

Which age group is peak for onset of diabetes among mid-adulthood urban population in West Ethiopia?

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ABSTRACT

Background: Diabetes mellitus is high in middle age and older; also studies argue age of 45 is an onset for diabetes, but which age group is peak season for onset of diabetes among middle aged is not answered, special in Ethiopia.

Objective: To investigate which age group is more risky for onset of diabetes among middle-age urban populations.

Design: Population based cross sectional method applied on 266 adults' stratified with age group 41-48, 49-56 and 57-64 years. Selected communes were selected one randomly and the other one purposively. Representative samples were equally selected from the two communes.

Results: From 266 participants, 7.14% were newly diagnosed diabetes including pre-diabetes, of this the actual diabetes accounts 2.25%. Potential risks were evaluated in between 41-48 years (early-onset) and peak phase for onset of diabetes, 49-56 years (average-onset), 57-64 (late-onset) of adulthood. Using cross tabulation, physical inactive, female, and alcohol associated with raised fasting blood sugar. In logistic analysis raised fasting blood sugar adjusted for sex associated with age groups. Early age of middle adulthood associated significantly with onset of diabetes ($p < 0.05$), meaning being age 41-48 was associated with elevated fasting glucose [OR: 1.74; 95%CI; 0.35-3.24] compared to middle and later adulthood.

Conclusion: The prevalence of newly diagnosed diabetes including pre-diabetes was high. Age of 41-48 years was the peak phase for onset of diabetes from middle age in west Ethiopia. Therefore, educating community on early detection and healthy lifestyle adoption is crucial to prevent diabetes and its complications.

Introduction

Diabetes is a degenerative chronic illness that affects adulthood and older, induced with the potential risk of hyperglycemia. Raised glucose in blood, was main effect of unrestrained diabetes and through duration it leads to serious damage to many of the organ systems, especially the nerves and blood vessels [1].

Non communicable illness formerly assumed as a disease of Western and the wealthy, but nowadays it affects all nations worldwide. The fact showed that the prevalence type 2 diabetes

(79%) has been rising more rapidly in low-and middle-income countries than in high-income countries. If not early treated diabetes can damage the heart, blood vessels, eyes, kidneys, and nerves. Risk of heart attacks and strokes have 50%-75% increased among adults with diabetes [2,3]. Diabetes retinopathy is an important cause of 2.6% of global blindness and arises as a result of long-term accumulated damage to the small blood vessels in the retina [4]. Studies postulated that diabetes is among the leading causes of kidney failure [5]. Fasting glucose intolerance or pre-diabetes is a grave health condition where

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blood sugar levels are higher than normal, but not high enough yet to be diagnosed as type 2 diabetes until FBS>126 mg/dl. Approximately 88 million (33.33%) American adults have pre-diabetes. Of those, more than 84% don't know they have it. Pre-diabetes puts you at increased risk of developing type 2 diabetes, heart diseases, and stroke [2]. Globally, the prevalence of type 2 diabetes has been increasing among adults; 451 million people living with diabetes as of International diabetes Federation Atlas report in 2017, and projected to tall to 693 million by 2045 [6]. Based on inhabited the prevalence of diabetes higher in urban than rural area [7].

Likewise, the prevalence of diabetes mellitus is growing among adult Ethiopian; as of world health organization 2000 projection by 2030, the magnitude of DM expected to be 1.8 million [8,9]. Studies from north Ethiopia, figure out about 2.3% in Gondar city and 10.2% in Bahir dar city 22 individuals lived with undiagnosed DM [10].

Like to other world, study conducted in 2014 in Ethiopia showed, about 1,603,100 (75.1%) of populations undiagnosed for diabetes mellitus. It is known that adults are still at the highest risk for developing type 2 diabetes. In 2015, around 1.5 million new total diabetes cases were recorded among adults as the CDC's 2017 National Diabetes Statistics Report. In 2015, adults aged 45 to 64 were the most diagnosed age group for diabetes; therefore, it is important to know which age group contributes towards its onset. In which age group is type 2 diabetes most likely to occur? The study aimed to investigate which age group most strongly associated with onset of diabetes in adults aged 41-64 years among urban residents conducted in study site.

Materials and Methods
■ Study area and period

The current study was performed purposively on urban residents in hub towns of west Ethiopia from February 1-15, 2019, which is 328 Km far from Addis Ababa.

■ Research design

A community based cross sectional study design was applied.

■ Populations

Adults 41-64 years lived more than six months

in the city were included. While individuals on treatment for diabetes; pregnant, lactating; psychiatric conditions; ill; use of weight-impacting medication and physically disables was excluded.

■ Sample and sampling techniques

The sample size was calculated by taking prevalence of dependent variable among healthy Ethiopian adults. The most common component of metabolic syndrome is abdominal obesity (19.6%) in Ethiopia. Therefore, considering 5% margin error, a confidence level of 95% and 10% gnawing away, finally 266 samples were researched.

