ORIGINAL RESEARCH

Patterns of Non-Communicable Disease, Multimorbidity, and Population Awareness in Bahir Dar, Northwest Ethiopia: A Cross-Sectional Study

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Objective: Ethiopia, like other developing countries, is going through an epidemiological transition, and high rates of non-communicable diseases (NCDs) are having a significant impact on the health system; however, there is limited evidence about community level NCD prevalence, multimorbidity, and population awareness that could inform targeted interventions and policy responses. This study aimed to identify factors associated with NCD prevalence, multimorbidity, and population awareness of NCDs in Bahir Dar, Northwest Ethiopia.

Methods: A community-based cross-sectional survey was conducted with 417 randomly sampled adults. We performed descriptive and logistic regression analyses to evaluate associations between NCD prevalence (cardiovascular diseases, diabetes, cancer, chronic respiratory diseases, chronic kidney disease, and hypertension) multimorbidity (2 or more NCDs) and demographic, socioeconomic, individual risk factors, anthropometrics, knowledge, and attitude.

Results: This study reveals that 24% of participating adults have an NCD, and 8% have multimorbidity. One-third (34.5%) have some NCD knowledge, and 75% consider NCDs more dangerous than communicable diseases. We find low NCD prevalence in participants: younger than 40 years of age (AOR 0.17, 95% CI 0.07 to 0.39); with normal body mass index (AOR 0.27, 0.10 to 0.77) and; with a family history of NCD (AOR 7.7, 4.2 to 14.1). Multimorbidity is lower in young adults (AOR 0.08, 0.03 to 0.26). NCD knowledge is higher in men (AOR 1.76, 1.06 to 2.93) and employed adults (AOR 2.91, 1.52 to 5.57), and NCD attitude in normal-weight adults (AOR 3.23, 1.42 to 7.39).

Conclusion: This study reveals a high prevalence of NCD and overall low NCD awareness in the population. Age above 40 years, family history of NCD, and weight in the obese category are significant predictors of NCD prevalence. These findings can help health professionals, health offices, and concerned stakeholders to plan targeted health interventions to reduce NCDs in the population.

Keywords: prevalence, epidemiology, demographic, socioeconomic status, individual risk factors, knowledge, attitudes, risk behaviours, chronic disease, Ethiopia

Introduction

Prevention of non-communicable diseases (NCDs) and their consequences is a global public health priority, causing more than 70% of annual deaths worldwide.[1] NCDs are increasingly burdening population health in developing countries.[2] The majority (77%) of the premature mortality burden of NCDs occurs in these settings, in people between 30 and 70 years.[1] This pattern is attributable to socioeconomic disparities, demographic transitions towards an ageing population, high prevalence of individual risk factors, poverty and lack of access to health care and prevention/control programs in the regions.[3–7]

The burden of NCDs causes severe socioeconomic impacts in developing countries.[8,9] Morbidities and disabilities that come with chronic NCDs hinder economic productivity and aggravate poverty at the individual and household levels.[10,11] NCDs exacerbate social inequity as NCD health care can be expensive and complex, and payments are often private and out-of-pocket. The lack of attention to NCDs and poor primary healthcare services in a population lead to

poor prevention, inadequate treatment, and late hospital presentations with complications, which create a heavier economic burden on people with low socioeconomic status (SES): the poor, less educated, and remote.[10,12–14]

Ethiopia, located in East Africa, is a developing country experiencing demographic and epidemiological transitions.[15,16] The country is currently experiencing the effects of rapid urbanization, globalization, and climate change.[6,17,18] The population of Ethiopia has doubled over the past two decades, with an average fertility rate of 4.4.[19,20] Government action to improve health, including the 2003 nationally launched health extension program for achieving universal coverage of primary health care in four main areas: hygiene and sanitation, disease prevention and control, family health services, and health education and communication[21] and emphasis on maternal and child health programs have decreased infectious and maternal and child deaths to some extent, and there are some gains in life expectancy.[16,19] However, over the last three decades, the population pyramid has shifted from the largest part of the population being children under-five to adults now constituting a significant portion of the population (demographic dividend), increasing the chronic disease burden.[15] As well, the socioeconomic and lifestyle changes coupled with the current globalization, rapid urbanization, and changes in food markets have led to shifts in people's dietary habits, a so called nutrition transition. People's dietary patterns shift from traditional healthy diets to processed, packaged, and fast foods.[22–24] Due to demographic and dietary changes, as well as lifestyle changes such as increases in sedentary behaviour, like other developing countries, Ethiopia is going through an epidemiological transition from communicable diseases to chronic diseases.

