity
- Dietary Habit

III. Physical Measurements

1. SBP
2. DBP
3. Wt
4. Ht
5. BMI
6. WC

IV.**BIOCHEMICAL TEST: Fasting blood sugar (FBS)**

4.8. Data collection

As recommended in the WHO Stepwise Approach guidelines on NCD risk factor surveillance (13) the survey consists of use of interviewer-administered structured questionnaires, to assess the socioeconomic, demographic and behavioral characteristics of the study subjects. One day prior to interview the study participants were told to have overnight fasting till late morning hours (Nothing per os except water). Then the participants were interviewed after verbal consent is obtained. Physical measurements (BP, height, weight, waist circumference) were measured using standard calibrated instruments. Venous blood sample was taken from the interviewed and assessed subjects and the sample was transported to JUSH laboratory. Plasma glucose determination were done using glucose Oxidase method and the result were be registered.

The questionnaires and checklists were prepared in English by the principal investigator by reviewing different related literatures and were translated to local languages (Amharic and Afan Oromo) by a health professional who is good in English, Afan Oromo and Amharic grammars and were checked for consistency by a third independent person competent in all the mentioned languages. The questionnaires were pre-coded and pretested to minimize errors. The data were collected by trained clinical nurse and laboratory technician Instructional manual on the procedures of data collection, handling, operational definitions, roles of data collectors and ethical issues were prepared. The data collectors and assistant were trained with demonstrations on the questionnaires/checklists by principal investigator for one day on the instructional manual of data collection ahead of the data collection schedule. The necessary tools for the data collections were given to the data collectors ahead of time and data collection was supervised daily. The data assistant was arranging the equipment needed for the data collection, cross check the collected data for completeness and finally by principal investigator before entry in to the computer.

4.9. Data Quality Assurance

During preparatory stage, the questionnaires were carefully designed by WHO pillars of health and were be pre-coded and pretested to minimize errors. Data collectors were trained prior to data collection. During data collection, the collected data was checked daily for completeness by the principal investigator.. During data entry and clearance, error were be minimized by using trained persons. During data analysis and report writing, appropriate statistical technique for appropriate data were used.

4.10. Data compilation & analysis

Collected data was rechecked for completeness and cleaned by principal investigator. Finally, the data was entered in to the computer through EPI data software and after verification, was imported in to SPSS 20 version for descriptive analysis and inferential statistics. Appropriate coding and recoding was done at each steps for the variables as necessary.

Descriptive statistics: frequencies, percentages, means, medians, standard deviations and ranges were used to describe findings. A bivariate analysis was done to sort variables candidate for multiple logistic regression having value less or equals to 0.25. Multivariate logistic regression analyses was conducted to generate factors strongly associated with the dependent variable. Finally association was declared with p value less than 0.05. Qualitative data was be subjected to thematic analysis; this method involves identifying, coding, analysing and clustering recurring factors into overarching themes with respective key and sub-themes. Additionally, data from sociodemographic factors, behavioural and medical risk factors ,and measurable variables were described based on their categories and the identified themes across dysglycemia and Type 2DM were presented together to add depth and richness to the findings

4.11. Ethical Consideration

Ethical clearance was obtained from Institutional Review Board (IRB) of the College of Health science and then from ethical review committee of JUSH and was taken to the Jimma Town Health Bureau and letter of permission was written to each kebele administration. Purpose & significance of the study was explained and informed consent was be taken from each study participant. Respondent's confidentiality was ensured during the study period. The interview scripts were numbered and coded and without including personal identifying data. Participants with abnormal blood sugar were advised and informed to go to health institutions to have their blood sugar repeated and have follow up.

4.12. Definition of variables and Operational definitions

- **Fasting Blood Glucose** - Blood glucose estimation obtained from a subject who has undergone an overnight fast from any food or drink (except water) for at least 8hrs.
- **Normal Fasting Glucose** - A Venous (Plasma) Glucose <110mg /dl (WHO/IDF cut-off points)
- **Dysglycemia**- in this study is used for individuals with IFG >= 110mg/dl.
- **Impaired fasting Glucose** – (IFG) -A fasting blood glucose value 110-125mg/dl)
- **Diabetes Mellitus** -For the purpose of this study Diabetes is defined as
    I. Fasting plasma glucose (FPG) ≥126mg/dl) (single test for surveillance purpose.)
    II. Diagnosed Diabetes On treatment or follow up
    III. A report of a previous diagnosis of diabetes by health professionals
- **Hypertension (Self-reported)**-Previously diagnosed/told to have hypertension, or on antihypertensive medication/s/
- **Positive Family History of Diabetes** - is a reported history in first degree family (Actual father/mother (not step), full brother/sister and full child)
- **Pack years**: is the average number of packs of cigarette smoked per day multiplied by the number of years of smoking.
- **One 'standard drink'** is the equivalent of one glass, can or bottle (330ml) of regular beer (which contains about 5% alcohol), one measure (40ml) of spirit, or one glass of wine.

