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Influence Of Substance Use On The Development Of Metabolic Syndrome In The Semi-Urban Population Of Jimma Town, South West Ethiopia.

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Abstract :
Background: Metabolic syndrome is a cluster of metabolically related cardiovascular disease (CVD) risk factors that increases the risk of CVDs by 2-fold and the risk of developing type 2 diabetes mellitus by 3-fold. Previous studies revealed that the development of metabolic syndrome and its components can be influenced by various life style factors. Metabolic syndrome can be determined in an individual by different criteria - proposed by international Diabetes Federation (IDF), National cholesterol Education programme-Adult Treatment panel (NCEP –ATP- III) and y WHO.
Objective: The main objective of this study was to assess the influence of substance use on the development of metabolic syndrome among adults in Jimma town, South West Ethiopia as determined by IDF and NCEP ATP –III criteria.
Methods: A community based cross-sectional study was conducted to assess the risk factors of Metabolic syndrome (Met S) by using IDF (Met S IDF) and NCEP ATP III criteria (Met S ATP-III) .The study was conducted in accordance with the Stepwise approach of the World Health Organization. Interviewer administered questionnaires was used for basic data collection; anthropometric measurements such as height , weight ,waist circumference , BMI and blood pressure measurements(systolic /diastolic) were done; blood sample were collected; lipid profile such as total cholesterol, triglyceride ,HDL-C, LDL -C and plasma glucose analyses were done. The prevalence of metabolic syndrome was determined based on the IDF and ATP III definitions from the anthropometric measurements and biochemical estimations. The association between Met S and substance use such as smoking, alcohol, khat chewing and coffee drinking were verified by chi-square and regression analysis using SPSS version 19.
Results and discussion: The population of Jimma town comprises of different ethnic, religious, economic, educational and occupational categories with variations in their life style habits. Cigarette smoking was directly associated with the development of Met S. Alcohol consumption was not significantly associated with Met S; moderate alcohol consumers are at a reduced risk of Met S compared to abstainers; consumption of wine was found to be inversely correlated with development of Met S (Met S IDF =0 % and Met S ATP III= 0 %); beer and local arrack (teje) consumption was directly associated with the development of Met S; heavy alcohol consumption was significantly associated with greater risk of developing Met S.
Moderate khat chewers had shown a lesser prevalence of Met S compared to abstainers (Met S IDF: chewer =11%, non chewer=18.3% and Met S ATP III: chewer= 7.3, non chewer=11.4%); but heavy chewers had shown a significantly higher prevalence of Met S. Generally, coffee consumers had shown a less prevalence rate compared to abstainers (Met S IDF: coffee consumers =15.9%, non consumers=22.2% and % and Met S ATP III: coffee consumers =9.9%, non consumers=14.2%); moderate coffee consumption (4-6 cups/day) was associated with a reduced risk of Met S (Met S IDF =5.5% and Met S ATP III=3.7%). Logistic regression analysis revealed that cigarette smoking, not drinking coffee, are directly associated with the development of Metabolic syndrome IDF. Drinking alcohol every day (AOR=0.798), drinking beer (AOR=0.870), drinking local arrack (tejje) (AOR=0.578), taking any forms of alcohol for long duration (AOR=1.614) were also directly associated. Cigarette smoking habit is directly associated with the development of Metabolic syndrome ATP-III; drinking beer (AOR=0.752) and local arrack (tejje) (AOR=0.678) are also directly associated.
Conclusions: Cigarette smoking was found to be a serious risk factor. Even though heavy alcoholism and heavy khat usage are risk factors, moderate alcoholism, occasional Khat chewing and moderate coffee drinking were all found to reduce the risk of being affected with Met S compared to abstainers.

Key words: Metabolic syndrome, substance use, coffee drinking, alcohol consumption, cigarette smoking.

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INTRODUCTION:

The global prevalence of chronic non communicable diseases (NCDs) is on the rise, with the majority of the growth occurring among populations in developing countries.[1] Metabolic syndrome is a cluster of metabolically related cardiovascular disease (CVD) risk factors that increases the risk of CVD by 2-fold and the risk of developing type 2 diabetes mellitus by 3-fold. The cluster includes various combinations of obesity (total body obesity measured by body mass index, or central obesity measured by waist-to hip ratio or waist circumference), atherogenic dyslipidemia (increased triglycerides, decreased high-density lipoprotein cholesterol), elevated blood pressure (systolic and diastolic), abnormal glucose tolerance, an insulin resistance measured by the homeostasis model assessment (HOMAIR) or fasting insulin.[2,3] The syndrome has been given different names such as the insulin resistance syndrome, or syndrome X [3,4, 5] and the deadly quartet[6] , the most popular being metabolic syndrome.[7]The definition of metabolic syndrome (MS) appears to be in an ever-changing flux. Various organizations have proposed definitions of MS such as WHO (1999), the NCEP—ATP-III (2001), and international Diabetes Federation (IDF) [8,9,10,11].

The metabolic syndrome has become one of the major public-health challenges worldwide [12]. The global statistics shows that approximately a quarter of adult populations suffer from this clinical entity [13]. According to various studies the prevalence of MS in general population in the United States, Saudi Arabia, and Turkey are 24%, 39.3%, and 33.4%, respectively [14- 16]. The literature also reveals that the prevalence of MS in Tehran is 30.1% while prevalence of MS in three major cities in center of Iran is 23.3%. A more interesting part of the MS story in Iran is that 45% of adult the population in Khorasan (Northeast Iran) has MS [17-19]. Similarly, the prevalence of the metabolic syndrome according to the WHO definition in seven European countries was estimated to be 23%. [20] In Canada, more than a quarter of the population between the ages of 35 to 75 years was affected by the metabolic syndrome based on the ATP III criteria [21]. At least 12% of the population aged 25 years and above was found to have three or more risk factors in Australia [22]. The third National Health and Nutrition Examination Survey in the United States reported the prevalence of MS at 24 per cent in healthy adults and found the cardiovascular and all-cause mortalities to be increased in men and risk of coronary disease increased in women [23]. The men with MS have been reported to be 2-4 times more likely to die of any cause than those without MS, even after adjustment for conventional risk factors [24]. Metabolic syndrome is evolving into a pandemic, contributing to approximately 6-7% for all-cause mortality, 12–17% for cardiovascular disease, and 30–52% for diabetes in the population [25]. In populations free of cardiovascular disease at baseline, cardiovascular morbidity and mortality increases 1.5- to 3-fold in the presence of the metabolic syndrome [26, 27]. According to International Diabetes Federation (IDF) a quarter of the world's adults have metabolic syndrome. People with metabolic syndrome are twice as likely to die from, and three times as likely to have a heart attack or stroke compared with people without the syndrome. People with metabolic syndrome have a five-fold greater risk of developing type2 diabetes mellitus. Up to 80% of the 200 million people with diabetes globally will die of cardiovascular disease. This puts metabolic syndrome and diabetes way ahead of HIV/AIDS in morbidity and mortality terms yet the problem is not as well recognized. The main reason behind this is that the combination of MS risk factors interacts synergistically to start or accelerate the progression of atherosclerosis [28].