Although community-level evidence on the prevalence of NCDs is lacking in Ethiopia, estimates show that the proportion of the disease burden caused by NCDs in the country was 22% in 2000, 33% in 2010, and 43% in 2019.[25] In 2018 WHO reported that 40% of the burden of diseases in the country is due to NCDs, mainly from cardiovascular diseases (CVDs) (16%), cancer (7%), chronic respiratory diseases (2%), and diabetes (2%).[26] A recent study in Addis Ababa found that NCDs caused 62% of total deaths: mostly from CVDs (27%), cancer (12%), diabetes (5%), chronic respiratory diseases (2%), and other NCDs (15%).[27] Moreover, a 2015 national NCD risk factor survey revealed that the majority of adults in the country are at risk for developing NCDs; the prevalence of inadequate fruit/vegetable intake was 98%, current alcohol consumption was 41%, physical inactivity was 22%, and tobacco use was 4%.[28] In light of the prevalence of risk factors, NCDs can be expected to rise steeply in the coming years unless appropriate preventive measures are set in place.

In most developing countries, including Ethiopia, the emphasis is on managing symptoms and complications of NCDs. Little attention has been given to prevention, mitigating risk factors, and reducing the likelihood of developing these diseases.[2] The common individual risk factors contributing to the majority of NCDs are tobacco use, alcohol consumption, insufficient physical activity, and unhealthy diets.[1] Socioeconomic status disparities such as education, occupation, income, and healthcare access are drivers of the individual risk factors for NCDs.[5,29] Reviews of empirical evidence show that in high-income countries, high SES, such as wealth and high educational achievement, is associated with a lower risk of NCDs.[13,30] However, with the stage of the epidemiological transition and contextual health variations,[31,32] higher SES individuals in LMICs may engage in unhealthy lifestyles, which increases the risk of NCDs.[33,34] For example, systematic reviews conducted in such countries show that individual risk factors such as alcohol, tobacco use and inadequate fruit/vegetable intake, and cardiovascular diseases and cancer were higher in people with low SES. In contrast, consumption of fats, salts, packaged foods, and diabetes prevalence's were higher in people with high SES.[5,29] Furthermore, studies show that people's knowledge about NCD prevention is low in developing countries, which could contribute to unhealthy behaviors and the rise of these diseases.[35] Given that evidence are scant regarding NCD prevalence and population distribution, while prevention programs are complex and require a plethora of stakeholders to reduce risk behaviors,[1] close gaps in SES, and raise community awareness about the diseases;[36] studying the impact of SES, individual risk factors, peoples knowledge and attitude on NCDs can help policymakers, stakeholders, and health care providers to facilitate prevention programs effectively.

Bahir Dar, a city located in Northwest Ethiopia, is one of the fast growing and most populous cities in Ethiopia. Bahir Dar has a different sociodemographic composition population than other cities in the country, such as Addis Ababa. However, there is a lack of evidence about community level prevalence of NCDs and risk factors. There is also a lack of information about the knowledge and attitudes of the population about NCDs. To fill evidence gaps and inform decision

making for appropriate NCD prevention, this study investigates three research questions: (1) what are the most commonly reported NCDs among adults in Bahir Dar? (2) what is the population level of knowledge and attitudes about NCDs? (3) What are the factors associated with the prevalence of NCD, multimorbidity, knowledge and attitudes in adults? We examined the association between various explanatory variables (SES, individual risk factors, knowledge about NCDs, attitudes about NCDs, and biomedical risk factors) and the prevalence of NCDs.

Materials and Methods
Study Design, Period, Setting, and Population
This community-based quantitative cross-sectional study is reported in line with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) statement.[37] Data were collected between May 2021 and June 2021. This study focuses on the prevalence of NCDs, multimorbidity, population awareness and variations across adults' SES, individual risk factors, knowledge, and attitude. The study was conducted in Bahir Dar town, Northwest Ethiopia, the capital city of Amhara regional state. Based on the 2007 Central Statistical Agency report, the town's total population is 221,991.[38] The city consists of six sub-cities with 17 administrative units (kebeles). The town has three public hospitals and ten primary health care centers.