- **Physical activity (WHO)**
    - Inactive: defined as doing no or very little physical activity at work, at home, for transport or during discretionary time.
    - Insufficiently active: defined as doing some physical activity but <150 minutes of moderate-intensity physical activity or 60 minutes of vigorous-intensity physical activity a week accumulated across work, home, transport or discretionary domains.
    - Sufficiently active: defined as at least 150 minutes of moderate-intensity physical activity or 60 minutes of vigorous-intensity physical activity a week accumulated across work, home, transport or discretionary domains, which approximately corresponds to current recommendations in many countries.
- **Overweight** - BMI 25.0--30.0 kg /m^2.
- **Obesity** –BMI ≥30.0 kg/ m^2
- **Central Obesity** – Waist circumference >94cm in men or> 80cm in women.
- **Hypertension (measured)** –SBP ≥140 mmHg and/or DBP ≥ 90mmHg

4.13. Dissemination plan

After approval by the advisors, this findings will be disseminated to all relevant stakeholders through presentation and publication. Copies of the research will be given to Jimma University, College of Health Science postgraduate library, and the department of Internal Medicine.

CHAPTER 5: RESULTS

5.1. SOCIODEMOGRAPHIC CHARACTERSTICS

A total of 264 participated in the study out of the calculated sample size of 269, giving a non-response rate of 1.9%. (The reason for not participating was refusal to give blood sample). Of the total respondents 150 (56.8%) are females and 114 (43.2%) are males. The age of the respondents ranged from 40 to 90 years, with a mean age of 54 ±13 years. The age group 40-64 years, with a total of 194 study subjects (73.5%), constituted the majority of respondents The majority (75.8%) of the respondents were married , 15.5% divorced , the rest (8.7) % widowed, single or separated. Housewives are the most frequent participants in this study (37.5%). This is followed by government employees (26.5%) and Merchants (22.7%). (Table 5-1 summarizes the sociodemographic characterstics of the study participants.)

Table 5.1 Sociodemographic characterstics of the respondents in Jimma Town, SW Ethiopia, January -August -2017 (n=264)

VARIABLES	CATEGORY	n (%)	Cumulative (%)
Age	40-64 years	194(73.5)	73.5
	65-79 years	57(21.6)	95.1
	More than 80 years	13(4.9)	100
Sex	Male	114(43.2)	43.2
	Female	150(56.8)	100
Marital Status	Married	200(75.8)	75.8
	Single	10(3.8)	78.8
	Divorced	41(15.5)	94.3
	Widowed	13(4.5)	100
Religion	Orthodox	106(40.1)	40.1
	Muslim	110(41.7)	81.8
	Protestant	47(17.8)	99.6
	Others	1(0.4)	100
Ethnic group	Oromo	118(44.7)	44.7
	Amhara	57(21.6)	66.3
	Dawro	28(10.6)	76.9
	Gurage	22(8.3)	85.2
	Others	39(14.8)	100
Education	Illiterate	22(8.3)	8.3
	Read and write	48(18.3)	26.5
	Grade 1-8	79(29.9)	56.4
	Grade 9-12	51(19.3)	75.8
	Higher education	64(24.3)	100
Occupation	Housewives	99(37.5)	37.5
	Gov. Employees	70(26.5)	64
	Merchants	60(22.7)	86.7
	Others		100
HH monthly income	Low	79(29.9)	29.9
	Intermediate	154(58.3)	89.3
	High	31(11.7)	100

5.2. MEDICAL AND BEHAVIORAL RISK FACTORS.

Family history of DM was present in 14% (37/264) and Gestational DM in 12% (18/150) female respondents and personal history of Hypertension in 20% (53/264).

Regarding the level of Physical activity, 120 (45.5%) of the respondents reported to have insufficient physical activity, 75(28.4%) are inactive and 69(26.1%) have sufficient physical activity, according to the WHO definitions.

History of Alcohol consumption is reported by 64(24.2%) of the study participants, 8(3%) reported heavy drinking 16(6%), moderate and 40 (15%) reported light drinking.

In this study 18.5% (49/264) participants had hypertension (28/150 of females and 21/114 of males) .About 30.6% (15%) of participants who had hypertension with our measurement were either told to have hypertension previously or are taking antihypertensive medications. The mean systolic blood pressure of the study population was 118 ± 14mmHg, while the diastolic mean was 75 ±10.2 mmHg. There is no statistically significant difference in the mean value of Blood pressure either between males and females (p=0.44) or among respondents with normal FBS or Dysglycemia. (p=0.47)

The body mass index (BMI) of the respondents ranged from 16.65 to 36.40 kg/m2, with a mean of 24.16kg/m2. The mean BMI of the females respondents was 24.5 ±3.4 kg m-2, and of the males was 23.6 ±3.8 kg m-2. Females constitute larger frequency of overweight or obese individuals, but there is no statistically significant difference between the two means. The difference between the means of BMI of respondents with normal FBS and Dysglycemia is statistically significant (p=0.00)

Waist circumference (Using the European cut-off points) 23.3% of female and 15.8 % of male respondents have central obesity. It ranges from 70 to 105 with a mean of 83.2cm for males and 73 to 104 with a mean of 83cm for females. There is no statistically significant difference between the mean WC of male and female (p=0.16), but there is statistically significant difference between mean of WC in normal FBS and Dysglycemia. (p=0.00)

The Fasting Blood sugar in the surveyed population ranges from 70 to 210mg/dl. The mean FBS was 96±17 mg/dl.