The associated risk factors with metabolic syndrome can be divided into modifiable and non-modifiable types. The major modifiable types include high blood pressure, disturbances in sex hormones (e.g.polycystic ovary syndrome (POS), mental ill health, hyperandrogenism in pre- and postmenopausal women, energy excess (higher carbohydrate, high fat, low food fiber, high meat intake, family history (diabetes, hypertension, obesity , overweight, life styles (tobacco use, alcohol consumption, physical inactivity, snoring and obstructive sleep apnea syndrome, psychosocial and personality factors (lower social class , difficulty in coping with stress low socioeconomic status, alcohol etc. On the other hand, the non modifiable risk factors include age, sex, ethnicity, family history and previous stroke and heart attack [15, 16, 29].

In Africa, the first reported MS study conducted in the mid-90s in Cameroon found a 1.5% and 1.3% prevalence of MetS among urban dwelling women and men using IDF criteria; however, the study did not measure HDL-C concentrations [30]. A second study conducted in 2004 in Seychelles, found a high prevalence of MetS where 25%–30% of their study population had the syndrome [31]. A recent study involving adults in semi-urban and rural communities in Nigeria found a prevalence of MetS to be 18% [32]. A community based study conducted in Tanzania in 2009 reported a 38% prevalence of MS [33]. The prevalence of the Met S in children and adolescents is relatively low (4%) when compared to the adult population (24%), except amongst overweight and obese adolescents where the prevalence of the metabolic syndrome has been reported as high as 29% [34,35,36].

In Ethiopia, a cross sectional study among working adults conducted in Addis Ababa, revealed that the overall prevalence of Met S was 12.5% and 17.9% according to ATP III and IDF definitions respectively. Using ATP III criteria, the prevalence of MS was 10.0% in men and 16.2% in women. Application of the IDF criteria resulted in a MS prevalence of 14.0% in men and 24.0% in women [37]. The habit of cigarette smoking, khat chewing, alcohol consumption and coffee use are very common in the general population of Ethiopia. However, no study has been conducted in this regard to investigate the impact of substance use on the development of Met S. The present study undertaken in the general population of Jimma town was to find out the influence of substance use on the development of Met S. The findings of this study will provide relevant information shall helps the health management at a higher level to understand the extent and risk factors associated with Met S and can be helpful for local health planners in so many different ways.

MATERIALS AND METHODS

A community based cross-sectional study was conducted from January to March, 2013 in Jimma town, south west Ethiopia to determine the influence of substance use such as cigarette smoking, alcohol consumption, khat chewing and coffee drinking habits on the development of Met S. Individuals aged ≥ 20 living in Jimma town at least for the last six months having no as cites due to any cause were included in the study. Pregnant women, known CVD and diabetes mellitus (DM) patients and HIV positive patients on ART were exempted from the study.

Sample size and Sampling Procedure

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The sample size was determined using single population proportion formula with assuming a confidence level of 95%, a design effect of 2, and 5% allowance for non- response rate. The total sample size of the study population was 1,316 individuals. Multi-stage sampling technique was employed for this study. Systematic random sampling was employed to select the potential study households from each study kebele (a revenue division) to collect the required data.

Data Collection Process

Interviewer-administered questionnaire which included items on socio-demographic factors, life style factors and anthropometric measurements were employed for data collection. A separate data collecting format was used to record data from anthropometric measurements digital sphygmomanometer and biochemical analysis. IDF and NCEP ATP III criteria were used to determine the presence of Metabolic Syndrome in an individual**. IDF Definition:** In accordance with the IDF criteria, subjects were classified as having Met S if participants had abdominal obesity (defined as waist circumference of ≥94 cm for men and ≥80 cm women) plus two of any of the following risk factors: (1) Raised TG level (≥150 mg/dL) (2) Reduced HDL-C (<40 mg/dL in males and <50mg/dL in females) (3) Raised blood pressure (systolic BP ≥130 or diastolic BP ≥85 mmHg) (4) Raised FG (≥100 mg/dL).**ATP III Definition**: In accordance with the ATP III criteria, subjects were classified as having Met S if participants had three or more of the following risk factors.(1) Abdominal obesity (waist circumference >102 cm in males and >88 cm in females)(2) Hyper-triglyceridemia (TG ≥150 mg/dL) (3) Reduced HDL-C (<40 mg/dL in males and <50 mg/dL in females) (4) High BP (≥130/85 mmHg) (5) FBG (≥110 mg/dL) [8,9,10,11].

Data Collection Techniques

The data collection was conducted in accordance with the STEP wise approach of the World Health Organization (WHO) for NCD surveillance in developing countries [38]. The approach had three levels: (1) interviewer administered questionnaires to gather socio-demographic characteristics and information about life style factors - khat chewing, cigarette smoking, alcohol consumption, coffee drinking (2) Anthropometric measurements (weight, height, BMI, waist circumference) and blood pressure were determined (3) biochemical analysis to determine participants' Serum triglycerides (TGs), serum total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C), fasting blood glucose (FBG). **Anthropometric measurements**: Weight was measured in kilograms (Kg) using the WHO weighing scale (digital weighing machine) at a precision of 0.1kg with the study subjects minimally dressed. Height was measured in centimeter (cm) in erect position at a precision of 0.1cm with shoes removed using a height scale. Waist circumference (WC) was measured in cm at the midpoint of the line between the lowest border of the thoracic cage and anterior superior iliac spine using a measuring tape. BMI was calculated as weight in Kilo gram / height in meter square. **Blood Pressure measurements:** Blood pressure was measured using automatic digital sphygmomanometer. The measurement protocol used was as follows. After a supine rest of 5 minutes, one measurement in the standing position, and two in the sitting position at 5-minute intervals on the left and right hand were done. The mean of all three measurements was used as the systolic and diastolic blood pressures (BPs and BP d). **Collection of Blood samples and analysis**: About 6 ml of venous blood samples from the ante-cubital vein was taken after an overnight fasting of 10-12 hours. Fasting blood (plasma) glucose, serum total cholesterol, HDL-Cholesterol (HDL-C) and triglycerides were determined by Auto analyzer (Human Star; Model -80) method by using specific reagents (Human). LDL-Cholesterol (LDL-C) was be calculate using the Freidwald's formula [39].VLDL=Triglycerides÷5 and LDL = Total cholesterol – (HDL + VLDL).

Data Analysis

The generated data was analyzed using Statistical Package for Social Sciences (SPSS) version 19.0. The association between dependent and independent variables were analyzed and presented using chi square test at the adopted confidence level of 95%, P value of 0.05 (i.e. 5%) or less were considered to be significant. The strength of statistical association was measured by adjusted odds ratios at 95% confidence intervals. Binary Logistic regression was used to determine association between dependent and the independent variables.

Ethical consideration

Ethical clearance for the study was obtained from Jimma University, College of public health and Medical Science, Ethical Review Committee through Department of Biomedical Science.

RESULTS

The objective of the community based cross-sectional study employed to determine the influence of substance use on the Met S in Jimma town. The results regarding various aspects of the investigations are indicated under the following headings..