The sample size (n = 423) of this study was calculated by using single population proportion formula ($Z_{a/2}^2 p(1-p)/d^2$), where "p" represents the prevalence of the outcome variable, "d" margin of error, and "Z" the statistical value of the normal distribution. The following values were used to calculate the sample size: a 50% prevalence rate, a Z-value of 1.96, a margin of error of 5%, and a 10% estimated non-response rate. We considered a 50% prevalence rate due to the absence of similar studies in the study area, thus maximizing the sample size estimation.

Participants in this study were sampled from adult residents in Bahir Dar town, by household (Figure 1). Using households as a sampling unit, data collectors started with a random household in each of the six sub-cities and progressed through a fixed interval (every 28 houses) to select the next household. This interval was estimated by dividing the total number of households (N = 12,000) by the calculated sample size (n = 423). One eligible participant from each selected household was invited to join the study. The inclusion criteria to participate in this study were adults
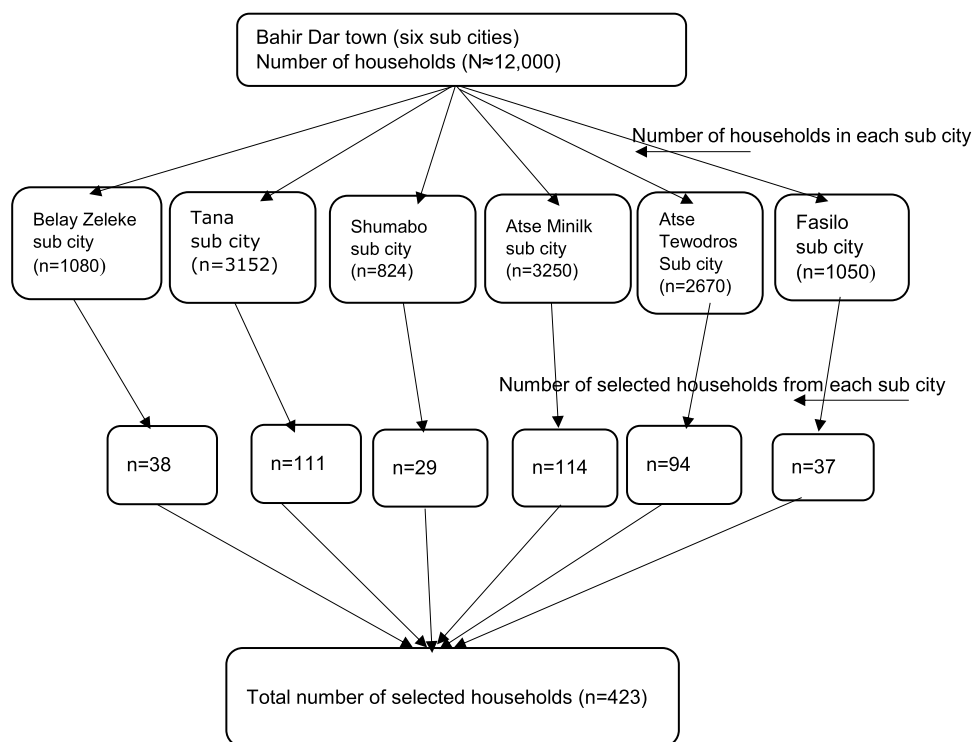
Figure 1 Study household sampling and recruitment flow chart.

between the ages of 18 and 65, being permanent residents (having lived in the town for at least six months), and who were able to provide the necessary information. If there were more than one eligible participant in the household, one was selected by lottery. Revisits were arranged for participants who were eligible but not available at home during the first research visit. However, if they were absent on the second visit, data collection moved to the adjacent house to invite an alternative study participant.

The data collection was performed by four health care providers (nurses) after two days of training on how to interview participants and perform physical measurements. Data collectors practiced the questionnaire, measurements, and participant information sheet. Appropriate feedback was provided until everyone performed the measurements consistently. A research team collected data on a wide range of demographic, SES, individual risk factors, knowledge, attitude, and physical measurements during a home visit using a structured interviewer-administered questionnaire and anthropometric measuring tools. The questionnaire was adopted from the WHO steps risk factors surveillance tool[39] and other similar studies assessing knowledge and attitudes about NCDs.[40,41] We translated the questionnaire into Amharic (local language). We pretested the instrument in 5% of the sample size in a similar setting to assess participants' response rate and clarity of the questions. Close supervision and monitoring were conducted throughout data collection by the primary investigator. The completeness and consistency of collected information and measurements were checked daily, and corrections were taken if errors were found before the next day's activity.