Table 5. 2 summary of medical and behavioral risk factors of the study participants in Jimma town, SW Ethiopia –January to August 2017.

Variable		**Male n(%)**	**Female n(%)**	**Total n(%)**
Gestational DM		------	**18(12)**	**18(12)**
Family history of DM		**17(14.9)**	**20(13.3)**	**37 (14)**
History of HTN		**17(14.9)**	**36(24)**	**53(20)**
Smoking history		**15(13)**	**3(2)**	**18(6.8)**
Physical Activity	Inactive	**24(21)**	**51(34)**	**75(28.4)**
	Insufficiently Active	**48(42)**	**72(48)**	**120(45.5)**
Diet (Fruit and Veg)	4X or less /day	**32(28)**	**75(50)**	**107(40.5)**
Alcohol consumption		**30(26.3)**	**34(22.7)**	**64(24.2)**
Alcohol Amount	Regular daily	**6(5.2)**	**2(1.3)**	**8(3)**
	Moderate	**9(8)**	**7(4.7)**	**16(6)**
	Light	**15(13)**	**25(16.7)**	**40(15.2)**
Hypertension		**21(18.4)**	**28(18.7)**	**49(18.5)**
BMI	Overweight	**32(28)**	**53(35.3)**	**85(32.2)**
	Obese	**9(8)**	**15(10)**	**24(9.1)**
Waist circumference (Central Obesity)		**18(15.8)**	**35(23.3)**	**53(20.1)**

Table5. 3 Summary of mean and standard deviation of continuous variables in study subjects in Jimma Town, January –August 2017 (n=264)

Parameter [Mean(SD)]	**Sex**		**p-value**	**FBS**		**p-value**
	M	F		Normal	Dysglycemia	
Systolic BP	118 (13.76)	119 (14.04)	0.44	119 (13.82)	118.8 (14.4)	0.97
Diastolic BP	75 (10.40)	75 (10.04)	0.70	75 (9.82)	76 (11.7)	0.47
BMI	23.67 (3.83)	25.52 (3.89)	0.07	23.5 (3.55)	26.9 (4.08)	0.00
Waist Circ.	83 (8.67)	81.6 (8.98)	0.16	81 (8.26)	86.3 (10.29)	0.00
FBS	96 (16.64)	95 (17.88)	0.58	89.96 (10.35)	122 (17.47)	0.00

5.3. PREVALENCE OF DYSGLYCMEIA

Of the total 264 subjects who were tested, 15 (5.7 %) had diabetes (with single test for survey), while 34(12.9%) had impaired fasting glucose. Overall, Dysglycemia was present in 48 (18.6 %) of the respondents (10.6% males and 8% females).

Highest frequency by age group was seen in > 80year old age group (4/9), although this is not statistically significant (p=0.49). 35% (13/37) of participants with family history of DM (p=0.007) and 22.6 %(12/53) of participants with history of hypertension (p=0.39) had dysglycemia. (See fig 3 and Table 5-2)

