

Prevalence, knowledge, and associated factors of atherosclerotic cardiovascular disease risk factors among adults in Jimma Town, Ethiopia: a community-based cross-sectional study

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Abstract

Background Amidst the epidemiological transition in sub-Saharan Africa, atherosclerotic cardiovascular disease (ASCVD) is emerging as a critical public health challenge; however, comprehensive community-level data regarding risk factors, awareness, and preventive practices remain sparse in Ethiopia. To address this gap, this study evaluated the prevalence of ASCVD risk factors, associated knowledge levels, preventive behaviors, and correlated determinants among adults in Jimma Town.

Methods A community-based cross-sectional study was conducted among 332 adults aged ≥ 18 years in Jimma Town between 1 and 28 November 2021. Data were collected on sociodemographic characteristics, lifestyle behaviours, anthropometric measurements, blood pressure, random blood glucose, and knowledge of ASCVD risk factors using a 10-item instrument. Binary and multivariable logistic regression identified factors associated with the principal outcomes (moderate physical activity, alcohol use, smoking exposure, khat chewing, hypertension-range blood pressure, central obesity, and good ASCVD knowledge); variables with $p \leq 0.25$ in bivariate analysis were entered into multivariable models.

Results Among the evaluated adult cohort (mean age 40.7 years; 56.3% female), the findings indicate a substantial cardiometabolic risk burden, characterized by high rates of hypertension-range blood pressure (44.6%), central obesity (42.9%, predominantly in women), and hyperglycemia (5.8%). Only 27.4% of participants achieved at least 150 min of moderate-intensity physical activity per week, alongside prevalent alcohol consumption (17.8%), smoking exposure (11.4%), and habitual khat chewing (19.9%), even though 56.3% of participants demonstrated good ASCVD risk factor knowledge. Furthermore, multivariable analyses revealed that moderate physical activity ≥ 150 min/week was associated with male sex (AOR = 2.05, 95% CI 1.23–3.42), usual khat chewing with male sex (AOR = 18.23, 95% CI 8.02–41.42) and younger age, alcohol use with age ≥ 45 years (AOR = 2.31, 95% CI 1.22–4.37) and medium/high income (AOR = 3.09, 95% CI 1.63–5.85), and good ASCVD knowledge was less likely among habitual khat chewers (AOR = 0.46, 95% CI 0.26–0.82) and those who routinely added salt to meals (AOR = 0.45, 95% CI 0.23–0.87).

Conclusions Adults in Jimma Town had a substantial burden of hypertension-range blood pressure, central obesity, and selected adverse lifestyle behaviors, which were further compounded by a gap in recognition of specific

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ASCVD risk factors and preventive practices. These findings underscore the need for multifaceted community-level public health interventions that synergize systematic risk screening with targeted educational programs to mitigate modifiable behavioral determinants, including physical inactivity, substance use, and poor dietary habits.

Clinical trial registration Not applicable. This was a community-based cross-sectional observational study and did not involve a clinical trial or prospective assignment of participants to an intervention.

Keywords ASCVD · Knowledge · Hypertension · Prevalence · Jimma · Ethiopia

Introduction

As a leading global cause of morbidity and mortality, atherosclerotic cardiovascular disease (ASCVD) is driven by the interplay of non-modifiable determinants and numerous modifiable risk factors, including hypertension (HTN), diabetes, dyslipidemia, obesity, tobacco use, physical inactivity, poor dietary patterns, and excessive alcohol consumption. Consequently, effective prevention strategies critically rely on the early detection and proactive management of these modifiable elements prior to disease manifestation [1, 2].

The global burden of ASCVD has increased substantially, particularly in low- and middle-income countries, where population ageing, urbanization, changing dietary patterns, and declining physical activity are occurring alongside persistent infectious and nutritional health issues [3, 4]. In contrast to many high-income countries, where ASCVD mortality has declined with improvements in prevention, risk-factor control, and treatment, the burden of ASCVD and its risk factors remain an important and growing public health problem in low- and middle-income countries [4, 5]. These trends highlight the importance of population-based approaches to cardiovascular prevention.

Sub-Saharan Africa is undergoing a rapid epidemiological transition driven by the increasing exposure to cardiovascular risk factors. Similarly, Ethiopia faces an evolving health profile characterized by the rising prominence of ASCVD amidst the enduring burden of infectious illnesses [6–8]. Although cardiovascular disease has been investigated in Ethiopia, existing evidence remains largely heterogeneous and facility-based, lacking a comprehensive population-level focus on ASCVD. Consequently, community-level data on the distribution and correlates of multiple ASCVD risk factors remain scarce, particularly in southwestern Ethiopia [6, 7, 9].

Knowledge of modifiable risk factors is vital for fostering health-seeking behaviors and adopting healthier lifestyles, although knowledge alone does not guarantee preventive practice. Furthermore, evidence from developing countries highlights persistent gaps in public communication and understanding regarding ASCVD risk and prevention [10, 11]. Assessing ASCVD risk factor awareness, lifestyle habits, and preventive practices provides valuable insights for optimizing community-based health education and prevention strategies. Furthermore, risk assessments in Ethiopia must account for locally prevalent behaviors, such as khat chewing, which has established cardiovascular risks [12, 13]. Other behavioral factors, including alcohol consumption, tobacco exposure, dietary practices, physical inactivity, and salt use, are potentially modifiable through primary prevention strategies [14, 15].

Evidence from Ethiopia remains insufficient to characterize these factors and practices towards ASCVD risk factors comprehensively at the community level. Previous work in Jimma Town has examined cardiovascular disease-associated risk factors, while other Ethiopian studies have assessed cardiovascular risk knowledge and lifestyle behavior in specific populations [16, 17]. Importantly, the present study was designed to assess risk factors for ASCVD at the community level and practices towards these risk factors rather than established ASCVD itself.

Methods

Study design and setting

This community-based cross-sectional study was conducted from November 1 to 28, 2021, and evaluated the distribution of atherosclerotic cardiovascular disease (ASCVD) risk factors, related knowledge, and lifestyle practices among adults in Jimma Town, southwestern Ethiopia.

Study population

The source population comprised adults aged 18 years or older residing in Jimma Town. The study population consisted of eligible adults who were available during the study period and agreed to participate. Individuals with a prior clinical diagnosis of ASCVD were excluded from the study.

Sample size determination

The sample size was calculated using the single population proportion formula ($n = Z_{1-\alpha/2}^2 \times p(1-p)/d^2$), where n is the required sample size, Z is the standard normal value corresponding to a 95% confidence level (1.96), p is the anticipated population proportion, and d is the desired margin of error. A proportion of 0.71 was used based on a previous community-based study of cardiovascular risk factors in Jimma Town (Desalegn et al., 2017). A 5% margin of error and 95% confidence level were assumed. The initial sample size was approximately 316 participants. Allowing 5% for potential non-response gave a final target sample of approximately 332 participants. A total of 332 adults were included in the final analytic dataset. Although multistage sampling was used, a design effect was not applied in the sample-size calculation; this is acknowledged as a limitation. A total sample of 332 adults was selected through a multistage sampling technique, which involved randomly choosing six out of 17 kebeles, proportionally distributing households, systematically sampling every 31st household using a bottle-spinning starting method, and randomly selecting one eligible adult per household.

Data collection instrument and procedures

Data were collected using a structured questionnaire administered by trained data collectors. The questionnaire obtained information on sociodemographic characteristics, healthcare contact and access, ASCVD risk-factor knowledge, lifestyle and behavioral practices, physical activity, dietary practices, tobacco and alcohol exposure, khat chewing, previous measurement or diagnosis of blood pressure (BP) or glucose abnormalities, family history of ASCVD, and selected anthropometric and clinical measurements. Data were initially entered using Epi-Data Entry v3.1, and the statistical analyses were performed using SPSS version 27.