■ Statistical data analysis and administration

For quality data, first it was checked for completeness and consistency, cleaned for outliers and missing values. Epi-Data version 3.1.2 was used for data entry and tracked to SPSS version 24 for analysis. Statistical analyses of the setting individuality and possible risks for raised blood glucose of samples were carried out. The results presented in frequencies with aid of tables and its association in chart.

■ Biomarker

To analyze the biomarker, from finger pluck blood specimen were collected as of standard.

Operational definitions

Raised fasting blood sugar (FBS \geq 126 mg/dl) is defined as diabetes and FBS \geq 100-125 mg/dl were pre-diabetes.

Results
■ Participant's characteristics

From two hundred sixty six study samples, 99 of them were males and 167 females respectively. With age group, 145 in between 41-48 years, 77 in the 49-56 years and 44 in the 57-64 years old. Out of undiagnosed samples, the estimated crude prevalence of newly diabetes was 7.14%. From this respondents majority (93.56%) of them had low physical activity, physically inactive population account 6.77%. With sex stratification, females' account 4.51% diabetes and 2.63% of them were male. Regarding alcohol consumption, 24.81% were having history of risky alcohol drinking; of these 11.86% of them were current drunker. Current drinking increased the concentration of fasting plasma glucose.

Using cross tabulation, physical inactive, female, and alcohol drinking being associated with raised fasting blood sugar (TABLE 1).

■ **Prevalence of diabetes**

The prevalence of pre-diabetes (impaired fasting blood glucose) was 4.89% and 2.25% of the participants were diabetic patients. Six participants with elevated fasting blood glucose were referred to chronic care center (Wollega University specialized Hospital) (TABLE 2).

■ **Associated factors with diabetes**

Trends in age-adjusted prevalence of undiagnosed diabetes including pre-diabetes among middle age adulthood in west Ethiopia in 2019 was 7.14%. From the three age groups of population, age between 40-48 years were highly (3.78%) affected. Meaning age of 40s

was associated with onset of both pre-diabetes and diabetes. From healthier adult did not now having diabetes but diagnosed during study, prevalence of hyperglycemia peak at age in between 41-48 years group. The magnitude declined in between 49-64 years, but in general middle aged adulthood was the peak season for onset of diabetes (TABLE 3).

In the binary logistic analysis adjusted for sex, high prevalence (3.78%) of fasting plasma glucose was registered in between 41-48 years old and with associated OR of 1.74. As showed in FIGURE 1 below, age of 40s were associated significant risk factor for of onset of diabetes (p<0.05) FIGURE 1 shows proportions of middle aged adulthoods with normal blood glucose level, and newly diagnosed populations with raised blood sugar.

TABLE 1. Characteristics of participants by fasting blood sugar, west Ethiopia, 2019(n=266).

Variables		High FBS	
		Raised >100 mg/dl	low <100 mg/dl
Physical activity	Low	18	224
	Vigorous	1	10
	Moderate	0	13
Smoking	Yes(quit , current)	2	25
	Never	17	222
Alcohol	Yes(quit , current)	7	59
	Never	12	188
Chet chewing	Yes(quit , current)	2	19
	Never	17	228
Sex	Female	12	155
	Male	7	92

TABLE 2. Description of fasting blood sugar by sex , west Ethiopia, 2019(n=266).

Variables		Impaired FBS (%)	Diabetes (%)
		FBS >100-125 mg/dl	FBS >126 mg/dl
Sex	Female	8(3.01)	4(1.5)
	Male	5(1.88)	2(0.75)
Total		4.89	2.25

TABLE 3. Binary regression analysis of middle age, urban, west Ethiopia, n=266.

Age-high blood glucose cross tabulation		Raised fasting blood sugar		95%CI
		Yes >100 mg/dl (%)	No <100 mg/dl (%)	
Age	Age between 41-48	10(3.78)	135(50.75)	1.74 (.35,3.24)
	Age between 49-56	5(1.88)	72(27.07)	1.22 (1.07,2.49)
	age between 57-64	4(1.51)	40(15.04)	1

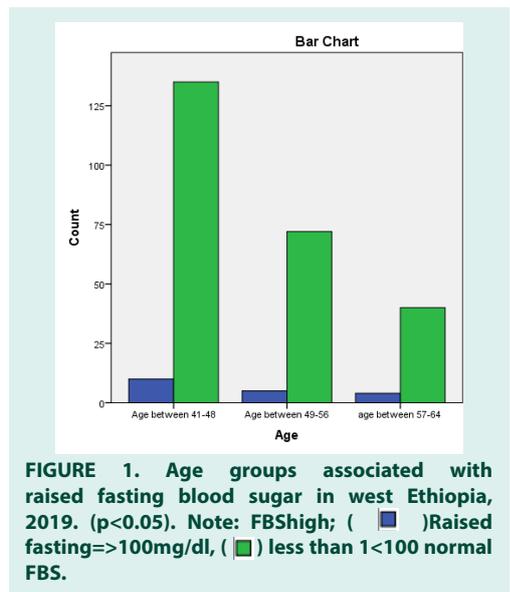


FIGURE 1. Age groups associated with raised fasting blood sugar in west Ethiopia, 2019. (p<0.05). Note: FBShigh; (■) Raised fasting =>100mg/dl, (■) less than 1 < 100 normal FBS.