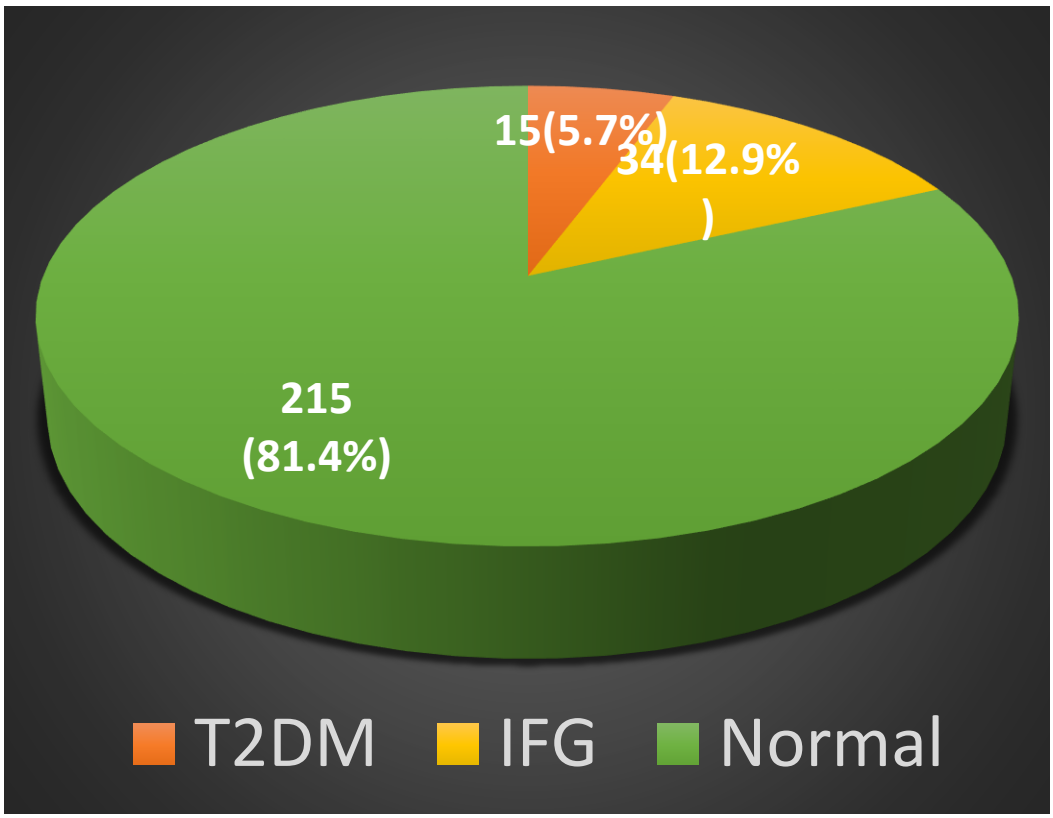

Figure 3 PREVALENCE OF DYSGLYCEMIA (IFG and T2DM) IN STUDY SUBJECTS IN JIMMA TOWN, SW ETHIOPIA JANUARY-AUGUST 2017 (n=264)

Table5. 4 Distribution and association of Dysglycemia among respondents by sociodemographic characteristics and Risk Factors in JimmaTown, SW Ethiopia –January -August 2017 (n=264)

Variables	Category	DYSGLYCEMIA		COR	95% CI		p-value
		No, n (%)	Yes, (%)		Lower	Upper	
Age	40-64yrs	160(60.6)	34(12.87)	1			
	65-79yrs	46(17.42)	11(4.2)	1.1	0.52	2.44	0.49
	Above 80yrs	9(3.4)	4(1.5)	2.1	0.60	7.18	
Sex	Male	93(35.22)	21(8)	0.9	0.53	1.84	0.96
	Female	122(46.21)	28(10.6)	1			
Marital status	Married	166(62.87)	34(12.87)	1			
	Others	49(18.56)	15(5.68)	1.5	0.75	2.96	0.25
Religion	Muslim	89(33.71)	21(8)	1.06	0.56	1.98	0.85
	Christian	125(47.34	28(10.6)	1			
Ethnic group	Oromo	95(36)	23(8.7)	1			
	Amhara	43(16.28)	14(5.3)	1.3	0.63	2.86	
	Dawro	26(9.85)	2(0.7)	0.3	0.07	1.43	0.33
	Gurage	17(6.44)	5(1.89)	1.2	0.40	3.63	
	Others	34(12.87)	5(1.89)	0.6	0.21	1.72	
Education	Illiterate	16(6.1)	6(2.3)	2.1	0.68	6.42	
	Read and W	38(14.4)	10(3.78)	1.5	0.58	3.72	0.36
	Grade 1-8	67(25.4)	12(4.54)	1			
	Grade 9-12	45(17.05)	6(2.3)	0.7	0.26	2.12	
	Higher Educ.	49(18.56)	15(5.68)	1.7	0.73	3.97	
Occupation	Merchant	46(17.42)	4(1.51)	1.3	0.6	3.0	
	Government employee	57(21.6)	13(6.1)	1.02	0.4	2.26	0.5
	Housewife	81(30.68)	18(6.81)	1			
	Others	31(11.74)	4(1.51)	0.58	0.18	1.85	