Assessment of knowledge of ASCVD risk factors

Participants' knowledge of ASCVD risk factors was assessed using ten closed-ended items adapted from the Heart Disease Fact Questionnaire (HDFQ) framework and the study questionnaire [18]. The ten items assessed recognition of smoking, alcohol consumption, unhealthy diet, physical inactivity, HTN, diabetes mellitus, dyslipidemia, overweight/obesity, khat chewing, and excessive salt intake. Each item had three response options: "yes," "no," and "I don't know," and was measured on a Likert scale. Knowledge was categorized according to the percentage of correct responses as follows: Good knowledge: $\geq 70\%$ of items correctly identified (7–10 points); Fair knowledge: 50–69% correctly identified (5–6 points), and Poor knowledge: $< 50\%$ correctly identified (0–4 points). These ten items demonstrated high internal consistency with a Cronbach's alpha of 0.924, and the external validity of the questionnaire was also assessed. For regression analysis, knowledge was dichotomized into good

knowledge ($\geq 70\%$) versus fair/poor knowledge ($< 70\%$), with fair and poor categories combined because the principal analytical objective was to identify factors associated with attainment of an adequate level of ASCVD risk knowledge.

Assessment of lifestyle and behavioral practices

Data were collected on key lifestyle behaviors, including tobacco exposure (current, second-hand, and past), recent alcohol consumption, usual weekly khat chewing, physical activity, sitting time, and dietary practices, such as the consumption frequency of fried and sweet foods, fruit and vegetable intake, and routine salt addition. Physical activity was evaluated using the frequency and duration of vigorous- and moderate-intensity exercises, categorizing participants based on whether they achieved at least 150 min of moderate-intensity activity per week, while daily sitting time was recorded and analyzed independently from physical activity.

Anthropometric measurements

Body weight and height were measured using standardized procedures. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Waist circumference (WC) was measured at the appropriate anatomical site using a non-stretch measuring tape and recorded in centimeters.

Measurement and classification of blood pressure and blood glucose

Blood pressure (BP) was assessed using standardized protocols, with initial elevated readings repeated after six hours and averaged, and categorized hierarchically into the HTN range ($SBP \geq 140$ and/or $DBP \geq 90$ mmHg), intermediate/elevated ($SBP \geq 120$ and/or $DBP \geq 80$ mmHg), and normal ($SBP < 120$ and $DBP < 80$ mmHg) groups. Random blood glucose (RBG) was measured at a single visit, with elevated levels defined as ≥ 200 mg/dL, rather than used for a formal diabetes diagnosis, while prior diagnoses and medication use were captured via questionnaire and reported descriptively owing to small sample frequencies.

Outcome variables and explanatory variables

The principal outcomes were defined before regression modelling and included:

- Moderate physical activity: ≥ 150 min/week versus < 150 min/week;
- Recent alcohol use: alcohol consumption during the preceding month, yes versus no;
- Current/second-hand smoking exposure: current or second-hand smoker versus ex-smoker/never smoker;
- Usual khat chewing: usually chewing khat versus occasionally/not chewing;
- Hypertension-range blood pressure: $SBP \geq 140$ mmHg and/or $DBP \geq 90$ mmHg versus lower blood-pressure categories;
- Central obesity: sex-specific WC threshold exceeded versus not exceeded;
- Good cardiovascular-risk knowledge: knowledge score $\geq 70\%$ versus $< 70\%$.

Obesity defined as $BMI \geq 30$ kg/m² and raised random glucose defined as $RBG \geq 200$ mg/dL were summarized descriptively but were not entered into multivariable logistic models because of the small number of outcome events. Potential explanatory variables included age, sex, educational level, monthly income, health-insurance status, healthcare counselling, and recent contact with a healthcare provider, alcohol exposure, khat chewing, tobacco exposure, physical activity, and selected dietary practices. The questionnaire was prepared with reference to the WHO STEPwise approach to noncommunicable disease (NCD) risk-factor surveillance.

Data management and quality control

Completed questionnaires were reviewed for completeness before data entry in to EpiData v3.1. Categorical variables were coded consistently with their predefined response categories. Continuous variables, including age, weight, height, BMI, waist circumference, SBP, DBP, and random blood glucose, were retained in their original units for descriptive and regression analyses. The final analytic dataset contained 332 participants. Missing values were retained as missing rather than being converted to substantive response categories. Analyses involving variables with missing observations were based on the available complete observations for the variables included in the respective analysis.

Statistical analysis

Statistical analysis was conducted using a statistical software package (SPSS version 27). Categorical variables were summarized using frequencies and percentages. Continuous variables were summarized using means and standard deviations when approximately normally distributed; ranges were also examined to identify implausible values and potential data-entry errors. The prevalence of selected ASCVD risk factors and lifestyle practices was estimated using the appropriate denominator for each variable. Percentages were calculated using the number of participants with available data for the relevant variable, and denominators were explicitly reported where missing observations occurred. Associations between categorical explanatory variables and binary outcomes were initially assessed using bivariate logistic regression. Variables with a bivariate p -value ≤ 0.25 were considered candidates for multivariable logistic regression.

Multivariable logistic regression

Separate multivariable logistic regression models were fitted for the principal binary outcomes. For each model, the dependent variable was explicitly coded as 1 for the outcome of interest and 0 for the reference condition. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported for all variables retained in the final model. Crude odds ratios (CORs), 95% CIs, and exact p -values were reported for candidate variables in the corresponding regression tables. The reference category for each categorical explanatory variable was specified explicitly. All covariates retained in each final model were reported regardless of statistical significance. Model results were therefore not restricted to variables with $p < 0.05$. The principal logistic models were:

- moderate physical activity ≥ 150 min/week;
- alcohol consumption during the preceding month;
- current/second-hand smoking exposure;
- usual khat chewing;
- hypertension-range blood pressure;
- central obesity; and.
- Good ASCVD-risk knowledge.

The models were interpreted as measures of association, not causation, because of the cross-sectional study design.

Multicollinearity and model diagnostics

Multicollinearity among explanatory variables was assessed before interpretation of the multivariable models. Variance inflation factors (VIFs) and tolerance statistics were examined for continuous and/or appropriately coded explanatory variables. Highly correlated measures representing the same underlying construct were not simultaneously retained when doing so produced substantial multicollinearity. BMI and waist circumference

were not treated as interchangeable measures of adiposity. For each logistic regression model, model discrimination was assessed using the area under the receiver operating characteristic curve (AUC). Calibration was assessed using an appropriate goodness-of-fit procedure, such as the Hosmer–Lemeshow test, where applicable. For continuous outcomes such as SBP, DBP, and waist circumference, associations were assessed descriptively and, where regression modelling was retained, coefficients were reported as unstandardized B values in the original measurement units, together with standard errors, 95% CIs, and exact *p*-values.

Handling of low-frequency outcomes

Multivariable regression was not performed for outcomes with insufficient numbers of events to support a stable model. In particular, only 17 participants met the BMI-defined obesity criterion and 19 participants had random blood glucose ≥ 200 mg/dL. These outcomes were therefore presented descriptively rather than being subjected to models with multiple explanatory variables. Similarly, the original composite count of ASCVD risk factors was not used as a conventional linear-regression outcome because the count was constructed from individual risk-factor components that were also used as explanatory variables, creating potential circularity and overadjustment. This composite outcome was therefore omitted from the principal multivariable analysis.

Statistical significance

All statistical tests were two-sided. An adjusted association was considered statistically significant at $p < 0.05$. Exact *p*-values were reported to three decimal places, except values below 0.001, which were reported as $p < 0.001$. Effect estimates were presented with 95% confidence intervals to emphasize both the magnitude and precision of associations.

Ethical considerations

Ethical approval for the study was obtained from the Institutional Review Board of the Institute of Health, Jimma University, Ethiopia. Formal administrative permission was obtained before data collection. Written informed consent was obtained from all participants before enrolment. Confidentiality was maintained by using study identification codes rather than personal identifiers. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Results

Participant characteristics

A total of 332 adults were included in the analysis. The mean age of the study participants was 40.7 years, and 187 (56.3%) were women. Most participants had contact with a health-care provider within the previous year (187, 56.3%), while 20 (6.0%) reported contact within the previous 2 years, 26 (7.8%) within the previous 5 years, and 13 (3.9%) had contacted a health-care provider 5 years ago. Eighty-six participants (25.9%) reported that they had never attended a health-care provider. Health-related counselling by a health professional was reported by 172 participants (52.0%).