Discussion and Conclusion

The finding of this study confirmed that the prevalence of undiagnosed diabetes including pre-diabetes was 7.14%; of this 2.25% came with FBS>126 mg/dl. This number is higher than results reported in different urban population of Ethiopia. Any other issue is that at which age group (early, middle and late adulthood) was the prevalence of diabetes is high. From general diabetes risks, age is common risk factor for it. Aging speed up during middle age adulthood and decline in vision, hearing, and immune-system functioning, end of menopause. Similar to study done in, his study also implies that middle aged adulthood is highly risk factor for type 2 diabetes. Also studies argue age 45 and above are the onset of type 2 DM and testing should begin at age 45 years, but the current study recommend age above 45 were candidate for complication like diabetes retinopathy. In contrary to those, the current study disproof that age of 40s is not the begging for onset of diabetes but it is a peak season for onset of type 2 diabetes. This finding imply that, it is suggested better to start testing following mid of life expectancy nearly at 35 years in Ethiopia, since age of 50s and above come with end line like: kidney failure, vision impairments, in general macro and micro vascular diseases. Since peak age for onset of diabetes is 40-48 groups for middle age adults; it needs revision policy for screening before complications occur.

The pathophysiological and complications of DM which causes ROS that production by different mechanisms, 1; the pathway of

polyol flux, 2; excessive formation advanced glycation end products, 3; high level of receptor expression of AGEs, 4; protein kinase C isoforms activation, 5; hexosamine pathway over activity, in addition to inactivation of two critical anti-atherosclerotic enzymes; the endothelial nitric oxide synthase and prostacyclin synthase. The oxidative stress contributed in the hypertension incidence by different mechanisms included vasodilator nitric oxide quenching, vasoconstrictor lipid peroxidation products generation, tetrahydrobiopterin depletion, endothelial cells and vascular smooth muscle cells damage, intracellular free calcium level elevation, endothelial permeability increased, inflammation and growth signaling events stimulation. The vascular oxidative stress can be stimulated hypertension; on the other hand it is unclear whether ROS initiate the development of hypertension. The results deal with Lassègue and Rhian that proved strong association between hypertension and oxidative stress. The long period of oxidative stress in DM patients contributed in complications, thus it should be treated with supplements, antioxidant foods and drugs.

Ethical Approval

This study was approved by the IBR of health institute, Jimma University (Reference No. IHRPGD/596/2019; January 1, 2019). Support letter was also taken from all concerned bodies. Prior to the first interview, participants were informed about objectives of the study and privacy during the interview

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RESEARCH ARTICLE

Disclosure

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References

1. Cho N, Shaw J, Karuranga S, et al. IDF Diabetes Atlas: Global Estimates of Diabetes Prevalence for 2017 and Projections for 2045. *Diabetes Res Clin Pract.* 138(3): 271–281. (2018).
2. Ogurtsova K, da Rocha Fernandes J, Huang Y, et al. IDF Diabetes Atlas: Global Estimates for the Prevalence of Diabetes for 2015 and 2040. *Diabetes Res Clin Pract.* 128(9): 40–50 (2017).
3. Shimels T. Prevalence and factors associated with diabetes mellitus and impaired fasting glucose level among members of federal police Commission residing in Addis Ababa, Ethiopia. *BMC Endocr Disord.* 16(14): 68(2016).
4. Belachew T, Asaminew B, Befekadu O, et al. Type II diabetes mellitus in Jimma Town, South West Ethiopia. *Eth J Health Sci.* 17(2): 15(2007).
5. Worede A, Alemu S, Gelaw YA, et al. The prevalence of impaired fasting glucose and undiagnosed diabetes mellitus and associated risk factors among adults living in a rural Koladiba town, Northwest Ethiopia. *BMC Res Notes.* 10(2): 251 (2017).
6. Bantie GM, Wondaye AA, Arike EB. Prevalence of undiagnosed diabetes mellitus and associated factors among adult residents of Bahir Dar city, northwest Ethiopia: a community- based cross- sectional study. *BMJ Open.* 9(10):e030158 (2019).
7. Beagley J, Guariguata L, Weil C, et al. Global estimates of undiagnosed diabetes in adults. *Diabetes Res Clin Pract.* 103(2):150-160 (2014).
8. Girma B. Prevalence of Metabolic Syndrome among Working Adults in Ethiopia. *Int J Hypertens.* 9(1): 193719 (2011).
9. Kerry RG, Mahapatra GP, Maurya GK, et al. Molecular prospect of type-2 diabetes: Nanotechnology based diagnostics and therapeutic intervention. *Rev Endocr Metab Disord.* 22(3): 421-451 (2021).