Monthly HH income	Low	69(26.13)	10(3.78)	0.5	0.24	1.14	
	Intermediate	121(45.8)	33(12.5)	1			
	High	25(17.04)	6(2.3)	0.88	0.33	2.32	0.27
Gestational DM	No	107(71.4)	25(16.6)	1			
	Yes	15(10)	3(2)	0.8	0.23	3.18	0.81
Family History DM	No	191(72.35)	36(13.6)	1			
	Yes	24(9.1)	13(5)	2.87	1.34	6.16	0.007
History of HTN	No	174(65.9)	37(14)	1			
	Yes	41(15.53)	12(4.5)	1.4	0.66	2.87	0.39
Smoking	No	199(75.4)	47(17.8)	1			
	Yes	16(6.1)	2(0.7)	0.5	0.11	2.38	0.40
Physical Activ.	Inactive	55(20.83)	20(7.5)	2.5	1.21	5.36	0.047
	Insufficiently Active	105(39.7)	15(5.68)	1			
	Active	55(20.83)	14(5.3)	1.7	0.80	3.95	
Diet (Fruit and Veg)	<2x/day	6(2.27)	3(1.1)	2.2	0.52	9.34	0.51
	2-4x/day	81(30.68)	17(6.6)	0.92	0.47	1.79	
	>4x/day	128(48.48)	29(11)	1			
Alcohol	No	159(60.22)	41(15.5)	1			
	Yes	56(21.21)	8(3)	0.5	0.24	1.25	0.15
Alcohol Amount	Regular daily	6(9.4)	2(3.12)	3	0.44	20.15	
	Moderate	14(21.8)	2(3.12)	1.28	0.21	7.82	0.40
	Light drinker	36(56.3))	4(6.25)	1			
Blood pressure	Normal	178(67.42)	37(14)	1			
	HTN	37(14)	12(4.5)	1.56	0.74	3.27	0.24
BMI	Normal	141(53.4)	14(5.3)	1			
	Overweight	61(23.1)	24(9.1)	3.96	1.92	8.17	
	Obese	13(4.92)	11(4.2)	8.5	3.22	22.54	0.00
WC	Normal	180(68.2)	36(13.63	1			0.002
	Central Obesity.	35(13.5)	18(6.81)	2.98	1.50	5.92	

Bivariate logistic analysis of factors showed that family history of DM , BMI, Waist circumference and Physical inactivity had statistically significant association with dysglycemia [P<0.05]. Overweight subjects showed about 4 times more likely and Obese subjects 8times more likely to have dysglycemia than subjects with normal BMI [95% CI ; 3.22,22.54]. In addition people who have central obesity (as defined by WC) are 2.98 times higher risk of having dysglycemia than normal WC [95% CI: 1.5, 5.92)].

Stepwise multiple logistic regression (for all variables with p<0.25) indicates that the likelihood of dysglycemia for study subjects who had family history of DM is 2.45 times those who had no family history of DM. [AOR=2.45, 95%CI (1.08, 5.52)]. Body habitus (Overweight or Obese) is also associated with higher likelihood of dysglycemia than respondents who had a normal BMI.(Overweight [AOR=3.8, 95%CI (1.84,7.95)], Obese - [AOR=,7.78, 95%CI (2.90, 20.91)] (see tables 5-4)

Table 5. 5 Multiple logistic regression of independent variables with dysglycemia in Study subjects of Jimma Town, January -August-2017

VARIABLE				**95%CI**		p-value (**)
		COR	**AOR**	**Lower**	**Upper**	
Family history of DM	No	1	1			
	Yes	2.87	2.45	1.08	5.52	***0.031***
Physical Inactivity	Inactive	2.5	1.08	0.40	2.90	0.69
	Insufficiently .active	1				
	Active	2.7				
Waist Circ.	Normal	1	1			
	Obese.	2.9	1.36	0.56	3.33	0.48
Body Habitus (BMI)	Normal	1	1			
	Overweight	2.87	3.8	1.84	7.95	
	Obese	8.5	7.78	2.90	20.91	**0.00**

(**) statistically significant at p<0.05)

CHAPTER 6

6.1. DISCUSSION

Evidence shows that the risk of developing diabetes from prediabetic states (Impaired fasting glucose or impaired glucose tolerance) is high. Longitudinal investigations have shown that persons categorized as being "impaired" by any of these definitions have approximately a 5 to 10% annualized risk of diabetes, a risk that is greater by a factor of approximately 5 to 10 than that among persons with normal glucose tolerance or normal fasting glucose. Risks appear to be similar among persons with isolated impaired fasting glucose (i.e., without impaired glucose tolerance) and isolated impaired glucose tolerance (without impaired fasting glucose). Persons with both impaired fasting glucose and impaired glucose tolerance have a higher risk of diabetes (approximately 10 to 15% per year) than those with only one abnormality. (30)

The Prevalence of DM is this study (5.7%) is comparable to the findings in urban areas Ethiopia and other African countries.(9,,11, 36,44) In a community based cross sectional study done in Gondar town, to screen individuals above age 35 prevalence of DM was found to be 5.1%, and in Jimma Town with similar study design prevalence was 5.3% (9, 12). This finding is also comparable with Bishoftu study (5.3%) which was done on selected institutions rather than the community. (11) The prevalence was lower in Gilgel Gibe research project (4.4%), which may be explained by the younger age group it involved (15-64) and inclusion of rural areas as well. (44)

The prevalence of IFG is 12.9% and of that of dysglycemia is 18.6% in this study. Comparison of those figures with other should be made carefully because different studies use different cut-off points to define Impaired fasting Glucose (IFG). ADA defines IFG as 100-125mg/dl while WHO and IDF recommend 110mg-125mg/dl as a cut of point as the definition of ADA would likely overestimate the prevalence and not recommended in resource limited settings as the implication for the health system and the individual is immense (**32**). So we used the WHO criteria to define IFG. Compared with the Gilgel research project (44) which used the WHO cut of point) both IFG (9.7%) and Dysglycemia (14.4%) are slightly lower in this s study, which may be explained by the younger age group in the study (15-64) and involvement of both urban and rural area. The study done in Jimma Town in 2006 with similar study design used 100-125mg/dl to define IFG

and by then the prevalence was 15.4%. Using this cut of point and calculate the prevalence to compare and see the trend the IFG in our study will be 26.7% which we may be interpreted as an increase in IFG by about 11% over 10years.