Most participants reported low monthly income. Two hundred and twenty-three participants (67.2%) were classified in the low-income category, 98 (29.5%) in the medium-income category, and 11 (3.3%) in the high-income category. Government employees accounted for 88 (26.5%) participants, followed by housewives (86, 25.9%), participants in other occupations (80, 24.1%), merchants (41, 12.3%), unemployed participants (30, 9.0%), farmers (4, 1.2%), and health professionals (3, 0.9%). Health insurance coverage was reported by 88

(26.5%) participants. Educational attainment ranged from no formal education to university education, with 25 (7.5%) participants being illiterate, 30 (9.0%) able to read and write, 116 (34.9%) having elementary education, 82 (24.7%) having completed high school, and 79 (23.8%) having university education.

Knowledge of ASCVD risk factors

Knowledge of ASCVD risk factors was assessed using 10 items addressing smoking, alcohol consumption, unhealthy diet, physical inactivity, hypertension, diabetes mellitus, dyslipidemia, obesity, khat chewing, and excessive salt intake. Each correct affirmative response contributed one point to a total score ranging from 0 to 10. The mean knowledge score was 6.52 ± 3.60 . Overall, 187 participants (56.3%) had good knowledge, defined as a score of $\geq 70\%$, while 59 (17.8%) had fair knowledge and 86 (25.9%) had poor knowledge. The 10-item instrument demonstrated high internal consistency in the study population (Cronbach's $\alpha = 0.924$).

Smoking and alcohol consumption were the most frequently recognized risk factors, each identified by 76.8% of participants. Excessive salt intake was identified by 74.1%, physical inactivity by 73.5%, and unhealthy diet by 70.2%. Obesity was recognized by 62.7%, while hypertension and khat chewing were each recognized by 56.0%. Diabetes mellitus and dyslipidemia were identified by 54.2% and 52.1%, respectively. Forty-six participants (13.9%) were unable to identify any of the 10 listed risk factors.

In the multivariable analysis, good knowledge was defined as a score of $\geq 70\%$ and compared with fair or poor knowledge. Participants who reported usual khat chewing had lower odds of good knowledge than participants who did not report usual khat chewing (AOR = 0.46, 95% CI 0.26–0.82; $p = 0.008$). Routine addition of salt to

Table 1 Sociodemographic and health-related characteristics of adults participating in the study, Jimma Town, Ethiopia, November 2021 ($N = 332$)

Variable	Category	Number (%)
Age, years	Mean $\pm$ SD	40.7 $\pm$ 15.2
Age group	< 45 years	206 (62.0)
	≥ 45 years	126 (38.0)
Sex	Male	145 (43.7)
	Female	187 (56.3)
Educational level	Illiterate	25 (7.5)
	Read and write only	30 (9.0)
	Elementary	116 (34.9)
	High school	82 (24.7)
	College/university	79 (23.8)
Occupation	Farmer	4 (1.2)
	Merchant	41 (12.3)
	Housewife	86 (25.9)
	Health-care professional	3 (0.9)
	Government employee	88 (26.5)
	Unemployed	30 (9.0)
	Other ¹	80 (24.1)
Monthly income	Low	223 (67.2)
	Medium	98 (29.5)
	High	11 (3.3)
Health insurance	Yes	88 (26.5)
	No	244 (73.5)
Counselled by a health-care professional	Yes	172 (52.0)
	No	160 (48.0)
Last contact with a health-care provider	Within the past year	187 (56.3)
	Within the past 2 years	20 (6.0)
	Within the past 5 years	26 (7.8)
	More than 5 years ago	13 (3.9)
	Never	86 (25.9)

SD, standard deviation. ¹ Other occupations included daily laborers, students, and self-employed individuals. **Note:** Percentages are based on the total study population ($N = 332$) unless otherwise indicated. Age ≥ 45 years was used as the age category in the multivariable analyses

meals was also inversely associated with good knowledge (AOR=0.45, 95% CI 0.23–0.87; $p=0.019$). Elementary education or higher was positively associated with good knowledge, although the association did not reach statistical significance after adjustment (AOR=1.68, 95% CI 0.92–3.07; $p=0.091$). Recent contact with a health-care provider was likewise not statistically significant (AOR=0.65, 95% CI 0.41–1.05; $p=0.076$) (Table 2).

Physical activity and dietary practices

Physical activity and dietary behaviors demonstrated several potentially unfavorable cardiovascular risk profiles. Ninety-one participants (27.4%) met the predefined threshold of at least 150 min of moderate-intensity physical activity per week. Thus, less than one-third of participants achieved the specified moderate-activity threshold. Most participants (85.2%) reported no vigorous-intensity physical activity. Sedentary behavior of at least 7 h per day was reported by 6.8% of participants. Daily fruit consumption was reported by 2.4%, while 8.7% reported consuming vegetables daily. A substantial proportion reported routinely adding salt to meals, and 21.8% reported consuming one to two servings of sweet foods per week. In the multivariable logistic regression model, men had higher odds of meeting the threshold of at least 150 min of moderate-intensity physical activity per week than

Table 2 Prevalence of selected ASCVD risk factors and cardiometabolic characteristics among adults in Jimma Town, Ethiopia, November 2021

SD, standard deviation; *BP*, blood pressure; *BMI*, body mass index. **Notes:** Blood-pressure categories were mutually exclusive and hierarchical: hypertension-range BP was defined as systolic BP ≥ 140 mmHg and/or diastolic BP ≥ 90 mmHg; among participants not meeting this criterion, intermediate/elevated BP was defined as systolic BP ≥ 120 mmHg and/or diastolic BP ≥ 80 mmHg; normal BP was defined as systolic BP < 120 mmHg and diastolic BP < 80 mmHg. Because waist circumference and random blood glucose had missing observations, their denominators are shown explicitly. Central obesity was defined using sex-specific waist-circumference thresholds (≥ 87.3 cm for men and ≥ 78 cm for women). Random blood glucose was measured under non-fasting conditions; ≥ 200 mg/dL is therefore reported as raised random blood glucose rather than a diagnosis of diabetes mellitus

Variable	Category/measurement	Number (%) or mean $\pm$ SD
Blood pressure, mmHg	Systolic BP, mean $\pm$ SD	128.80 $\pm$ 20.20
	Diastolic BP, mean $\pm$ SD	87.76 $\pm$ 11.65
Blood pressure category	Normal	57 (17.2)
	Intermediate/elevated, below hypertension range	127 (38.3)
	Hypertension-range BP	148 (44.6)
BMI category	Underweight (< 18.5)	55 (16.6)
	Normal (18.5– < 25.0)	200 (60.2)
	Overweight (25.0– < 30.0)	60 (18.1)
	Obesity (≥ 30.0)	17 (5.1)
	Overweight or obesity (≥ 25.0)	77 (23.2)
Central obesity	Yes	142/331 (42.9)
	No	189/331 (57.1)
Random blood glucose, mg/dL	Mean $\pm$ SD	124.76 $\pm$ 48.11
Random blood glucose	< 200 mg/dL	306/325 (94.2)
	≥ 200 mg/dL	19/325 (5.8)
Current/second-hand smoking exposure	Yes	38 (11.4)
	No	294 (88.6)
Alcohol consumption in the preceding month	Yes	59 (17.8)
	No	273 (82.2)
Alcohol consumption ≥ 2 drinks/day	Yes	16 (4.8)
	No	316 (95.2)
Usual khat chewing	Yes	66 (19.9)
	No	266 (80.1)
Moderate physical activity ≥ 150 min/week	Yes	91 (27.4)
	No	241 (72.6)
Vigorous physical activity	None	283 (85.2)
	Any	49 (14.8)
Sitting ≥ 7 h/day	Yes	23 (6.8)
	No	309 (93.2)
Daily fruit consumption	Yes	8 (2.4)
	No	324 (97.6)
Daily vegetable consumption	Yes	29 (8.7)
	No	303 (91.3)

women (AOR=2.05, 95% CI 1.23–3.42; $p=0.006$). Participants with health insurance had lower odds of meeting the moderate-activity threshold (AOR=0.47, 95% CI 0.25–0.89; $p=0.021$). Age ≥ 45 years (AOR=0.70, 95% CI 0.40–1.22; $p=0.208$), elementary education or higher (AOR=1.72, 95% CI 0.74–4.02; $p=0.211$), and medium/high income (AOR=1.13, 95% CI 0.66–1.93; $p=0.660$) were not independently associated with achieving the activity threshold (Table 3).