Reporting of the prevalence of NCDs and participants' knowledge and attitudes about NCDs are based on the following:

NCD Prevalence

The presence of NCD was assessed by the participant's self-report to the question, "Have you been diagnosed by a health care professional with any of the following chronic diseases?" The list of NCDs included in the questionnaire are CVDs, diabetes mellitus, cancer, chronic respiratory diseases, chronic kidney diseases, hypertension, and "others" to capture others mentioned by the participant. These six diseases were selected because they are the most common NCDs in developing regions, accounting for more than 80% of cases.

NCD Knowledge

Adults were interviewed about their level of knowledge about NCDs. We first assessed adults' general understanding about NCDs by asking the following "yes" or "no" question: "A non-communicable disease is one that cannot be spread between people?" After that, participants' knowledge was assessed based on the following questions, "How much do you know about the following NCDs?" It was queried separately for hypertension, cardiovascular diseases, cancer, and diabetes. The response options for these questions include nothing at all, only heard the term before, know some about the disease, and know a lot about it. We considered a participant to have some knowledge about NCDs if they reported having some knowledge regarding each of the above four mentioned chronic diseases. Diabetes knowledge was further assessed using seven validated diabetes knowledge questions having three response options: true, false, or not sure. We summarized the participant's correct answers for each question. Adults were considered knowledgeable if they correctly answered at least four of the seven questions.

NCD Attitude

First, the general attitude of adults about NCDs was assessed using the following Likert scale statement: "chronic non-communicable diseases are more dangerous than communicable diseases" having five response options: strongly agree, agree, neutral, disagree, and strongly disagree. Adults who responded, "strongly agree" or "agree", were categorized together to describe adults' attitudes towards NCDs as "more dangerous" than communicable diseases. We then assessed participants' attitudes about specific NCDs, "Have you ever been concerned about developing chronic diseases such as CVDs and cancer?" These questions have three response options: "yes, often", "yes, sometimes", and "not at all". These responses were later classified into two categories: yes ("yes, often" and "yes, sometimes") and no (not at all) to describe participants' concerns about the diseases.

The explanatory variables collected to examine their association with the prevalence of NCD, multimorbidity, knowledge, and attitude (outcome variables) are described in Table 1.

Table 1 Independent Variables and Measurements

Categories	Variables
Demographic	Age, sex (male, female), and marital status (single, married, and others including living together but not married, separated/divorced, or widowed).
Socioeconomic status	(i) Educational status: no formal education, primary school (grade 1 to 8), secondary school (grade 9 to 12), college (certificate or diploma), and tertiary (degree and above) (ii) Occupational status: house duties, government employee, private organization employee, merchant, manual workers (daily, factory, building, garment, garage), driver, agriculture, unemployed, and others to be mentioned. For interpretation and analysis, the occupational status of adults was classified into three groups: securely employed, insecure job, and unemployed. (iii) Income: The average monthly income of participants were collected and classified into three groups based on the country's minimum salary rate: very low (less than 2250 Ethiopian birr), low to middle (2251 to 5000), and middle income (5001 and above) (iv) Health care affordability: The health care affordability of participants was assessed by participants' "yes" or "no" response to the question, "Can you afford to see a health care provider?"
Family history	Family history of NCDs such as CVD, diabetes, cancer, chronic respiratory diseases, hypertension, and chronic kidney diseases was collected by a self-report question: "Does your family member have any of the above-mentioned chronic diseases"? A participant was recorded as having a family history of chronic diseases if they responded "yes" to at least one of the above-mentioned chronic diseases.
Dietary habits	Dietary habits of adults were assessed by collecting the daily intakes of: (i) Fruit/vegetable: Adequate fruit/vegetable intake was assessed by the daily consumption of any fruit (like banana, mango, avocado, apple, orange, and pineapple) or vegetable (like green leafy vegetables, papaya, tomato, cauliflower, cabbage, and beans) for five or more servings per day.[42] (ii) Salt intake: This was assessed by interviewing participants; how often did they add salt when cooking or eating meals or drinks? If they replied as always, it was classified as daily salt intake. (iii) Sweet and sugary foods (any sugar, honey, or jam) intake was assessed by interviewing participants about whether they consume these food groups daily.
Physical activity	Physical activity was measured based on the adult's weekly physical activity status. Performing at least 75 minutes of vigorous physical activity or 150 minutes of moderate-intensity physical activity classified the participants as physically active.[43]
Alcohol consumption, tobacco use, and khat chewing	These risk behaviours were collected and categorised into three categories: former user (refers to participants who have used these products in the past but not currently), current use (refers to participants who have used these products within the past 30 days prior to the survey), and non-user (refers to participants who have never used these products).[42,44–46]
Individual risk factor score	The presence of each tobacco use, alcohol consumption, diet (fruits/vegetable intake), physical inactivity, and khat chewing received a score of "1" and the absence a score "0". The sum of each individual risk factor score was used to describe "low" to "high" individual risk factor score on a continuum scale of 0 to 5 to compare the prevalence of NCD between low and high individual risk factor scores.
Wellbeing	Adults' level of wellbeing was assessed by using the WHO wellbeing scale. We assessed participants level of wellbeing in the past two weeks before the survey. The scale consists of five questions to be rated from 1 to 5. The total response scores were categorized into three groups (low, average, and high) to compare NCDs prevalence variations between adults with low and high wellbeing values.[47]