Life style characteristic of the study population

The life style characteristics of the study population are given in Table .1.Within the study population 92 individuals (7%) were cigarette smokers and 1224(93%) were non smokers, 686(52.1%) were alcohol consumers and 630(47.9%) were non consumers, 288(21.9%) were Khat chewers and 1028(78.1%) were non-chewers. Alcohol consumption was found to be the prominent life style characteristic followed by Khat chewing and cigarette smoking in the study population.

Cigarette smoking was found to be very common among males (14.8%) than females (P=0.000**). But, alcohol consumption is observed to be almost similar (Males, 52.1% and females, 52.2%) in both groups (P=0.514). The Khat chewing tendency seemed to be more common among the males (31.3%) compared to females (13.5%) of the study population (P=0.000**).

Table:1. Life style characteristics of the study population.

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Characteristics		Total N (%) N=1316	Men N (%) N=620	Women N (%) N=696	P value
Smoking	Smoker	92(7)	92(14.8)	0(0)	0.000
	Non- smoker	1224(93)	528(85.2)	696(100)	
Alcohol consumption	Consumer	686(52.1)	323(52.1)	363(52.2)	0.514
	Non consumer	630(47.9)	297(47.9)	333(47.8)	
Khat chewing	Chewer	288(21.9)	194(31.3)	94(13.5)	0.000
	Non chewer	1028(78.1)	426(68.7)	602(86.5)	
Coffee habit	Consumer	1140(86.6)	533(86)	607(87.2)	0.280
	Non consumer	176(13.4)	87(14)	89(12.8)	

***P<0.05 is significant

Substance use and Met S IDF

Life style characteristics such as habit of coffee consumption, habit of alcoholism, cigarette smoking and Khat chewing all possibly can have influence on the development of Met S IDF in an individual. The prevalence of Met S – IDF in different categories (according to substance use) of the study population are incorporated in Table: 2.**Smoking and Met S IDF**: Cigarette smokers constitute 7 % of the study population. The data obtained from this study indicated that cigarette smokers had more chance of developing Met S-IDF (26.1%) compared to non smokers (16%) (P= 0.018**).

Table: 2. Prevalence of Met S IDF in different substance use categories.

Characteristics		No Met S-IDF N =1316 N (%)	Met S-IDF N =1316 N (%)	P value
Smoking habit	Yes N=92(7)	68(73.9)	24(26.1)	0.018
	No N=1224(93)	1028(84)	196(16)	
Alcohol consumption	Yes N=686(52.1)	564(82.2)	122(17.8)	0.157
	No N=630(47.9)	532(84.4)	98(15.6)	
Alcohol type	Beer N=280(21.3)	217(77.5)	63(22.5)	0.033
	Wine N=36(2.7)	36(100)	0(0)	
	Jin/arrack/brandy/whisky rum N=30(2.3)	30(100)	0(0)	
	Local arrack/Teje N=275(20.4)	216(78.5)	59(21.5)	
	Mixed N=65(4.9)	65(100)	0(0)	
	Total=686(52.1)	564(82.2)	122(17.8)	
Khat chewing	Chewer N=288(21.9)	256(88.9)	32(11.1)	0.002
	Non chewer N=1028(78.1%)	840(81.7)	188(18.3)	
	Non vegetarian N=693(52.7)	583(84.1)	110(15.9)	
Coffee habit	Yes N=1140(86.6)	959(84.1)	181(15.9)	0.027
	No N=176(13.4)	137(77.8)	39(22.2)	
	No N=1096(83.3)	912(83.2)	184(16.8)	

***P<0.05 is significant

Alcohol consumption and Met S IDF: Alcohol consumers constitute 52.1% of the study population (this include beer -21.3%, wine -2.7,Jin/brandy whisky/Rum-2.3%,local arrack (tejje)-20.4% and mixed usage -4.9%). The prevalence rate of Met S- IDF in alcohol consumers was found to be 17.8 % and that in non consumers was 15.6%. There was no significant difference in the prevalence rate of Met S-IDF between alcohol consumers and non consumers (P=0.157). But, among alcohol consumers, individuals who usually consume beer showed Met S-IDF prevalence of 22.5%, wine showed a prevalence of 0%, Jin/arrack/whisky

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/brandy showed a prevalence of 0%, local arrack (teje) showed a prevalence of 21.5% and mixed usage showed a prevalence of 17.8%. **Khat chewing and Met S IDF**: In the study population, 21.9 % had the habit of Khat (Leaf of Catha edulis) chewing. The prevalence of Met S – IDF among Khat chewers was found to be significantly less (11.1%) than that among non chewers (18.3%). **Coffee consumption and Met S IDF:** In the study population a great majority (86.6%) are coffee consumers with a Met S-IDF prevalence of 16.8% (Table.2.). Among the non consumers 22.2 % were affected with Met S IDF.

Substance use and Met S ATP-III

The prevalence of Met S ATP-III different categories (categorised) according to the type of substance usage) of the study population is incorporated in Table: 3. **Cigarette smoking and Met S ATPIII:** Cigarette smokers constitute 7 % of the study population (Table.3). No significant variations in the prevalence rate (P=0.130) were observed between cigarette smokers (8.7%) and non-smokers (10.7%). **Alcohol consumption and Met S ATPIII:** Alcohol consumers constitute 52.1% of the study population (this include beer -21.3%, wine -2.7,Jin/brandy whisky/Rum-2.3%,local arrack (tejje)-20.4% and mixed usage -4.9%). The prevalence rate of Met S – ATP-III in alcohol consumers was found to be 10.8 % and that in non consumers was 10.2%. No significant variations in the prevalence of Met S ATP-III was observed between alcohol consumers and non consumers (P=0.390). Among alcohol consumers, individuals who used to take beer showed Met S – ATP-III prevalence of 16.4%, wine showed a prevalence of 0%, Jin/arrack/whisky /brandy showed a prevalence of 0%, local arrack (Teje) showed a prevalence of 10.2% and mixed usage category showed a prevalence of 0%(P=0.001**). Similar to the pattern of Met S IDF prevalence rate, in the case of Met S ATP III also, the individuals who consume beer and local arrack showed a significantly higher prevalence rate compared to people who consume other forms of alcohol. **Khat chewing and Met S ATPIII:** In the study population, 21.9 % had the habit of Khat chewing (Table.3). The prevalence of Met Met S – ATP-III among Khat chewers was found to be 7.3% and was found to be significantly less than that among non chewers (11.4%). This result again revealed the nullifying effect of Khat chewing on the development of Met S ATP-III. Non chewers had more tendency to develop Met S IDF as compared to chewers (P= 0.026**). This is observed to be similar to the manifestation of Met S IDF described before (Table 2).

Table: 3. Prevalence of metabolic syndrome ATP-III in different substance use categories.