The Prevalence of DM is higher than estimated by the IDF in 2013 for Ethiopia (2%) , since this estimate is an overall for rural and urban areas the reason for this difference may be the prevalence of DM is higher in Urban than in rural area. Studies in Ethiopia and other African countries show that in I general the prevalence of IFG or DM is higher in urban than rural areas This difference has been ascribed to body Habitus, dietary habit, and sedentary lifestyle seen in urban settings. (9, 23, 34, 41).

In this study female respondents slightly predominate (56.6 vs 43.2%) with Male to female ratio of 1 to 1.3. The overall prevalence of Dysglycemia is 18.6% and is similar between males and while, the prevalence of T2DM is slightly higher in females than in males. (7.9% vs. 6%) but is not statistically significant (p=0.79)

There are varying reports on distribution of DM between male and female study subjects.. Studies in Addis Ababa and north west Gondar show that the results are comparable between the two sexes (39,40), where as in other studies done in Jimma and Addis, the proportion shows that one of the sexes predominates. (13, 14, 15). These differences, however, might be explained by the availability of study subjects.(8).

Although not statistically significant , participants above the age of 80 yrs. have increased odds of Dysglycemia [2.1, 95%CI (0.60, 7.18), p=0.49],while the prevalence of DM is higher in the age range of 40-64(6.2%) followed by 65-79 age group (5.5%) and there are no individuals with DM in above the 80 yrs age group. (p=0.9). In an urban Ghana study the majority (75%) of 675 patients were females in the age range of 40-60yrs. (mean, 55 years).

In developing countries, the majority of people with diabetes are in the age range of 45–64 years. In the developed countries, the majority of people with diabetes are aged ≥65 years. This pattern will be accentuated by the year 2025 (18). Although our study is not specifically designed to Study prevalence of DM, it shows the distribution of dysglycemia in the age groups for studies to be done in the future.

Studies both In Ethiopia and other countries show that the prevalence of overweight and Obesity is on the rise.(20). A study in Addis done to assess the trend of Overweight and Obesity over one decade (2000-2011) has shown that overweight increased by 24.5% and Obesity by 40.2% (36). . In a cross sectional study done in Gonder to assess the prevalence of hypertension and Body habitus 32.4% of individuals were overweight and 16 % were Obese (35).

The prevalence of Overweight and obesity in this study is 32% and 9% respectively, meaning 41% of the respondents have BMI >=25kg/m2. Females belong with higher frequency in both categories. But the difference between Mean Values is not statistically significant. (p=0.07) . But the mean BMI of participants with Normal FBS is compared with those with dysglycemia the difference is statistically significant (p=0.00) , This was demonstrated with multiple logistic regression which showed that Body habitus is found to be an independent predictor of dysglycemia. Overweight [AOR=3.8, 95%CI (1.84,7.95)], Obese - [AOR=,7.78, 95%CI (2.90, 20.91)] .

Closely related to overweight and obesity is the presence of sedentary lifestyle especially among the urban population. In this study about 74% of the participants reported to have either inactive or insufficiently active level of physical activity. This may be because of the less physically demanding nature of occupation in towns compared to rural areas. The largest proportion of dysglycemia is also seen in the physically inactive group-36.4% (20/55). Physical inactivity is positively associated with dysglycemia [COR=2.5, 95%CI (1.25, 5.36) , p=0.047)] in this study although after adjustment for other variables the effect of physical inactivity is not statistically significant. [(AOR=1.08, 95%CI (0.40, 2.90), p=0.69]. Central obesity is also positively associated with dysglycemia (COR=2.9, 95% CI (1.50, 5.92) , p=0.002] although it is not an independent predictor, [AOR= 1.36, 95%CI (0.56, 3.33) , p=0.48]. There are studies in Ethiopia and African countries which show that Physical inactivity and Central obesity are independent predictors of DM (5, 10,11). On the other hand unlike most studies which show significant association between obesity and impaired glucose hemostasis, being obese was not associated with this outcome in an Ethiopian study done at Akaki spare parts Share company (28)

Among the medical and behavioral risk factors, having first degree family history of DM was an independent predictor of dysglycemia [COR=2.87, 95%CI (1.34, 6.16) , p=0..007] , AOR=2.45, 95%CI (1.08, 5.52) , p=0.031]. This finding is consistent with other reports in Ethiopia and other countries. [10, 28, 29, 33,42). How genetic predisposition alone cause DM is not known, but it is thought to be the result of a combination of genetic and environmental factors [31].