(*Continued*)

Table 1 (Continued).

Categories	Variables
Anthropometric measurements	Adult's weight, height, and hip/waist circumference were measured in this study: (i) Weight: Participants' weight was measured using standardised portable weight scales and collected in kilograms (kg) to the nearest decimal point (example 73.1 kg). (ii) Height: the height of participants was measured using fixed, non-bending wooden meters. Participants were instructed to take off their shoes and stand upright while the occiput, shoulder, buttock, and heels touching the wall. Height measures were recorded in centimeters (cm). (iii) Waist/hip circumference: These were measured using non-stretchable meters at the midpoint of the end of ribs and iliac crest for waist circumference and at the largest part of the buttock for hip circumference.[48] Values were recorded in cm.
Overweight/obesity	(i) Overweight/obesity: We computed the body mass index of adults by dividing weight (kg) by height square in meters (m^2), and values between 25–29.9 kg/m^2 classify an adult as overweight and ≥30 as obese.[49] (ii) Abdominal obesity: This was assessed by calculating the ratio of waist circumference (cm) to hip circumference (cm), and values were categorized by using the WHO cut of points: ≥0.85 for females and ≥0.90 for males.[50]

Statistical Analysis

Survey data were entered into Epi-data software version 3.1 and exported to SPSS (Statistical Package for Social Sciences) version 28 for analysis. We performed descriptive (frequencies and percentage) and inferential statistics (Chi-Square and logistic regression) to present the results of this study. The prevalence of NCDs, knowledge, and attitudes about NCDs are summarized using frequency and percentage. We categorized the number of NCDs reported by adults into three groups in line with previous studies:[51–53] "0" free from NCDs, "1" have one form of NCD, and "2" have at least two types of NCDs. In order to describe the prevalence of NCDs, the reported numbers of NCDs are categorized into two groups: "yes" for adult's having at least one form of NCD, and "no" for adults without NCD. To assess the prevalence of multimorbidity, these numbers are further categorized into two groups: "yes" for adults with two or more NCDs and "no" for adults without any NCD or those with only one type of chronic disease. The knowledge and attitudes of adults are categorized according to the criteria outlined earlier in this manuscript. We used Chi-square tests to explore NCD prevalence, multimorbidity, knowledge, and attitudes across adult's demographic (age, sex, marital status), socio-economic (education, occupation, income, health care affords), individual risk factors (diet, physical activity, alcohol intake, tobacco use, and khat chewing), and biomedical risk factors (overweight/obesity), and with other pertinent variables. We performed logistic regression analyses to identify significant predictors of NCD prevalence, multimorbidity, knowledge, and attitudes. We first examined associations between the explanatory variable and the outcome variables in the bivariable analysis. Variables that showed associations in the bivariable analysis were adjusted in the multivariable logistic regression to determine significant predictors of the outcome variables. For NCD prevalence and multimorbidity, demographic (age, marital status), socioeconomic (education, health care affords), individual risk factors (diet, alcohol), family history, weight status, NCD knowledge, and attitudes were adjusted in the multivariable logistic regression. To identify the significant predictors of NCD knowledge and attitudes, the final models were adjusted for demographic variables (age, sex, and marital status), socioeconomic factors (education, occupation, and income), and individual risk factors (physical inactivity, diet, salt intake, alcohol consumption, and khat use). We examined the presence of collinearity among the variables adjusted in each model, and variance inflation factors (VIF) of less than three were achieved for all variables for all models, indicating the absence of collinearity. The final models were checked for significant Omnibus tests of model coefficients ($p<0.05$) and non-significant Hosmer-Lemeshow goodness fit test ($p>0.05$). We used adjusted odds ratios with corresponding 95% confidence intervals (CI) to report the findings of the study and α significance level at a p-value of less than 0.05 as criteria to declare statistical significance.