Characteristics		No Met S (ATP-III) N =1316 N (%)	Met S (ATP-III) N =1316 N (%)	P value
Smoking habit	Yes N=92(7)	84(91.3)	8(8.7)	0.130
	No N=1224(93)	1094(89.3)	130(10.7)	
Alcohol consumption	Yes N=686(52.1)	612(89.2)	74(10.8)	0.390
	No N=630(47.9)	566(89.8)	64(10.2)	
Alcohol type	Beer N=280(21.3)	234(83.6)	46(16.4)	0.001
	Wine N=36(2.7)	36(100)	0(0)	
	Jin/arake/brandy/wisky rum N=30(2.3)	30(100)	0(0)	
	Local arakke/Teje N=275(20.4)	247(89.8)	28(10.2)	
	Mixed N=65(4.9)	65(100)	0(0)	
	Total=686(100)	612(89.2)	74(10.8)	
Khat chewing	Chewer N=288(21.9)	267(92.7)	21(7.3)	0.026
	Non chewer N=1028(78.1%)	911(88.6)	117(11.4)	
	Non vegetarian N=693(52.7)	616(89.9)	77(11.1)	
Coffee habit	Yes N=1140(86.6)	1027(90.1)	113(9.9)	0.031
	No N=176(13.4)	151(85.8)	25(14.2)	

***P<0.05 is significant

Coffee consumption and Met S ATPIII: In the study population a great majority (86.6%) are coffee consumers with a Met S – ATP-III prevalence of 9.9% (Table.3). Among the non consumers 14.2 % were affected with Met S – ATP-III.

Frequency/quantity of substance use and prevalence of Met S – IDF

The results indicating the prevalence of Met S IDF according to the frequency of substance is given in Table 4**. Frequency of Cigarette smoking and Met S –IDF:** Cigarette smokers constitute 7 % (N=92) of the total study population (N=1316). Among

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cigarette smokers the Met S-IDF prevalence was found to be very high (26.1%) as compared to the prevalence in the overall study population (16.7%) and to the non smokers (16%). These results indicate the fact that cigarette smoking is one of the life style factors that can contribute to the development of Met S IDF. Considering the frequency of smoking with development of Met S IDF, individuals who used to smoke 1-5 cigarette / day showed 10.3 % prevalence, 6-10 cigarettes /day showed 27.3 % prevalence and >10 cigarettes a day showed 40.5 % prevalence.

Frequency/quantity of alcohol consumption and Met S –IDF: In Accordance with the IDF criteria, the frequency of Met S (Met S-IDF) in the study population was already calculated to be 16.7 %. Among the people who consume alcohol in various forms (52.1%) the overall occurrence of Met S IDF was 17.8%.There was no significant difference in the prevalence rate between consumers and non consumers as far as the entire population is concerned. However, there observed, a significant variation in the occurrence of Met S- IDF between different categories of alcohol users, who were categorized according to the frequency of alcohol consumption (Table 4). The individuals who consume alcohol every day had shown a Met S – IDF prevalence of 32.1%, 2-3 days /week had shown a prevalence of 12.9 %, 1 day /week had shown a prevalence of 22.2% and occasional consumers had shown a prevalence of 15.4%. From these results, it is clear that there is no significant difference in the Met S IDF prevalence rate between non users (15.6%) and people who occasionally use alcohol (15.4%) stating that occasional alcohol consumption had no impact on the development of Met S-IDF. There observed significant difference in the occurrence of Met S IDF prevalence between non users (15.6%) and people who consume everyday (32.1%), 2-3 days /week (12.9%) and people who use once in a week (22.2%).

Table: 4. Frequency of substance (alcoholism, smoking and Khat chewing and coffee consumption) and Met S IDF.

Frequencies usage		No MetS-IDF N=1316 N(%)	MetS-IDF N=1316 N(%)	P value
Alcohol consumption	Every day N=56(8.1)	38(67.9)	18(32.1)	0.01
	2-3 days /week N=70(10.3)	61(87.1)	9(12.9)	
	Once /week N=126(18.3)	98(77.8)	28(22.2)	
	Occasionally N=434(63.3)	367(84.6)	67(15.4)	
	Total=686(100)	564(82.2)	122(17.8)	
Khat chewing	Every day N=69(24)	55(79.7)	14(20.3)	0.001
	2-3 days /week N=10(3.5)	4(40)	6(60)	
	Once /week N=142(49.3)	130(91.5)	12(8.5)	
	Occasionally N=67(23.2)	67(100)	0(0)	
	Total=288(100)	256(88.9)	32(11.1)	
Cigarette smoking	1-5/day N=39(42.3)	35(89.7)	4(10.3)	0.000
	6-10/day N=11(12)	8(72.7)	3(27.3)	
	>10/day N=42(45.7)	25(59.5)	17(40.5)	
	Total=92(100)	68(73.9)	24(26.1)	
Coffee Consumption	<1 cup /day N=97(8.5)	83(85.6)	14(14.4)	0.021
	2-3 cups /day N=745(65.3)	605(81.2)	140(18.8)	
	4-6 cups /day N=163(14.3)	154(94.5)	9(5.5)	
	>6 cups /day N=135(11.9)	117(86.7)	18(13.3)	
	Total N=1140(100)	959(84%)	181(15.9)	

***P<0.05 is significant

Frequency/quantity of Khat chewing and Met S –IDF: The percentage of Khat chewers in the study population was 21.9 %. Among Khat chewers Met S IDF prevalence rate was found to be 11.1 % and is significantly less than the overall prevalence in the study population (16.7%) as well as the prevalence among the non chewers(18.3%). Among the Khat chewers the people who chew

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Khat everyday had a prevalence of 20.3 %, the people who chew khat 2-3 days/ week had prevalence of 60%,1 day /week had a prevalence of 8.5 % and occasional khat chewers showed 0 % prevalence of Met S IDF(P=0.001**). **Frequency /quantity of Coffee consumption and Met S IDF**: In the study population 86.6 % are coffee users. The results of the study showed that the prevalence of Met S-IDF among coffee consumers in general (15.9%) is almost comparable (little less, but not very significant) to that of the entire study population (16.7%). Coffee consumers belong to different categories according to the quantity /frequency of coffee consumption as given in Table. 4. On observing the relationship between the quantity/frequency of coffee intake and the Met S-IDF prevalence, the results seemed to be interesting. People who consume at least 1 cup coffee /day had a Met S IDF prevalence of 14.4%, 2-3 cup/day had 18.8 %, 4-6 cup/day had 5.5% and 6 cup /day had 13.3% of prevalence.

Frequency of substance use and prevalence of Met SATP-III

It is also important to understand the impact of the frequency/quantity of substance and coffee consumption on the development of Met S according to ATP-III definition (Table.5). **Frequency of Cigarette smoking and Met S –ATP-III:** Cigarette smokers constitute 7% (N=92) of the total study population (N=1316). Among cigarette smokers the Met S-ATP-III prevalence was found to be (8.7%). Considering the frequency of smoking with development of Met S IDF, individuals who used to smoke 1-5 cigarette / day showed 5.2 % prevalence, 6-10 cigarettes /day showed 9.1 % prevalence and >10 cigarettes a day showed 11.9 % prevalence. **Frequency/quantity of alcohol consumption and Met S –ATP-III:** In Accordance with the ATP-III criteria, the frequency of Met S (Met S-ATP-III) in the study population (N=1316) was already calculated to be 10.5%. Among the people who consume alcohol in various forms (52.1%) the overall occurrence of Met S ATP-III was 10.8%.There was no significant difference in the prevalence rate between consumers and non consumers as far as the entire population is concerned. However, there observed, a significant variation in the occurrence of Met S-ATP-III within different category of alcohol users, who were categorized according to the frequency of alcohol consumption.