Hypertension is present in 18.5% of the study participants. only 30% of those were told to have elevated BP before or are taking antihypertensive ,which means that hypertension remains undiagnosed, which was also demonstrated by other studies This is comparable with prevalence of hypertension in Addis Ababa in 2010 (19.1%) and higher than prevalence of HTN in a community based cross sectional study in Gondar (14.4%) (35, 36**)**. In our study 22.6% (12/53) of respondents who reported history of hypertension had dysglycemia. and 24.5% (12/49) of those with measured High BP had dysglycemia. There is no statistically significant difference between the mean Blood pressure between males or females (p=0.44) or between participants with normal FBS or dysglycemia(0.47).. In both bivariate and multiple logistic regression there is no significant association between hypertension and dysglycemia in this study. [COR= 1.56, 95%CI (0.74, 3.27), p=0.24] . But literatures show that hypertension remains an important comorbid condition with diabetes or prediabetic conditions**.(** 28,29, 36 **)** and hypertension is considered as risk factor for insulin resistance and ADA recommends screening for patients with hypertension. **(**14).

Other risk factors in the literature which were investigated in our study didn't show any significant association with the outcome variable**..**

In our study 6.8% of the respondents have given history of ever smoking cigarette. There is no significant association between smoking status and dysglycemia. Although smoking is an established cardiovascular risk factor, generally existing evidences are conflicting regarding relationship between smoking and DM or IFG. In one Chinese study, compared to non-smokers, current smokers were less likely to be centrally obese or have elevated BP (AOR: 0.82 and 0.74, both $P < 0.05$), among males of a normal weight. There were no significant associations between quitting smoking and metabolic disorders either among males of a normal weight or males who were overweight/obese. In conclusion, smokers have a lower likelihood of NIDDM than non-smokers among Chinese males with a lower BMI/smaller waist. (45)

On the other hand European INTERACT study , Former and current smoking was associated with a higher risk of incident type 2 diabetes compared with never smoking in men and women, independent of educational level, physical activity, alcohol consumption, and diet. Smoking may be regarded as a modifiable risk factor for type 2 diabetes, and smoking cessation should be encouraged for diabetes prevention (*46)*

Alcohol consumption was reported by 24.2% of our study participants, mostly (15%) are light drinkers and 3% are regular daily drinkers. But there is no statistically significant association between drinkers or non –drinkers or frequency of drinking and dysglycemia. In the Ethiopian study which was conducted in workers of different institutions in Bishoftu, among the respondents who consumed alcohol; frequent drinker compared to non-drinker was 4.5 times more likely to have undiagnosed DM followed by social drinker [OR=4.32; 95% CI: 1.42-14.1]. Besides the study has shown that high Triglyceride level significantly associated with undiagnosed DM [OR=4.22; 95% CI: (11)

Lastly this study didn't show any statistically significant association between the sociodemographic variables (religion, ethnicity, Occupation, income category) and dysglycemia.

6.2. STRENGTHS AND LIMITATIONS OF THE STUDY

STRENGTHS

- A cross sectional community based study with randomly selected participants , which may be more representative
- It utilized several data quality control measures such as careful training of data collectors recruited as qualified health professionals (nurses and health assistants) who were already familiar with the process.
- Done using a validated –WHO- stepwise Approach. The study used a modified version of the standard WHO risk factor questionnaire that had been pre-tested for its suitability in the Ethiopian population.

LIMITATIONS

- Other associated risk factors like dyslipidemia were not assessed.
- OGTT is not done (Full picture of prediabetic may not be seen with fasting blood sugar alone).
- Assessment of independent predictors of IFG and T2DM is not done (needs specifically designed study to assess this).

6.3. CONCLUSIONS and RECOMMENDATIONS

CONCLUSIONS

- This study has found a prevalence of dysglycemia higher than previously reported in urban populations, but comparable prevalence of DM to similar populations in urban areas. Hypertension was found to be prevalent and remains largely undiagnosed although not associated with dysglycemia in this study. Physical inactivity and central obesity are positively associated with dysglycemia, although not an independent predictors .Family history of DM, body habitus (Overweight and Obesity) were found to be risk factors (independent predictors) for dysglycemia. The proportion of respondents with lower level of physical activity, could in part may account for the high prevalence of over-weight, obesity, hypertension, and dysglycemia among the study subjects.

RECOMMENDATIONS.

- Given the high prevalence of Impaired glucose hemostasis in Jimma Town , Adults >= 40yrs with Overweight or Obese body habitus , Family history of DM and Hypertensive need to be screened for dysglycemia so that Follow up and Important lifestyle modifications may be given for the individual patient with Impaired glucose homeostasis
- Studies specifically designed to study the predictors of DM and Studies on Hypertension and associated factors are needed in the future.
- Larger scale studies that also includes the rural population are needed to develop local protocol for screening, as the population profile may not be similar to the town population.