Results

Non-Communicable Diseases by Socioeconomic and Individual Risk Factors

Out of all 423 visited houses having eligible participants, 417 adults agreed to participate in this study, making a response rate of 98.6%. Table 2 summarises participant's sociodemographic characteristics and individual risk factors, and Figure 2 shows the prevalence of NCDs and multimorbidity.

More than half (55%) of the participants in this study were female. The mean age of respondents was 35.6 ± 12.6 years, with 74.8% of participants aged 18 to 40. More than half of the participants were married (56.4%) and post-secondary educated (54.4%). The average monthly income of participants was 8574 ± 8776 Ethiopian birr per month, with 13.2% of adults being classified as having low income, less than 2250 birr per month. Above one-third (36.2%) of adults reported being unable to afford health care services. Forty percent of participants reported having a family history of chronic diseases: 3.4% of adults with a family history of cancer, 4.3% with CVDs, 11.3% with chronic respiratory diseases, 13.2% with diabetes, and 17.3% with hypertension.

From all participating adults in this study, 24% (n = 100) reported having one form of NCD, and 8% (n = 33) have multimorbidity. About 5.5% (n = 23) of adults reported having diabetes, 3.6% have COPD, 3.1% (n = 13) have CVD, 1.7% (n = 7) have cancer, and 16.1% (n = 67) have hypertension.

The distribution of NCDs and multimorbidity was higher in adults aged 56 years and above ($p<0.01$). NCDs were more commonly reported in married and uneducated adults ($p<0.01$). The prevalence of NCD was also higher in adults who said they could not afford health care costs ($p<0.01$); in adults with a family history of chronic diseases; with

Table 2 Sociodemographic Characteristics of Participants, Individual Risk Factors, and Non-Communicable Disease

Variables	Variable Category	Total n (%)	Number of Non-Communicable Diseases[§]			P-value
			0	1	2[+]	
Age	18–40	312 (74.8)	236 (84.6)	36 (11.5)	12 (3.8)	<0.01
	41–55	53 (12.7)	36 (67.9)	13 (24.5)	4 (7.5)	
	56+	52 (12.5)	17 (32.7)	18 (34.6)	17 (32.7)	
Gender	Male	189 (45.3)	136 (72.0)	36 (19.0)	17 (9.0)	0.20
	Female	228 (54.7)	181 (79.4)	31 (13.6)	16 (7.0)	
Marital status	Married	235 (56.4)	175 (74.5)	42 (17.9)	18 (7.7)	<0.01
	Others	47 (11.3)	26 (55.3)	12 (25.5)	9 (19.1)	
	Single	135 (32.4)	116 (85.9)	13 (9.6)	6 (4.4)	
Education	Primary or lower	94 (22.5)	56 (59.6)	23 (24.5)	15 (16.0)	<0.01
	Secondary	96 (23.0)	79 (82.3)	15 (15.6)	2 (2.1)	
	Post-secondary[‡]	227 (54.5)	182 (80.2)	29 (12.8)	16 (7.1)	
Occupation	Securely employed†	137 (32.9)	104 (75.9)	25 (18.2)	8 (5.8)	0.76
	Unemployed	121 (29.0)	93 (76.9)	17 (14.0)	11 (9.1)	
	Insecure jobs[‡]	159 (38.1)	120 (75.5)	25 (15.7)	14 (8.8)	
Income (ETB)	Less than 2250	53 (13.7)	39 (73.6)	10 (18.9)	4 (7.5)	0.76
	2251–5000	126 (32.6)	99 (78.6)	16 (12.7)	11 (8.7)	
	5001 and above	208 (53.9)	153 (73.6)	37 (17.8)	18 (8.7)	
Health care affordability[a]	Yes	266 (63.8)	212 (79.7)	39 (14.7)	15 (5.6)	0.03
	No	151 (36.2)	105 (69.5)	28 (18.5)	18 (11.9)	
Family history	Yes	166 (39.8)	91 (54.8)	45 (27.1)	30 (18.1)	<0.01
	No	251 (60.2)	226 (90.0)	22 (8.8)	3 (1.2)	
Fruits/vegetables intake	Adequate	18 (4.3)	14 (77.8)	3 (16.7)	1 (5.6)	-
	Inadequate	399 (95.7)	303 (75.9)	64 (16.0)	32 (8.0)	
Salt intake (daily)	Yes	366 (87.8)	283 (77.3)	60 (16.4)	23 (6.3)	<0.01
	No	51 (12.2)	34 (66.7)	7 (13.7)	10 (19.6)	
Sweet foods intake (daily)	Yes	136 (32.6)	114 (83.8)	14 (10.3)	8 (5.9)	0.03
	No	281 (67.4)	203 (72.2)	53 (18.9)	25 (8.9)	
Physical activity level	Active	259 (62.1)	196 (75.7)	43 (16.6)	20 (7.7)	0.92
	Inactive	158 (37.9)	121 (76.6)	24 (15.2)	13 (8.2)	
Alcohol consumption	Yes	221 (53.0)	177 (80.1)	34 (15.4)	10 (4.5)	0.02
	No	196 (47.0)	140 (71.4)	33 (16.8)	23 (11.7)	