Table: 5. Frequency of substance (alcoholism, smoking and Khat chewing and coffee consumption) and Met S ATP-III.

Frequencies usage		No Met S-ATP-III N=1316 N (%)	Met S-ATP-III N=1316 N (%)	P value
Alcohol consumption	Every day N=56(8.1)	50(89.3)	6(10.7)	0.012
	2-3 days /week N=70(10.3)	65(92.9)	5(7.1)	
	Once /week N=126(18.3)	107(84.9)	19(15.1)	
	Occasionally N=434(63.3)	390(89.9)	44(10.1)	
	Total=686(100)	612(89.2)	74(10.8)	
Khat chewing	Every day N=69(24)	57(82.6)	12(17.4)	0.000
	2-3 days /week N=10(3.5)	5(50)	5(50)	
	Once /week N=142(49.3)	138(97.2)	4(2.8)	
	Occasionally N=67(23.2)	67(100)	0(0)	
	Total=288(100)	267(92.7)	21(7.3)	
Cigarette smoking	1-5/day N=39(42.3)	37(94.8)	2(5.2)	0.01
	6-10/day N=11(12)	10(90.9)	1(9.1)	
	>10/day N=42(45.7)	37(88.1)	5(11.9)	
	Total=92(100)	84(91.3)	8(8.7)	
Coffee consumption	<1 cup /day N=97(8.5)	86(88.7)	11(11.3)	0.028
	1-3 cups /day N=745(65.3)	662(88.9)	83(11.1)	
	4-6 cups /day N=163(14.3)	157(96.3)	6(3.7)	
	>6 cups /day N=135(11.9)	122(90.4)	13(9.6)	
	Total N=1140(100)	1027(90.1)	113(9.9)	

***P<0.05 is significant

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The individuals who consume alcohol every day had shown a Met S – ATP-III prevalence of 10.7%, 2-3 days /week had shown a prevalence of 7.1 %, 1 day /week had shown a prevalence of 15.1% and occasional consumers had shown a prevalence of 10.1%. From these results, it is clear that there is no significant difference in the Met S ATP-III prevalence rate between non users (10.2%) and people who occasionally use alcohol (10.1%) stating that occasional alcohol consumption had no impact on the development of Met S-ATP-III. There observed no significant difference in the occurrence of Met S ATP-III between non users (10.2%) and people who consume everyday (10.7%),but for people who use alcohol 2-3 days /week (7.1%) and people who use once in a week (15.1%) shown significant variations. **Frequency/quantity of Khat chewing and Met S ATPIII:** The percentage of Khat chewers in the study population was 21.9 %. Among Khat chewers Met S ATP-III prevalence rate was found to be 7.3 % and is significantly less than the overall prevalence in the study population (10.5%) as well as the prevalence among the non chewers (11.4%). Among the Khat chewers the people who chew Khat everyday had a prevalence of 17.4 %, the people who chew khat 2-3 days/ week had prevalence of 50%,1 day /week had a prevalence of 2.8 % and occasional khat chewers showed 0 % prevalence of Met S ATP-III. **Frequency /quantity of Coffee consumption and Met S ATP-III**: In the study population 86.6 % are coffee users. The results of the study showed that the prevalence of Met S-ATP-III among coffee consumers in general (9.9%) is almost comparable (little less, but not very significant) to that of the entire study population (10.5%).Coffee consumers belong to different categories according to the quantity /frequency of coffee consumption as given in The Table:5. On observing closely the relationship between the quantity/frequency of coffee intake and the Met S-ATP-III prevalence, the results seemed to be interesting. People who consume at least 1 cup /day had a Met S ATP-III prevalence of 11.3%, 2-3 cup/day had 11.1%, 4-6 cup/day had 3.7% and 6 cup /day had 9.6%.

Logistic regression analysis

The results of Binary Logistic regression analysis (Table: 6 & 7.) revealed that not drinking coffee (AOR=0.786;95%CI=0.410-0.908*) is associated with the development of Metabolic syndrome IDF. Cigarette smoking greatly aggravate the development of Met S IDF in the study population (AOR=1;95% CI=1.234-5.123*).

Table:6. Predictors of Metabolic syndrome (IDF) in Jimma Town,south west Ethiopia by logistic regression.

Characteristics		No MetS ATP N (%)	MetS ATP N (%)	AOR	C I 95 %
Cigarette smoking	Non-smoker	1028(84)	196(16)	1	
	Smoker	68(73.9)	24(26.1)	4.567	1.234-5.123*
Alcohol consumption	Consumer	564(82.2)	122(17.8)	1.00	
	Non-consumer	532(84.4)	98(15.6)	1.087	0.667-1.771
Khat chewing	Chewer	256(88.9)	32(11.1)	1.00	
	Non-chewer	840(81.7)	188(18.3)	0.585	0.227-1.333
Coffee habit	Yes	959(84.1)	181(15.9)	1.00	
	No	137(77.8)	39(22.2)	0.786	0.410-0.908*

Generally alcoholism is not associated with the development of Met SATP-III. Cigarette smoking habit (AOR=4.113; 95%CI=1.73-2.76), is associated with the development of Metabolic syndrome ATP-III. Alcoholism is not a crucial factor in the development of Met S ATP-III.

Table:7. Predictors of Metabolic syndrome ATP –III in Jimma Town south west Ethiopia (by logistic regression analysis).

Characteristics		No MetS ATP N (%)	MetS ATP N (%)	AOR	C I 95 %
Cigarette smoking	Non-smoker	1094(89.3)	130(10.7)		
	Smoker	84(91.3)	8(8.7)	4.113	1.73-2.763*
Alcohol consumption	Consumer	612(89.2)	74(10.8)	1.00	
	Non-consumer	566(89.8)	64(10.2)	1.114	0.684-1.815
Khat chewing	Chewer	267(92.7)	21(7.3)	1.00	
	Non-chewer	911(88.6)	117(11.4)	0.541	0.252-1.162
Coffee habit	Yes	1027(90.1)	113(9.9)	1.00	
	No	151(85.8)	25(14.2)	0.682	0.353-1.316

DISCUSSION

In the study population 7% were cigarette smokers, 52.1% were alcohol consumers and 21.9% were Khat chewers. Alcohol consumption is the prominent life style characteristic followed by Khat chewing and cigarette smoking. Cigarette smoking was found to be very common among males than females (P=0.000**) but, alcohol consumption was observed to be almost similar in both groups (P=0.514). The Khat chewing tendency seemed to be significantly high among the males (P=0.000**) of the study population.

Association between substance use and metabolic syndrome

The life style habits such as alcoholism, cigarette smoking, Khat chewing etc were estimated to be very common in the study

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population and, most of these were found to influence on the development of Met S at varying degrees.