Tobacco, alcohol, and khat use

Fifty-nine participants (17.8%) reported alcohol consumption during the month preceding the study. Sixteen participants (4.8%) reported consuming two or more alcoholic drinks per day. Usual khat chewing was reported by 66 participants (19.9%). Thirty-eight participants (11.4%) were classified as having current smoking or second-hand smoke exposure. These behavioral exposures were analyzed separately in the descriptive analysis and as predefined binary outcomes in multivariable logistic regression. Among participants who reported recent alcohol consumption, age ≥ 45 years was independently associated with higher odds of alcohol use (AOR=2.31, 95% CI 1.22–4.37; $p=0.010$). Medium/high income was also associated with greater odds of alcohol consumption compared with low income (AOR=3.09, 95% CI 1.63–5.85; $p<0.001$). Male sex showed a non-significant association with alcohol use after adjustment (AOR=1.80, 95% CI 0.98–3.30; $p=0.057$). Health-professional counselling and health insurance were not independently associated with recent alcohol consumption.

For current or second-hand smoke exposure, male sex was associated with higher odds in the adjusted model, although the confidence interval included the null value (AOR=1.89, 95% CI 0.93–3.83; $p=0.079$). Recent health-care contact showed a borderline inverse association with current or second-hand smoke exposure

Table 3 Knowledge of ASCVD risk factors and preventive lifestyle practices among adults in Jimma Town, Ethiopia

Variable	Category	Numbers (%)
Knowledge score, 0–10	Mean $\pm$ SD	6.52 $\pm$ 3.60
Overall knowledge level	Poor (<50%)	86 (25.9)
	Fair (50–69%)	59 (17.8)
	Good ($\geq 70\%$)	187 (56.3)
Recognition of ASCVD risk factors	Smoking	255 (76.8)
	Alcohol consumption	255 (76.8)
	Excessive dietary salt intake	246 (74.1)
	Physical inactivity	244 (73.5)
	Unhealthy diet	233 (70.2)
	Overweight/obesity	208 (62.7)
	Khat chewing	186 (56.0)
	Hypertension	186 (56.0)
	Diabetes mellitus	180 (54.2)
	Dyslipidemia	173 (52.1)
	Number of risk factors recognized	None
		46 (13.9)
	Moderate-intensity physical activity	≥ 150 min/week
		91 (27.4)
Vigorous-intensity physical activity	< 150 min/week	8 (2.4)
	No moderate-intensity activity (0 min/week)	233 (70.2)
	None	283 (85.2)
	Any	49 (14.8)
Sitting time	≥ 7 h/day	23 (6.8)
	< 7 h/day	309 (93.2)
Fruit consumption	Daily	8 (2.4)
	Less than daily	324 (97.6)
Vegetable consumption	Daily	29 (8.7)
	Less than daily	303 (91.3)
Sweet-food consumption	1–2 servings/week	72 (21.8)
	Other frequency	260 (78.2)

ASCVD, atherosclerotic cardiovascular disease; SD, standard deviation. **Notes:** Knowledge was assessed using 10 closed-ended items evaluated on a Likert scale. Each correct identification received one point, giving a total score of 0–10. Knowledge was categorized as poor (<50%), fair (50–69%), or good ($\geq 70\%$). The 10 risk-factor recognition percentages are based on the individual questionnaire items. Physical-activity categories are reported using the revised ≥ 150 min/week threshold adopted for this analysis. Percentages are based on the total sample ($N=332$), unless otherwise indicated

(AOR=0.43, 95% CI 0.18–1.02; $p=0.055$). Counselling by a health professional and medium/high income were not independently associated with the outcome. Usual khat chewing was strongly associated with male sex. Men had substantially higher odds of usual khat chewing than women (AOR=18.23, 95% CI 8.02–41.42; $p<0.001$). Participants aged ≥ 45 years had lower odds of usual khat chewing than younger participants (AOR=0.21, 95% CI 0.10–0.47; $p<0.001$). Health insurance was also associated with usual khat chewing (AOR=2.46, 95% CI 1.19–5.09; $p=0.016$). Recent health-care contact and counselling were not independently associated with usual khat chewing (Table 4).

Blood pressure profile

The mean systolic blood pressure was 128.80 ± 20.20 mmHg, while the mean diastolic blood pressure was 87.76 ± 11.65 mmHg; blood pressure categories were defined hierarchically to ensure that each participant was assigned to one mutually exclusive category. Using the classification, 148 participants (44.6%) had hypertension-range blood pressure, 127 (38.3%) had intermediate/elevated blood pressure below the hypertension range, and 57 (17.2%) had normal blood pressure (Fig. 1).

In the bivariate analysis, age ≥ 45 years, health insurance, education, counselling by a health professional, recent health-care contact, alcohol consumption, moderate physical activity, and routine salt addition met the predefined $p \leq 0.25$ criterion for entry into the multivariable model. After adjustment, recent alcohol consumption was independently associated with hypertension-range blood pressure. Participants who reported alcohol consumption during the preceding month had more than twice the odds of hypertension-range blood pressure compared with those who did not report alcohol consumption (AOR=2.27, 95% CI 1.23–4.22; $p=0.009$).

Age ≥ 45 years (AOR=1.62, 95% CI 0.97–2.69; $p=0.063$) and counselling by a health professional (AOR=1.75, 95% CI 0.98–3.11; $p=0.057$) showed associations that did not reach conventional statistical significance. Health insurance (AOR=1.47, 95% CI 0.87–2.49; $p=0.149$), elementary education or higher (AOR=0.74, 95% CI 0.39–1.42; $p=0.368$), recent health-care contact (AOR=0.89, 95% CI 0.50–1.61; $p=0.711$), moderate activity ≥ 150 min/week (AOR=0.66, 95% CI 0.39–1.13; $p=0.129$), and routine salt addition (AOR=0.56, 95% CI 0.29–1.08; $p=0.082$) were not statistically significant in the adjusted model (Table 5).

Table 4 Factors associated with moderate physical activity, alcohol consumption, smoking exposure, and usual khat chewing among adults in Jimma Town, Ethiopia

Predictor	Moderate physical activity ≥ 150 min/week AOR (95% CI), p	Alcohol consumption in preceding month AOR (95% CI), p	Current/second-hand smoking AOR (95% CI), p	Usual khat chewing AOR (95% CI), p
Age ≥ 45 years	0.70 (0.40–1.22), $p=0.208$	2.31 (1.22–4.37), $p=0.010$	—	0.21 (0.10–0.47), $p<0.001$
Male sex	2.05 (1.23–3.42), $p=0.006$	1.80 (0.98–3.30), $p=0.057$	1.89 (0.93–3.83), $p=0.079$	18.23 (8.02–41.42), $p<0.001$
Health insurance	0.47 (0.25–0.89), $p=0.021$	1.64 (0.86–3.15), $p=0.135$	—	2.46 (1.19–5.09), $p=0.016$
Elementary education or higher	1.72 (0.74–4.02), $p=0.211$	—	—	—
Medium/high income	1.13 (0.66–1.93), $p=0.660$	3.09 (1.63–5.85), $p<0.001$	1.50 (0.74–3.04), $p=0.259$	—
Recent health-care contact ≤ 2 years	—	—	0.43 (0.18–1.02), $p=0.055$	0.95 (0.43–2.11), $p=0.908$
Counseled by health-care professional	—	1.38 (0.74–2.57), $p=0.314$	1.00 (0.42–2.41), $p=0.996$	0.58 (0.26–1.29), $p=0.182$