(Continued)

Table 2 (Continued).

Variables	Variable Category	Total n (%)	Number of Non-Communicable Diseases§			P-value
			0	1	2+	
Current tobacco use	Yes	8 (1.9)	6 (75.0)	2 (25.0)	0 (0.0)	-
	No	409 (98.1)	311 (76.0)	65 (15.9)	33 (8.1)	
Current khat chewing	Yes	21 (5.0)	15 (71.4)	3 (14.3)	3 (14.3)	-
	No	396 (95.0)	302 (76.3)	64 (16.2)	30 (7.6)	
Individual risk factor score (risk behaviours)	0–1	107 (25.7)	76 (71.0)	20 (18.7)	11 (10.3)	0.49
	2	223 (53.5)	173 (77.6)	32 (14.3)	18 (8.1)	
	3–4	87 (20.9)	68 (78.2)	15 (17.2)	4 (4.6)	
Wellbeing	Low	146 (35.1)	112 (76.7)	22 (15.1)	12 (8.2)	0.96
	Average	125 (30.0)	92 (73.6)	23 (18.4)	10 (8.0)	
	High	145 (34.9)	112 (77.2)	22 (15.2)	12 (7.6)	
Overweight/obesity	Normal	290 (70.4)	229 (79.0)	42 (14.5)	19 (6.6)	<0.01
	Overweight	87 (21.1)	66 (75.9)	13 (14.9)	8 (9.2)	
	Obese	35 (8.5)	17 (48.6)	12 (34.3)	6 (17.1)	
Central obesity	Yes	274 (65.7)	198 (72.3)	49 (17.9)	27 (9.9)	0.06
	Low risk	143 (34.3)	119 (83.2)	18 (12.6)	6 (4.2)	

Notes: n: number; §the sum of the number of chronic diseases that participants reported which includes cardiovascular diseases, diabetes mellitus, cancer, hypertension; chronic respiratory diseases, chronic kidney diseases); ‡college (certificate or diploma) and tertiary (degree and above); †securely employed (government or private organization employee), ‡insecure jobs (daily, factory, building, garment, garage driver, agriculture, and house duties); ℘The health care affordability of participants was assessed by participants' "yes" or "no" response to the question, "Can you afford to see a health care provider?"; ETB: Ethiopian birr; and p-values are from chi-square tests.

individual risk factors such as salt intake, sweet foods intake, and alcohol consumption; and with biomedical factors like overweight/obesity (p<0.01).

Knowledge and Attitude

Table 3 summarises the knowledge and attitudes of adults about NCDs. Most adults (87%) know that NCDs are chronic diseases that do not spread between people, and 76% of participants perceive that NCDs are more dangerous than communicable diseases. Most (70%) participants reported having some knowledge about hypertension; 94% of adults knew that hypertension could have negative health consequences, and 91% appreciated the importance of regular blood pressure checkups. About 54% of adults know something about CVDs, although 21% of participants did not know whether they are preventable, and 62% of adults have never been concerned about developing CVDs. Fifty-five percent of adults know something about cancer, and 73% of participants know something about diabetes. However, 25% of adults did not know whether diabetes could be preventable Only one-third (34.5%) of participating adults have some overall knowledge about NCDs. The prevalence of NCD was lower in adults who have some knowledge about NCDs (17%) than in adults who have not (29%) (p=0.02).

Factors Associated with the Prevalence of NCD

The final predictors for the prevalence of NCD are age, family history of chronic diseases, and the weight status of adults —the results are presented in Table 4.