Cigarette smoking and Metabolic syndrome

Cigarette Smoking and Met S IDF: Cigarette smokers constitute 7 % of the study population. The present data(Table.2) indicated that cigarette smokers had more chance of developing Met S –IDF (26.1%) compared to non smokers in which the prevalence rate was 16% (P= 0.018**).The effect of smoking on the development of atherosclerosis, hypertension(HT) and cardiovascular disorders(CVDs) were all already established facts. Nicotine present in cigarette smoke can augment the clot formation within the blood vessels leading to coronary heart diseases (CHDs). Hypertension itself being a determinant of Met S IDF can cause the development of the same. The association between the frequency of Cigarette smoking and the prevalence of Met S –IDF was also studied in detail. The results showed a positive correlation between the extent of smoking and the chance of developing Met SIDF. It has been established that the more the number of cigarettes smoked /day the more the chance of getting affected with Met S –IDF. An average a smoker who smokes 10- 15 cigarettes a day (group prevalence 40.5%) had a more chance Met S IDF than a non smoker (group prevalence 16%) as evidenced by the present investigation (P=0.000**).**Cigarette smoking and Met S ATPIII:** No significant variations in the prevalence rate were observed between cigarette smokers (8.7%) and non-smokers (10.7%) in the study population as far as Met S ATP-III is concerned(P=0.130). Considering the frequency of smoking with development of Met S ATP-III, individuals who used to smoke 1-5 cigarette / day showed 5.2 % prevalence, 6-10 cigarettes /day showed 9.1 % prevalence and >10 cigarettes a day showed 11.9 % prevalence. These results established the fact that the more the number of cigarettes smoked /day the more the chance of getting affected with Met S –ATP-III (P=0.01**). The impact of cigarette smoking on the development of both Met S IDF and Met S ATP III were seemed to be the same on close analysis. There are so many previous reports on the deleterious effect of smoking on different cardio-metabolic parameters as well as normal physiological function and the development of Met S. Cigarette smoke contains large amounts of free radicals. In addition, smokers have lower antioxidant vitamins intake and/or higher antioxidant turnover rates. These conditions increase oxidative stress in smokers compared to non-smokers [40]. Cigarette smoking is one of the major risk factors for cardiovascular disease. Smokers have a higher risk of coronary artery disease than non-smokers. Several possible explanations have been offered for this association, including altered blood coagulation, impaired integrity of the arterial wall, and changes in blood lipids [41]. Several studies have shown an association between cigarette smoking and altered serum lipids. Studies revealed that cigarette smokers have lower high-density lipoprotein (HDL) cholesterol levels and higher levels of total cholesterol, low-density lipoprotein (LDL) cholesterol, and triglyceride than non-smokers [42, 43]. It is evident that smoking causes endothelial dysfunction, decreased HDL cholesterol levels, hypertriglyceridemia and increased oxidation of LDL cholesterol and platelet activation leading to a prothrombotic state [44]. Another study revealed significant improvements in LDL-C, HDL-C and the HDL-C-to-LDL-C ratio 8 weeks after cutting down on smoking.[45] Another community-based study conducted on association between metabolic syndrome and smoking cigarette using the definition of Adult Treatment Panel III (ATP III) guideline in 5573 non-diabetic men with a mean age of 38.07 ± 14.85 years demonstrated that the serum low-density lipoprotein cholesterol (LDL-C : 115.34 ± 39.03 vs. 112.65 ± 40.94 mg/dl, respectively, P = 0.015) and triglycerides (TG : 175.13 ± 102.05 vs. 172.32 ± 116.83 mg/dl respectively, P = 0.005) levels were higher in smokers than in non-smokers. Mean systolic and diastolic blood pressures were significantly lower in smokers than in non-smokers (systolic: 112.06 ± 15.888 vs. 117.25 ± 17.745 mmHg, respectively, P = 0.000; diastolic: 73.66 ± 10.084 vs. 76.23 ± 10.458 mmHg, respectively, P = 0.000).This study also revealed that the percentage of individuals with 2 Met S components was higher among smokers than among non-smokers (39.64% vs. 33.00%, respectively, P = 0.000). However, the percentage of non-smokers with 3 Met S components was higher compared to smokers (49.62 % vs. 43.82%, respectively, P = 0.000) [46].

Alcohol consumption and Metabolic syndrome

Alcohol consumption and Met S IDF: Alcohol consumers constitute 52.1% of the study population. The prevalence rate of Met S- IDF in alcohol consumers was found to be 17.8 % and that in non consumers was 15.6%. There was no significant difference in the prevalence rate of Met S-IDF between alcohol consumers and non consumers (P=0.157). But the study proved that alcohol consumers who consume beer/draft beer and tejje (local arrack) had shown significantly high potential to develop Met S IDF as compared to the individual who drink other forms of alcohol. It was very important to notice that the people who drink wine had shown significantly very less chance develop to develop Met S IDF as compared to others(P=0.033**).The present study also established some relationships between frequency/quantity of alcohol consumption and Met S IDF. There observed, a significant variation in the occurrence of Met S- IDF between different categories of alcohol users, categorized according to the frequency of alcohol consumption. From the results it was very clear that there was no significant difference in the Met S IDF prevalence rate between non users (15.6%) and people who occasionally used alcohol (15.4%) stating that occasional alcohol consumption had no impact on the development of Met S-IDF. It was very important to note that consuming alcohol everyday could increase the risk of developing Met S (15.6% to 32.1%), 1 day /week could reduce the risk compared to everyday consumers (32.1 % to 22.2%) and ideally, consuming alcohol 2-3 days per week could even decrease the risk(12.9%) below non consumers (15.6%)(P=0.01**). As per the feedback obtained from the present study it is advisable to consume alcohol in a controlled way to reduce the chance of development of Met S IDF, not forgetting the fact that alcohol have deleterious effect on other systems and physiological functions and are not under the scope of the present study. Recent literatures has revealed that moderate intake of alcohol can increase the HDL –C level and thereby reduces the risk of Met S and chances of getting coronary Heart Diseases(CHDs). **Alcohol consumption and Met S ATPIII:** Alcohol consumers constitute 52.1% of the study population. The prevalence rate of Met S – ATP-III in alcohol consumers was found to be 10.8 % and that in non consumers was 10.2%. No significant variations in the prevalence of Met S ATP-III was observed between alcohol consumers and non consumers (P=0.390). Similar to the pattern of Met S IDF

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prevalence rate, in the case of Met S ATP III also, the individuals who consume beer and local arrack (tejje) had shown a significantly higher prevalence rate compared to people who consume other forms of alcohol. It was very important to notice that the people who drink wine had shown significantly very less chance to develop Met S ATP III as compared to others. On considering the frequency of alcohol use and its association with Met S ATP III, the individuals who consume alcohol every day had shown a Met S – ATP-III prevalence of 10.7%, 2-3 days /week had shown a prevalence of 7.1 %, 1 day /week had shown a prevalence of 15.1% and occasional consumers had shown a prevalence of 10.1%. From these results, it was clear that there was no significant difference in the Met S ATP-III prevalence rate between non users (10.2%) and people who occasionally consumed alcohol (10.1%) stating that occasional alcohol consumption had no impact on the development of Met S-ATP-III. There observed no significant difference in the occurrence of Met S ATP-III between non users (10.2%) and people who consumed everyday (10.7%),but for people who consumed alcohol 2-3 days /week (7.1%) and people who used to consume once in a week (15.1%) shown significant variations. These results clearly suggested that consuming alcohol every day did not increase the risk of developing Met S ATP-III (10.7%), and consuming alcohol 2-3 days per week can even decrease the risk (7.1%) below that of abstainers (10.2%)(P=0.012**). As per the present study it is advisable to consume alcohol in a controlled way to reduce the chance of development of Met S ATP III similar to that of Met S IDF. There are several reports supporting the results of the present study that moderate alcohol consumption had an inverse effect on the development of Met S as defined by both IDF and ATP III criteria.