AOR, adjusted odds ratio; CI, confidence interval; ASCVD, atherosclerotic cardiovascular disease. Reference categories: age < 45 years; female sex; no health insurance; illiterate/read-and-write education; low income; health-care contact > 2 years ago/never; and no health-care counselling. **Notes:** Separate binary logistic regression models were fitted for each outcome. Covariates with $p \leq 0.25$ in bivariate analyses were considered for multivariable modelling. Adjusted odds ratios are reported with 95% confidence intervals and exact two-sided p -values. A dash indicates that the variable was not retained in the corresponding final multivariable model. Associations should be interpreted as cross-sectional associations rather than causal effects

Fig. 1 Distribution of blood pressure categories among adults in Jimma Town, Ethiopia (N = 332). Blood pressure categories are mutually exclusive and defined as: normal (<120/<80 mmHg), intermediate/elevated (120–139 and/or 80–90 mmHg), and hypertension-range (≥140 and/or ≥90 mmHg)

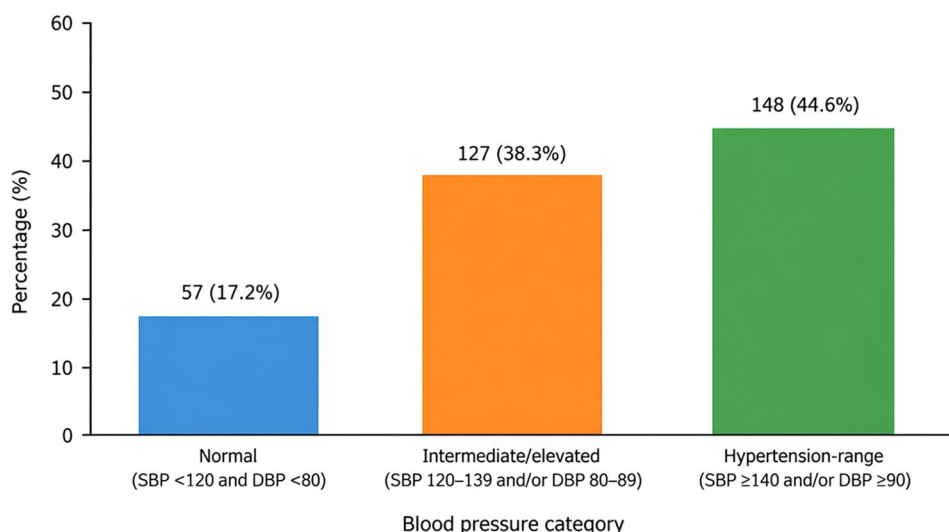


Table 5 Factors associated with hypertension-range blood pressure among adults in Jimma Town, Ethiopia (N=332)

Predictor	Category	HNT-range BP, n/N (%)	No HTN-range BP, n/N (%)	COR (95% CI)	p-value	AOR (95% CI)	p-value
Age	<45 years (reference)	76/206 (36.9)	130/206 (63.1)	1.00	—	1.00	—
	≥45 years	72/126 (57.1)	54/126 (42.9)	2.28 (1.45–3.59)	<0.001	1.62 (0.97–2.69)	0.063
Health insurance	No (reference)	99/244 (40.6)	145/244 (59.4)	1.00	—	1.00	—
	Yes	49/88 (55.7)	39/88 (44.3)	1.84 (1.12–3.01)	0.015	1.47 (0.87–2.49)	0.149
Education	Illiterate/read-write only (reference)	32/55 (58.2)	23/55 (41.8)	1.00	—	1.00	—
	Elementary or higher	116/277 (41.9)	161/277 (58.1)	0.52 (0.29–0.93)	0.028	0.74 (0.39–1.42)	0.368
Counseled by a health professional	No (reference)	57/161 (35.4)	104/161 (64.6)	1.00	—	1.00	—
	Yes	91/171 (53.2)	80/171 (46.8)	2.08 (1.34–3.23)	0.001	1.75 (0.98–3.11)	0.057
Recent healthcare contact	>2 years ago/never (reference)	48/125 (38.4)	77/125 (61.6)	1.00	—	1.00	—
	≤2 years	100/207 (48.3)	107/207 (51.7)	1.50 (0.95–2.36)	0.079	0.89 (0.50–1.61)	0.711
Alcohol consumption	No (reference)	110/273 (40.3)	163/273 (59.7)	1.00	—	1.00	—
	Yes	38/59 (64.4)	21/59 (35.6)	2.68 (1.49–4.81)	<0.001	2.27 (1.23–4.22)	0.009
Moderate physical activity	<150 min/week (reference)	117/241 (48.5)	124/241 (51.5)	1.00	—	1.00	—
	≥150 min/week	31/91 (34.1)	60/91 (65.9)	0.55 (0.33–0.90)	0.019	0.66 (0.39–1.13)	0.129
Salt addition to meals	No (reference)	31/50 (62.0)	19/50 (38.0)	1.00	—	1.00	—
	Yes	117/282 (41.5)	165/282 (58.5)	0.43 (0.23–0.81)	0.008	0.56 (0.29–1.08)	0.082

Notes: Hypertension-range blood pressure was defined as SBP ≥ 140 mmHg and/or DBP ≥ 90 mmHg and was based on the average of the initial and repeat study-visit measurements when repeat measurement was indicated; it should not be interpreted as a clinical diagnosis of chronic hypertension. COR, crude odds ratio; AOR, adjusted odds ratio; CI, confidence interval. Each multivariable model included variables meeting the prespecified bivariate screening criterion of $p \leq 0.25$. Reference categories are shown explicitly. Two-sided $p < 0.05$ was considered statistically significant; p-values < 0.001 are reported as < 0.001

Anthropometric characteristics and central obesity

The mean BMI was 21.52 ± 3.41 kg/m² among men and 23.33 ± 4.32 kg/m² among women. Women had a higher mean BMI than men, with a mean difference of 1.81 kg/m²; the difference was statistically significant ($p < 0.001$). Based on BMI calculated from measured weight and height, 55 participants (16.6%) were underweight, 200

Fig. 2 Prevalence of selected ASCVD risk factors among adults in Jimma Town, Ethiopia (N = 332). BP, blood pressure; BMI body mass index. Central obesity was defined using sex-specific waist circumference thresholds (n=331). Raised random glucose was defined as a non-fasting glucose level ≥ 200 mg/dl (n=325).

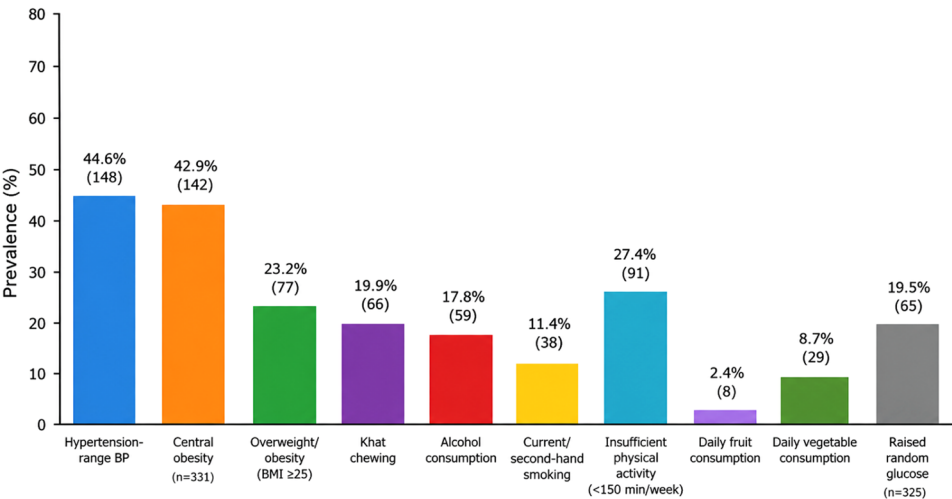
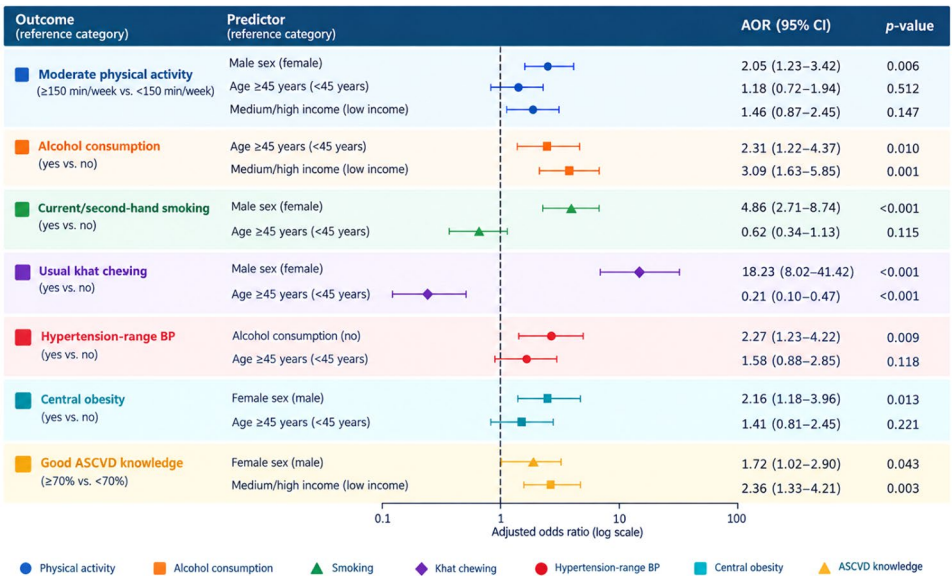