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ANNEXES

Annex 1 informed consent

1.1 Informed Consent (Amharic)

ለተሳ□ፊ የሚሰጥ የጥናት ውል ማስገንዘቢያ

□ኔ ዶ/ር ተመሰለው ዘነበ የተባልኩ የውስጥ ደዌ ህክምና ት/ት ክፍል የመጨረሻ አመት ሬዝደንት የመመረቂያ ፁሁፌን ለመስራት ለሚያስፈልገኝ ጥናት □ርስዎ መመረጥዎን ሳሳውቅዎት በ□ላቅ □ስታ ነው::

ጥናቱ የሚካሂደው በቃለ መጠይቅ መሳሪያ አና ጥቂት የደም ናሙና በመውሰድ **ሲሆን በ□ርሶ ላይ ምንም አይነት ጉዳት አይደርስም:: ከጥናቱ መውጣት ከፈለጉ በማንኛውም ሰዓት አቋርጠው መውጣት ይችላሉ:: ይህም በማድረግዎ ምንም ተጽ□ኖ አይደርስብዎትም:: ከጥናቱ የሚገኘው ውጤት ወደፊት የሚካሄዱ ሌሎች ጥናቶች መነሻ ከመሆኑም ባሻገር የተፈለገው ጥናት በዘናችን ምን □ንደሚመስል ያስገነዝባል:**

□□ርሶ ስምና ሊሎች የ□ርስዎን ማንነት የሚያመለክቱ ነገሮች በጥናቱ ላይ አይገቡም::

አመሰግናለሁ

ተሳ□ፊው በጥናቱ ለመሳተፍ ካልፈለቶ አመስግነው ያሰናብቷቸው::

□ቷ□ቂ□ ሰም---------- ቀን----------

1.2. Informed Consent In Afan Oromo

I) Oddeffanoo Qoratamaaf kennamu

Ani Dr Tamassalaw Zannaba jedhama. Karoora barreeffama eebbaa irratti hirmaataa akka naaf taatan kabajaanin isin gaafadha. Qorannoon kun kan adeemsifamu waa'ee dhukuba sukaraa ilaalchise yoo ta'u ,hamma rakkina dhibeen kun umu fi facaina hawassa magala Jimma qabu, adddan baasufi baruu dha. Qorrannoon kun daqiiqaa 30 fudhachuu danda'a. Ooddeffanoon qorranoo kanarraa argamu hojii fundurraati adeemsamuuf gargaarsa guddaa kenna. Qorrannoo keessaa yeroo barbaadanitti ba'uun dandeessan.

Galatoomaa!

Maqaa Qorataa---------- Guyyaa----------Yoo qorannaa irratti qooda fudachuu hin barbaadne ta'an, isaan galateessaatii dhiisaa.

Annex 2: Data collection Tool

Instructions: Please answer the following questions by interviewing the participants carefully by first writing the registration number. Go through each questions according to their ascending orders and check for completeness and accuracy at the end. . Take the measurable entities with the tools given and fill the forms accordingly.

SOCIODEMOGRAPHIC DATA

1. Age (in completed years)----------
2. Sex M F

3. Marital status:

a- Married b-Single c-divorced d- widowed e-Separated

4. Religion:

A-Orthodox b-Muslim c-Protestant d-Catholic

e- Other (specify)_____

5-Ethinicity:

a-Oromo b-Amhara c-Dawro d-Gurage e-Other (specify)----

6- Educational status

a- Illiterate b- read and write c- grade 1-8 d- grade 9-12 e-Higher education

7- Occupation

A-Merchant b-Government employee c-Housewife. D-Daily laborer

Other(specify)_____

8-Monthly income (Estimated)---------- (Birr)

2.2-Medical and Behavioral Risk Factors

9- Were you told to have Increased Blood suger during pregnancy/Big baby Wt if known(For female participants)

a-Yes b-No

10-Do you have first degree family history DM?

a-Yes b-No c-Don't Know

11- Do you have/Told to have/ Or Taking drugs of Hypertension ?

a-Yes b- No

12-Do you smoke cigarate ?

a- Yes b- no

13-If Yes to Q13 Amount in pack yrs----------Currently smoking a) yes b)no , If no Quited-------

14-Which of the following best describes your usual level of activity (see operational definition for the description)

a) Inactive
b) Insufficiently active
c) Sufficiently active

15- How many times per day do you take fruits and Vegetables ? (Select one response)

a)Not at all
b)Not everyday
c)Once a day
d)2-4 times per day
e) 5 or more times per day

16- Do you drink drink alcohol? Yes No

17- If yes to Q20

a) Regular daily (>3 standard drinks/day(M) , >2 drinks/day(F))
b) Moderate (1-2 drinks/day)
c) Light drinker (<1drink/day)

2.3- PHYSICAL MEASUREMENTS

1-Blood pressure

- SBP_____
- DBP____

2. Weight (In Kg)____

3. Height (in m)

4. BMI (in Kg/m2)____

5. Waist circumference(cm)__

2.4-Biochemical (Blood test) : FBS (in mg/dl)----------