In relation to substance use the research has mostly focused on the association between MS and alcohol. Some studies have reported moderate alcohol use to be associated with a lower prevalence of Met S[47,48]. Under the 1998 Korean National Health and Nutrition Examination Survey covering 7962 adults (3597 men, 4365 women), the prevalence of the Met S has been reported as 20.8 % among men and 26.9 % among women. The adjusted odds ratio for the Met S in the group with daily consumption of 1-14.9 g alcohol was 0.71 (95% CI: 0.53, 0.95) among men and 0.80 (95% CI: 0.65, 0.98) among women. Alcohol consumption had a significant inverse relation with the odds ratio for low HDL cholesterol in all alcohol subgroups. In this study heavy alcohol consumption (≥30 g/day) was associated with significantly higher odds ratios for high blood pressure and high TG in men and high FPG and high TG in women [49]. In a contrary, study from Portugal, a prevalence of 3.5-42.3 per cent was reported for Met S, with no significant association with alcohol intake [50]. Among the studies that specifically looked into the prevalence of Met S in alcohol dependent (AD) subjects, a study from Brazil reported prevalence of Met S to be 5.1 % in alcohol dependent psychiatric inpatients [51]. Another study from USA found 22 % of the subjects meeting the criteria for Met S in a sample of alcohol and nicotine dependent adults [96]. It was reported that the alcohols protective effect on CVDs might be because of favourable alterations in blood chemistry and prevention of clot formation in the arteries that deliver blood to the heart muscles. It was also established that moderate drinkers are at lesser risk and heavier drinkers are at higher mortality risk [53]. In a study conducted among patient s with Met S it was proved that body weight and systolic blood pressure of the subjects decreased significantly during the experimental period and their abdominal circumference also decreased, although not significantly[54]. Heavy drinking, in particular among liquor drinkers is associated with an increased risk of MetS by influencing its components [55]. Another study, among Americans showed that alcohol consumption was associated with a lower prevalence of Met S irrespective of the type of beverage consumed [56]. In a study conducted among men and women over 60 years it was proved that compared with low alcohol drinkers' moderate drinkers exhibited a more favourable pattern of health benefits [57].

It was found to be very significant that the people who drink wine had shown significantly very less chance to develop Met S IDF as well as Met S ATP III. There are so many reports supporting this finding. Mild to moderate alcohol consumption is associated with a lower prevalence of MetS with a favourable influence on lipids waist circumference and fasting insulin. The association was strongest among whites and among beer and wine drinkers. In this study alcohol consumption was inversely associated with the prevalence of the following 3 components of the Met S such as low HDL-C, elevated TG, high WC as well as hyper insulinemia [58]. In a recent review analysis, it was highlighted that epidemiological and experimental evidences supporting the protective effect of moderate wine intake against MetS and its associated cardio-metabolic complications and discuss the molecular mechanism underlying the multiple beneficial action of red wine polyphenols with the focus on resveratrol. The beneficial effects resulted from its antioxidant, anti inflammatory, vascular protective and insulin sensitizing properties [59]. Another feedback obtained from the present investigation was that beer and local arrack (tejje) drinkers had more chance of developing Met S IDF and Met S ATP III. The exact reason for these effects should be investigated further in detail.

Khat chewing and metabolic syndrome

Khat chewing and Met S IDF: In the study population, 21.9 % had the habit of Khat (Leaf of Catha edulis) chewing. The prevalence of Met S – IDF among Khat chewers was found to be 11.1% and was found to be significantly less than that among non chewers (18.3%). This result revealed the nullifying effect of Khat chewing on the development of Met S-IDF ie. non chewers had more tendency to develop Met S IDF as compared to chewers(P= 0.002**). One possible reason could be the Khat induced inhibition on normal appetite, decreased food intake, resulting hypoglycaemia and caloric deficiency, increased lipid mobilization in the adipose tissue and the resulting decrease in waist circumference /BMI. There are controversies regarding the Khat induced reduction in body weight. Therefore it is very important to explore at which frequency /quantity it is having the weight loosing effect. It is also very important to take in to account the frequency of Khat chewing on the prevalence of Met S-IDF. Among the Khat chewers the people who chew Khat everyday had a prevalence of 20.3 %, the people who chew khat 2-3 days/ week had prevalence of 60%,1 day /week had a prevalence of 8.5 % and occasional khat chewers showed 0 % prevalence of Met S IDF(P=0.001**). These results reflected the potential of Khat to reduce the chance of development of Met S IDF if it is used in a controlled way. In another way, Khat chewing either occasionally (0% prevalence of Met S IDF) or once in a week (8.5% prevalence of Met S IDF) can bring down the

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chance of being affected with Met S-IDF on comparison to non chewers where the prevalence rate is 18.3%.Where as, khat chewing everyday (20.3%) or more than 2 days per week (60%) can develop Met S IDF as indicated by the present results. In short Khat is dose dependent, in the correct dosage it it seemed to have an inverse effect on development of Met S IDF, but if it is in excess it will have aggravating effect on the same. Therefore, Khat chewing either occasionally or 1 day per week is advisable as far as the development of Met S IDF is concerned keeping in mind that Khat may have potential deleterious effect on many other organs and important physiological functions. **Khat chewing and Met S ATPIII:** The prevalence of Met Met S – ATP-III among Khat chewers was found to be 7.3% and was found to be significantly less than that among non chewers (11.4%). This is very similar to the relation between Met S IDF and Khat discussed before in this session and revealed that non chewers had more tendency to develop Met S IDF as compared to chewers(P= 0.026**). There are controversies regarding the Khat induced reduction in body weight. Therefore it is very important to explore at which frequency /quantity it is having the weight loosing effect**.** On considering the frequency of Khat chewing and its association with Met S ATP III, the people who chew Khat everyday had a prevalence of 17.4 %, the people who chew khat 2-3 days/ week had prevalence of 50%,1 day /week had a prevalence of 2.8 % and occasional khat chewers showed 0 % prevalence of Met S ATP-III. These results also reflected the potential of Khat to reduce the chance of development of Met S ATP-III similar to that of Met S IDF. Khat chewing either occasionally (0% prevalence of Met S ATP-III) or once in a week (2.8% prevalence of Met S ATP-III) can bring down the chance of being affected with Met S-ATP III but chewing khat everyday can increase the risk. Moderate Khat chewing is recommendable to get rid of Met S ATP III as evident from the present study. This result is similar to that obtained for Met S IDF.