Fig. 3 Principal multivariable associations with selected outcomes among adults in Jimma Town, Ethiopia (N = 332). AOR, adjusted odds ratio; CI, confidence interval; BP, blood pressure; ASCVD, atherosclerotic cardiovascular disease. Note: Central obesity model is based on the preliminary analysis (n = 332) and should be updated after the final complete-case analysis (n = 331)



(60.2%) had normal BMI, 60 (18.1%) were overweight, and 17 (5.1%) met the criterion for obesity. Overall, 77 participants (23.2%) were either overweight or obese.

Among men, 30 (20.7%) were underweight, 98 (67.6%) had normal BMI, 15 (10.3%) were overweight, and 2 (1.4%) were obese. Among women, 25 (13.4%) were underweight, 102 (54.5%) had normal BMI, 45 (24.1%) were overweight, and 15 (8.0%) were obese (Fig. 2).

Waist circumference measurements were available for 331 participants. The mean waist circumference was 79.94 ± 9.66 cm among men and 81.95 ± 12.74 cm among women. Using the sex-specific central-obesity thresholds of ≥ 87.3 cm for men and ≥ 78 cm for women, 27 of 145 men (18.6%) and 115 of 186 women with available measurements (61.8%) met the criterion for central obesity. Overall, 142 of 331 participants (42.9%) had central obesity (Fig. 3).

Multivariable analysis of knowledge and selected behavioral outcomes

The final logistic regression models were specified separately for each principal binary outcome rather than using a single composite “ASCVD risk-factor count” as the dependent variable. Variables with $p \leq 0.25$ in the bivariate

Table 6 Factors associated with central obesity and good ASCVD knowledge among adults in Jimma Town, Ethiopia

Predictor	Category	Central obesity, n/N (%)	No central obesity, n/N (%)	COR (95% CI)	p-value	AOR (95% CI)	p-value
A. Factors associated with central obesity							
Age	<45 years (reference)	73/205 (35.6)	132/205 (64.4)	1.00	—	1.00	—
	≥45 years	69/126 (54.8)	57/126 (45.2)	2.19 (1.39–3.44)	<0.001	2.59 (1.43–4.67)	0.002
Sex	Female (reference)	115/186 (61.8)	71/186 (38.2)	1.00	—	1.00	—
	Male	27/145 (18.6)	118/145 (81.4)	0.14 (0.08–0.24)	<0.001	0.12 (0.06–0.23)	<0.001
Education	Illiterate/read-write only (reference)	31/55 (56.4)	24/55 (43.6)	1.00	—	1.00	—
	Elementary or higher	111/276 (40.2)	165/276 (59.8)	0.52 (0.29–0.93)	0.029	1.27 (0.63–2.58)	0.503
Counseled by health professional	No (reference)	58/161 (36.0)	103/161 (64.0)	1.00	—	1.00	—
	Yes	84/170 (49.4)	86/170 (50.6)	1.73 (1.12–2.69)	0.014	0.95 (0.51–1.78)	0.880
Recent healthcare contact	>2 years ago/never (reference)	39/125 (31.2)	86/125 (68.8)	1.00	—	1.00	—
	≤2 years	103/206 (50.0)	103/206 (50.0)	2.21 (1.38–3.52)	<0.001	1.78 (0.94–3.36)	0.078
Usual khat chewing	No (reference)	128/265 (48.3)	137/265 (51.7)	1.00	—	1.00	—
	Yes	14/66 (21.2)	52/66 (78.8)	0.29 (0.15–0.55)	<0.001	1.11 (0.49–2.50)	0.801
Moderate physical activity	<150 min/week (reference)	115/241 (47.7)	126/241 (52.3)	1.00	—	1.00	—
	≥150 min/week	27/90 (30.0)	63/90 (70.0)	0.47 (0.28–0.79)	0.004	0.72 (0.39–1.31)	0.283
Salt addition to meals	No (reference)	28/50 (56.0)	22/50 (44.0)	1.00	—	1.00	—
	Yes	114/281 (40.6)	167/281 (59.4)	0.54 (0.29–0.98)	0.044	0.59 (0.29–1.21)	0.148
B. Factors associated with good ASCVD-risk-factor knowledge, Outcome: Good knowledge score ≥70% (7–10 of 10 items). Analytic sample: N=332; 187 (56.3%) had good knowledge							
Education	Illiterate/read-write only (reference)	26/55 (47.3)	29/55 (52.7)	1.00	—	1.00	—
	Elementary or higher	161/277 (58.1)	116/277 (41.9)	1.55 (0.87–2.77)	0.140	1.68 (0.92–3.07)	0.091
Recent healthcare contact	>2 years ago/never (reference)	77/125 (61.6)	48/125 (38.4)	1.00	—	1.00	—
	≤2 years	110/207 (53.1)	97/207 (46.9)	0.71 (0.45–1.11)	0.133	0.65 (0.41–1.05)	0.076
Usual khat chewing	No (reference)	159/266 (59.8)	107/266 (40.2)	1.00	—	1.00	—
	Yes	28/66 (42.4)	38/66 (57.6)	0.50 (0.29–0.86)	0.012	0.46 (0.26–0.82)	0.008
Salt addition to meals	No (reference)	36/50 (72.0)	14/50 (28.0)	1.00	—	1.00	—
	Yes	151/282 (53.5)	131/282 (46.5)	0.45 (0.23–0.87)	0.017	0.45 (0.23–0.87)	0.019

Notes: COR, crude odds ratio; AOR, adjusted odds ratio; CI, confidence interval. For central obesity, the analysis was restricted to the 331 participants with available waist-circumference measurements. Central obesity was defined using sex-specific thresholds of ≥78 cm for women and ≥87.3 cm for men. Because sex is intrinsically incorporated into the waist-circumference thresholds, the sex coefficient should be interpreted cautiously and primarily as a consequence of the sex-specific classification rather than as an independent biological effect. The multivariable model included variables meeting the prespecified bivariate screening criterion of $p \leq 0.25$. For good knowledge, the outcome was good knowledge versus fair/poor knowledge. Reference categories are shown explicitly. Two-sided $p < 0.05$ was considered statistically significant; p-values <0.001 are reported as <0.001

analysis were considered candidates for the corresponding multivariable model, and all covariates retained in the final models are reported. For good knowledge, the final model included education, recent health-care contact, usual khat chewing, and routine salt addition. Usual khat chewing and routine salt addition were independently associated with lower odds of good knowledge.