There are so many supporting as well as contradictory literatures and studies to these findings. The sympathomimetic actions of cathinone would be expected to raise plasma catecholamine levels. These catecholamine would increase blood glucose levels by activation of glycogenolysis in skeletal muscles and the liver; a beta, 2- adrenergic receptor-mediated response. There is also inhibition of insulin release from the pancreatic beta-cells via beta-2-adrenoceptor stimulation which would also elevate blood glucose levels further [60]. While some studies show that in healthy non-diabetics, khat does not affect fasting or post-prandial serum glucose levels [61], others have suggested a decrease in serum glucose [62]. Rabbits fed a diet containing different levels of khat leaves showed an increase in plasma glucose levels after 4 months but a significant reduction after 6 months [63]. These results are difficult to interpret but indicate the complex relationships between the stimulation of glygogenolysis by raised catecholamine levels and the effects of raising glucose on insulin release. Raised glucose levels will result in compensatory increases in insulin release. This study also showed that feeding rabbits with khat caused a significant reduction in plasma cholesterol throughout the 6-month period [63]. In a cross-sectional study of 4001 adults aged 25 to 64 years in Addis Ababa, Ethiopia, Tesfaye et al., reported a significant association between khat chewing and elevated mean diastolic blood pressure (P=.02)[64]. Biochemical effects of varying levels of Catha edulis leaves on the plasma concentration of glucose done among diabetic and healthy khat chewers reported a significant decrease in plasma glucose during the experimental period by all levels of Catha. Edulis leaves chewing. It was observed that healthy khat chewers have 61.22% reduction in blood sugar within 4 hours after consumption [65]. Khat chewing induces anorexia, week stream of micturition, post chewing urethral discharge and insomnia (delayed bed time which result in late wakeup and low work performance in the next day, the effects are because of cathinone and cathine on CNS [66]. It was reported that arrhythmia and moderate increase in blood pressure which can come chronic upon long term use Khat has amphetamine tike properties [67]. It was reported that cathinone and cathine acts centrally, hypothalamus and decrease hunger [68]. In a recent report it was mentioned that healthy Khat chewers showed 61.22% reduction in blood sugar within 4 hour after consumption [69]. There is also a contradictory statement that chronic khat chewing does not affect serum glucose and C- peptide in healthy individuals while it increases glucose and c- peptide level during khat sessions in a diabetic individual especially those having serum glucose between 200-450 mg /dl at 2 hours post meal [70]. It was also reported that the TC level decreased, HDL-C decreased, LDL-C increased, TG level increased immediately after the Khat chewing session and then returned to the normal levels during withdrawal period but, FBG insignificant was insignificant, in rabbit [71].

Coffee consumption and metabolic syndrome

Coffee consumption and Met S IDF: Among coffee consumers Met S-IDF prevalence was 16.8% .and among non consumers it was 22.2 % (P=0.027***). The significant variation in the prevalence rate reflected the potential of the coffee to prevent the development of Met S-IDF in the studied population and is to be further analyzed in detail. On observing the relationship between the quantity/frequency of coffee intake and the Met S-IDF prevalence, the results seemed to be interesting. People who consume at least 1 cup /day had a Met S IDF prevalence of 14.4%, 2-3 cup/day had 18.8 %, 4-6 cup/day had 5.5% and 6 cup /day had 13.3% of prevalence. This suggested that moderate consumption of coffee (4-6 cups /day) can even prevent the development of Met S IDF (P=0.021**).There are a lot of supporting literatures available in this regard. There are some literatures which support the negative effect of the coffee in the development of Met S IDF. **Coffee consumption and Met S ATPIII:** Among coffee consumers Met S – ATP-III prevalence was 9.9% and among the non consumers it was 14.2 %. Again a wide variation in the prevalence rate between coffee users and non users (P=0.031***) reflected the potential of the coffee to prevent the development of Met S – ATP-III in the studied population and the result is similar to that of MS IDF. On observing closely the relationship between the quantity/frequency of coffee intake and the Met S-ATP-III prevalence, the results seemed to be again interesting same as that of Met S IDF. People who consume at least 1 cup /day had a Met S ATP-III prevalence of 11.3%, 2-3 cup/day had 11.1%, 4-6 cup/day had 3.7% and 6 cup /day had 9.6%, suggesting that moderate consumption (4-6 cup/day) of coffee can have a negative influence on the development of Met S ATP-III (same as that of Met S IDF).

These finding are supported by several other previous studies. There are several previous reports on the association between coffee consumption and Met S. In a study conducted in Japan there

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existed an inverse correlation between coffee consumption and prevalence of Met S diagnosed using NCEP ATPIII criteria. It was associated with low serum TAG and established that moderate coffee consumption reduces the risk of development of Met S [72]. A very recent study reported that a daily intake of 2-3 cups of coffee is safe and is associated with neutral to beneficial effects for most of the studied health outcomes. Epidemiological studies suggested that regular coffee drinkers have reduced risk of mortality of any cause both cardiovascular and all cause mortality [73]. Another report says coffee consumption was protective towards the development of Met S [74]. This might be because of Poly phenol compounds present in the coffee that exhibit anti-inflammatory and antioxidant properties [75]. Another study revealed that among all components of Met S high BP and high serum level of TAG were inversely associated with moderate coffee consumption in men after adjusting for age BMI smoking status, alcohol drinking status and physical exercise. In women moderate coffee consumption was not significantly associated [76]. In another study, moderate coffee consumption was found to be inversely associated with the development of Met S [77]. There are also important reports regarding the duration of coffee consumption and CVDs in hypertensive individuals. There was no association between long term coffee consumption and increased BP or between habitual coffee consumption and CVDs in hypertensive individuals [78].

It has been revealed that smoking cigarettes and not drinking coffee are the major aggravating factors of Met S-IDF and Met S-ATP III in the Urban population of Jimma Town. Generally, alcoholism is not associated with the development of Met S IDF, but drinking alcohol every day drinking beer, drinking local arrack(tejje),consuming any forms of alcohol for long duration were found to be associated.

CONCLUSIONS

The cross sectional study "Metabolic syndrome and its association with substance use in Jimma Town Southwest Ethiopia" ended up with the following final conclusions.

Cigarette smoking was found to be directly associated with the development of Met S IDF as well as Met S ATP III and the risk increases with the increase in smoking frequency and intensity. Generally, alcohol consumption was not associated with the development of either Met S IDF or Met S ATP III in the study population. Consumption of Beer and the local arrack (tejje) were found to aggravate the development of both Met S IDF and ATP III. Moderate alcohol consumption was found to have some beneficial effect ie. it reduces the risk of being affected with Met S IDF as well as Met S ATP III compared to non consumers. On the other hand, heavy alcohol consumers are at a very high risk of getting affected with Met S IDF as well as Met S ATP III. Wine drinking was inversely correlated with Met S IDF as well as Met S ATPIII. On general look, Khat chewing was inversely correlated with Met S as evident from the prevalence rate among chewers and non chewers, as far as the entire population is concerned.Everyday khat chewers are at a higher risk compared to non chewers, but to be very interesting occasional Khat chewers are at a reduced risk compared to non chewers. Generally coffee consumption was inversely correlated with the Met S. Moderate coffee consumption ie.4-6 cups per day significantly reduce the risk of Met S IDF as well as Met SATP III as evident from the prevalence rate.

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