For moderate physical activity, male sex and health insurance were independently associated with the outcome. For alcohol use, age ≥45 years and medium/high income were independently associated with higher odds of recent alcohol consumption. For usual khat chewing, male sex and health insurance were positively associated with the outcome, whereas age ≥45 years was inversely associated with usual khat chewing. For current or

Table 7 Summary of principal multivariable associations with selected ASCVD risk-factor and knowledge outcomes

Outcome	Predictor	AOR	95% CI	p-value
Moderate physical activity ≥ 150 min/week	Male sex	2.05	1.23–3.42	0.006
	Health insurance	0.47	0.25–0.89	0.021
Alcohol consumption in the preceding month	Age ≥ 45 years	2.31	1.22–4.37	0.010
	Medium/high income	3.09	1.63–5.85	<0.001
Current/secondhand smoking	Male sex	1.89	0.93–3.83	0.079
	Healthcare contact ≤ 2 years	0.43	0.18–1.02	0.055
Usual khat chewing	Male sex	18.23	8.02–41.42	<0.001
	Age ≥ 45 years	0.21	0.10–0.47	<0.001
	Health insurance	2.46	1.19–5.09	0.016
Hypertension-range BP	Alcohol consumption	2.27	1.23–4.22	0.009
Central obesity	Age ≥ 45 years	2.61	1.45–4.72	0.001
Good ASCVD knowledge	Usual khat chewing	0.46	0.26–0.82	0.008
	Adding salt to meals	0.45	0.23–0.87	0.019

Notes: AOR, adjusted odds ratio; CI, confidence interval; BP, blood pressure; ASCVD, atherosclerotic cardiovascular disease. AORs are from separate multivariable binary logistic regression models. Reference categories were female sex, age < 45 years, no health insurance, no alcohol consumption, no khat chewing, no salt addition, and the corresponding lower-risk/reference categories specified in Tables 4, 5 and 6. This summary table presents only the principal associations and does not replace the complete regression tables. Central-obesity estimates were based on the 331 participants with available waist circumference measurements. Because central obesity was defined using sex-specific waist-circumference thresholds, sex should not be interpreted as an independent biological predictor of this outcome

second-hand smoke exposure, none of the covariates retained in the final model reached conventional statistical significance, although male sex and recent health-care contact showed associations that did not reach conventional statistical significance. For hypertension-range blood pressure, alcohol consumption was the only variable with a statistically significant independent association in the final model (Table 6).

Outcomes with insufficient events for multivariable modelling

BMI-defined obesity occurred in only 17 participants (5.1%), while raised random blood glucose ≥ 200 mg/dL occurred in 19 participants. These event counts were considered insufficient for reliable multivariable logistic regression using the planned number of covariates. Consequently, adjusted odds ratios were not estimated for these outcomes. The principal adjusted associations are summarized in Table 7. Male sex was associated with approximately twice the odds of achieving at least 150 min of moderate physical activity per week. Health insurance was inversely associated with achieving this activity threshold.

Discussion

This community-based cross-sectional study assessed the prevalence of selected atherosclerotic cardiovascular disease (ASCVD) risk factors, participants' knowledge of these risk factors, and factors associated with selected behavioral and cardiometabolic outcomes among adults in Jimma Town, Ethiopia. The principal findings were a substantial burden of hypertension-range blood pressure, central obesity, and selected behavioral risk factors, together with important gaps in preventive lifestyle practices. Although 56.3% of participants demonstrated good knowledge of ASCVD risk factors, considerable gaps remained in recognition of specific cardiometabolic risk factors and in the adoption of recommended preventive behaviors. The multivariable analyses further showed that the factors associated with the selected outcomes differed according to the outcome examined, emphasizing the multifactorial nature of cardiovascular risk.

The prevalence of hypertension-range blood pressure was 44.6% in this population. This finding indicates a substantial burden of abnormal blood pressure in adults living in Jimma Town and is consistent with the broader evidence that cardiovascular risk factors are increasingly important in low- and middle-income countries

undergoing epidemiological transition [6, 14, 19, 20]. Previous evidence from Ethiopia has also demonstrated a considerable prevalence of cardiovascular disease and its associated risk factors, although estimates have varied according to population characteristics, measurement methods, and geographic setting [6, 16, 17].

Alcohol consumption was independently associated with hypertension-range BP. Participants who reported alcohol consumption during the preceding month had more than twice the adjusted odds of hypertension-range BP compared with non-users (AOR = 2.27, 95% CI 1.23–4.22). This finding is biologically plausible and is consistent with the established role of unhealthy alcohol consumption as a cardiovascular risk behavior [1, 2]. Nevertheless, because of the cross-sectional design, the observed association should not be interpreted as evidence that alcohol consumption caused elevated blood pressure. Central obesity was also common, affecting 42.9% of participants with available waist measurements. The prevalence was substantially higher among women than men, reflecting both differences in waist circumference and the sex-specific thresholds used to define central obesity. The use of sex-specific cut-points is important when interpreting this finding because the outcome definition itself incorporates sex. The high prevalence of central obesity is nevertheless important from a public-health perspective because abdominal adiposity is an established cardiometabolic risk marker [1, 2].

Raised random glucose was observed in 19 of 325 participants with available measurements. Because the glucose measurement was non-fasting and the number of participants with values ≥ 200 mg/dL was small, these findings should be interpreted as raised random glucose rather than a prevalence estimate of diabetes mellitus. Similarly, multivariable modelling was not undertaken for this outcome because of the limited number of events. The availability of information on previous glucose testing, diabetes diagnosis, and treatment nevertheless indicates an important opportunity for more comprehensive cardiometabolic assessment in future studies.

Several potentially modifiable behaviors were prevalent in the study population. Only 27.4% of participants achieved at least 150 min of moderate physical activity per week, whereas 70.2% reported no moderate-intensity activity. Daily fruit and vegetable consumption was also uncommon, reported by only 2.4% and 8.7% of participants, respectively. These findings suggest that the burden of cardiovascular risk in this population extends beyond abnormal clinical measurements to potentially modifiable lifestyle practices. The association between male sex and moderate physical activity remained significant after adjustment (AOR = 2.05, 95% CI 1.23–3.42). Men therefore had approximately twice the odds of meeting the ≥ 150 -minute weekly moderate-activity threshold compared with women. This sex difference may reflect differences in occupational activity, social roles, leisure-time activity, or opportunities for exercise, although these mechanisms were not directly evaluated in the present study. The finding should therefore be interpreted as an observed association rather than a causal effect.

Alcohol consumption was reported by 17.8% of participants, while 19.9% reported usual khat chewing and 11.4% reported current smoking or second-hand smoke exposure. Alcohol consumption was associated with age ≥ 45 years and medium/high income. Participants aged ≥ 45 years had more than twice the adjusted odds of reporting alcohol consumption (AOR = 2.31, 95% CI 1.22–4.37), while those in the medium/high-income categories had approximately threefold higher odds (AOR = 3.09, 95% CI 1.63–5.85). These findings indicate that behavioral risk patterns may differ according to sociodemographic characteristics and therefore may require differentiated prevention approaches. The association between male sex and usual khat chewing was particularly strong (AOR = 18.23, 95% CI 8.02–41.42), while participants aged ≥ 45 years had substantially lower odds of usual khat chewing (AOR = 0.21, 95% CI 0.10–0.47). Health insurance was also positively associated with usual khat chewing. Khat is a locally relevant exposure that has received increasing attention in relation to cardiovascular health, although the evidence regarding its cardiovascular effects remains less established than for conventional risk factors [12, 21]. Therefore, the present findings support the importance of including khat use in cardiovascular risk assessment in Ethiopian settings but do not establish a causal cardiovascular effect.

The prevalence of smoking exposure was relatively low compared with some international populations, but tobacco exposure remains clinically important because even relatively small proportions of smokers can contribute substantially to population cardiovascular risk. The adjusted association with male sex did not reach conventional statistical significance in the present analysis (AOR = 1.89, 95% CI 0.93–3.83; $p = 0.079$). The relatively small number of participants reporting current or second-hand smoking also limits the precision of the estimate.

More than half of participants (56.3%) achieved a good knowledge score, while 25.9% had poor knowledge and 17.8% had fair knowledge. The mean knowledge score was 6.52 ± 3.60 out of 10. Internal consistency of the ten-item instrument was high in this sample (Cronbach's $\alpha = 0.924$), supporting the reliability of the revised scoring approach. Recognition of ASCVD risk factors varied substantially between individual risk factors. Smoking and alcohol consumption were recognized by 76.8% of participants, whereas dyslipidemia was recognized by only 52.1%, diabetes by 54.2%, and hypertension and khat chewing by 56.0% each. Importantly, 13.9% of participants were unable to identify any of the ten listed risk factors. Thus, describing overall knowledge as simply “low” would be inappropriate. Rather, the findings indicate moderate-to-good overall recognition accompanied by important gaps in knowledge of specific cardiometabolic risk factors.

This pattern is consistent with previous Ethiopian evidence demonstrating gaps in knowledge and cardiovascular-prevention practices among adults [17]. It also supports evidence that effective cardiovascular prevention requires not only identification of individuals at increased risk but also effective communication of cardiovascular risk and practical prevention strategies [11, 22]. In the adjusted analysis, usual khat chewing was inversely associated with good knowledge (AOR = 0.46, 95% CI 0.26–0.82), as was routinely adding salt to meals (AOR = 0.45, 95% CI 0.23–0.87). These findings should be interpreted cautiously. They do not demonstrate that khat chewing or salt use causes poor cardiovascular knowledge. Rather, they indicate that participants reporting these behaviors were less likely to fall into the good-knowledge category after adjustment for the variables included in the model. The findings may point to subgroups that could benefit from more targeted health education.

An important finding of this study was the apparent gap between knowledge and behavior. Although 56.3% of participants had good overall knowledge, only 27.4% achieved the recommended threshold for moderate physical activity; daily fruit and vegetable consumption was uncommon, and substantial proportions reported alcohol, khat, or tobacco exposure. This suggests that knowledge alone may not be sufficient to produce healthy cardiovascular behaviors. Such a knowledge–practice gap is consistent with the broader literature on cardiovascular prevention, where awareness of risk factors does not necessarily translate into sustained behavioral modification [11, 22]. Social and economic circumstances, availability of healthy foods, opportunities for physical activity, cultural practices, healthcare access, and individual perceptions of risk may all influence whether knowledge is translated into action.

The findings should be interpreted in the context of Ethiopia's continuing epidemiological transition. Ethiopia, like many other low- and middle-income countries, is experiencing an increasing importance of noncommunicable diseases while continuing to face a substantial burden of communicable diseases [6–8, 19]. Previous Ethiopian studies have documented cardiovascular risk factors in both clinical and community populations, but the magnitude of individual risk factors has varied considerably across settings, and the majority of the studies focused on patients in hospital settings [6, 16, 17]. The Jimma setting is particularly relevant because previous work from the area has already identified cardiovascular risk factors among adults [16]. The present study extends that evidence by simultaneously examining clinical measurements, behavioral exposures, and knowledge of risk factors within a community sample. This integrated approach is useful because cardiovascular prevention requires attention to both the biological burden of risk and the behavioral and knowledge-related context in which that burden occurs.

The findings also reinforce the importance of considering locally relevant exposures. Khat chewing is relatively common in parts of Ethiopia and East Africa and has been discussed as a potential cardiovascular concern [12, 13, 21, 23, 24]. Similarly, dietary salt use, physical inactivity, alcohol consumption, and tobacco exposure remain relevant modifiable behaviors. Cardiovascular prevention strategies in Ethiopia may therefore benefit from incorporating culturally and locally relevant exposures rather than relying exclusively on conventional risk-factor frameworks.

The findings have several potential implications for cardiovascular prevention in Jimma and similar urban Ethiopian settings. First, the high proportion of participants with hypertension-range BP suggests that community-based screening and appropriate follow-up remain important. However, screening programs should distinguish an elevated measurement from a confirmed diagnosis and provide appropriate repeat assessment. Second,

the high prevalence of central obesity and the relatively common combination of overweight/obesity indicate the importance of prevention strategies addressing diet and physical activity. The particularly low frequency of daily fruit and vegetable consumption suggests that health-promotion interventions should address practical dietary choices rather than focusing exclusively on knowledge dissemination.

Third, the findings support targeted interventions for behavioral risk factors. The strong sociodemographic pattern observed for alcohol and khat use suggests that prevention efforts may need to be tailored to specific population groups. Healthcare providers may also have an important role in identifying behavioral risk factors during routine encounters and providing brief, targeted counselling. Finally, the knowledge findings suggest that cardiovascular health education should emphasize less-recognized risk factors, particularly hypertension, diabetes, dyslipidemia, obesity, and the cardiovascular implications of dietary and behavioral practices. Evidence indicates that effective cardiovascular risk communication can contribute to prevention, although education should be combined with interventions that address the structural and behavioral barriers to healthy choices [11, 22].

Strengths and limitations

The study's key strengths include its community-based design, objective clinical and anthropometric measurements, comprehensive assessment of both knowledge and behavioral practices, and high internal consistency of the knowledge instrument. Conversely, the acknowledged limitations comprise design effect was not taken into consideration during calculation of sample size, a cross-sectional design that precludes causal inference, single-visit blood pressure and random glucose assessments, reliance on self-reported behavioral data susceptible to bias, limited generalizability beyond Jimma Town, and low event frequencies for certain outcomes that restricted multivariable modeling.

Conclusions

This study demonstrates a substantial burden of ASCVD risk factors among adults in Jimma Town, particularly hypertension-range blood pressure, central obesity, physical inactivity, and potentially modifiable behavioral exposures, which were high, in line with the relatively low knowledge of ASCVD risk factors and preventive practices. These findings suggest that ASCVD prevention in this setting should combine community-based risk-factor screening with targeted lifestyle counseling and locally appropriate health education. Particular attention should be given to BP assessment and follow-up, obesity prevention, physical activity, dietary practices, alcohol use, tobacco exposure, and khat chewing. Because the study was cross-sectional, these associations should be interpreted as correlational and confirmed through longitudinal and intervention studies

Abbreviations

AOR	Adjusted Odds Ratio
ASCVD	Atherosclerotic Cardiovascular Disease
AUC	Area Under the Receiver Operating Characteristic Curve
BMI	Body Mass Index
BP	Blood Pressure
CI	Confidence Interval
COR	Crude Odds Ratio
CVD	Cardiovascular Disease
DBP	Diastolic Blood Pressure
HTN	Hypertension
IQR	Interquartile Range

mg/dL	Milligrams per Deciliter
RBG	Random Blood Glucose
SBP	Systolic Blood Pressure
SD	Standard Deviation
VIF	Variance Inflation Factor

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1186/s12872-026-06868-5>.

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Author contributions AAG, DRB, and KNT contributed to the planning, conception, study design, execution, data acquisition, analysis, and interpretation. AAG and KNT were involved in drafting, revising, and critically reviewing the manuscript. All authors approved the final version for publication, agreed on the selected journal, and accepted responsibility for the integrity and accuracy of the work.

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Data availability All data supporting the findings of this study are presented in the manuscript. Additional details and raw data are presented to the corresponding author, the Editor-In-Chief, and others with a reasonable request.

Declarations

Ethics approval and consent to participate Ethical approval for this study was obtained from the Institutional Review Board (IRB) of the Institute of Health, Jimma University, Ethiopia, before commencement of data collection (IHRPG/55//21, Date: 10/22/2021). Formal administrative permission was also obtained from the relevant local authorities before the study was conducted. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. All eligible participants were informed about the purpose and procedures of the study, the voluntary nature of participation, their right to decline participation or withdraw at any time without penalty, and the measures taken to protect the confidentiality of their information. Written informed consent was obtained from all participants before enrolment. For participants who were unable to read or write, the consent process was conducted in the presence of an impartial witness, and consent was documented in accordance with the approved study procedures. Participants were identified using unique study codes rather than personal identifiers. The research team maintained the confidentiality and privacy of participants throughout data collection, data management, analysis, and reporting.

Consent for publication Not applicable. No individual-level information, identifiable personal data, or identifiable images are reported in this manuscript.

Competing interests The authors declare no competing interests.

Patient and public involvement Patients or members of the public were not involved in the design, conduct, analysis, or reporting of this study as research partners. Community members participated as study participants after providing informed consent.

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