Prevalence of non-communicable diseases among adults in Bahir Dar

■ Total   ■ Male   ■ Female
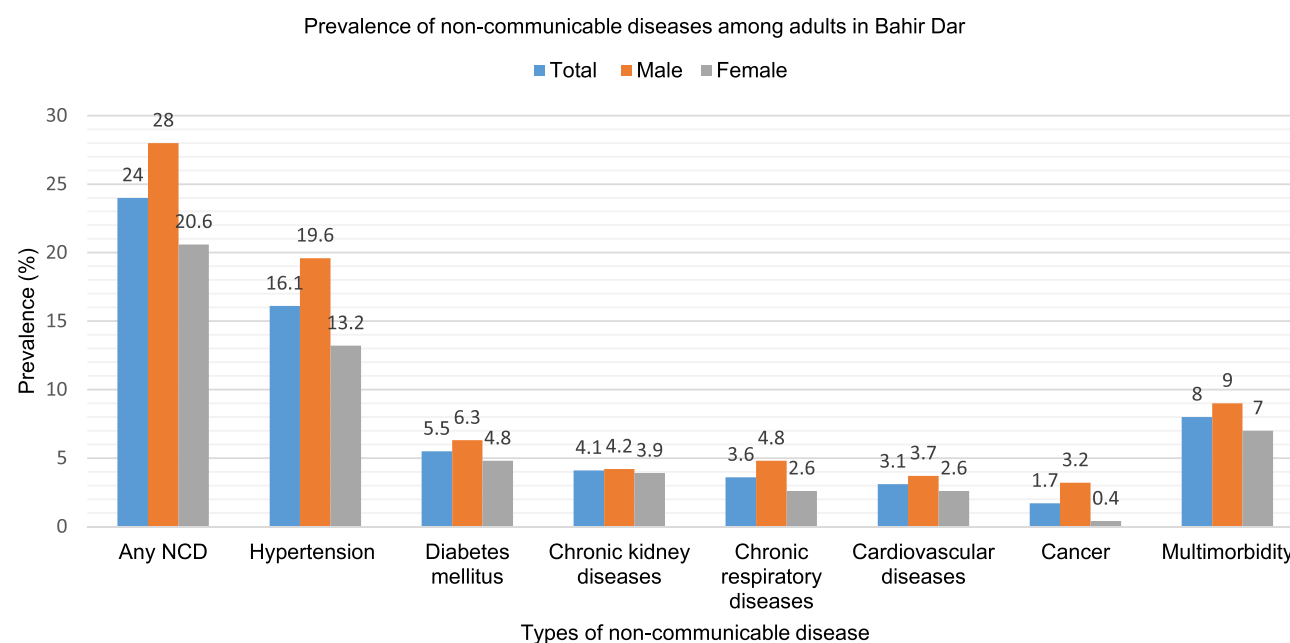
Figure 2 Prevalence of non-communicable diseases and multimorbidity.

The age of participants is significantly associated with the prevalence of NCD. Adults who were between the ages of 18 and 40 years are 83% less likely to have NCD than adults aged 56 years and above (AOR 0.17, 95% CI 0.07 to 0.39), and adults between the ages of 40 and 55 are 73% less likely to have NCD than adults aged 56 and above (AOR 0.27, 95% CI 0.10 to 0.71). Multimorbidity of NCDs is less likely to be reported in adults younger than 40 than adults aged 56 years and above (AOR 0.08, 95% CI 0.03 to 0.26).

A family history of chronic diseases is significantly associated with NCD prevalence. Adults with a family history of chronic disease are almost eight times more likely to have an NCD than adults without a family history of chronic disease (AOR 7.71, 95% CI 4.23 to 14.06).

Adult weight status is significantly associated with the prevalence of NCDs. Normal-weight adults are 73% less likely to have NCD than obese adults (AOR 0.27, 95% CI 0.10 to 0.77), and overweight adults are 68% lower to have NCD than obese adults (AOR 0.32, 95% CI 0.10 to 0.97).

Factors Associated with NCD Knowledge and Attitude

The final predictors for NCD knowledge are: the sex and occupational status of adults; for NCD attitude: weight status, and alcohol use; and occupational status for diabetes knowledge—the results are summarised in Table 5.

The sex of participants is significantly associated with the level of NCD knowledge. Male adults are almost two times more likely to have some knowledge about NCDs compared to female adults (AOR 1.76 95% CI 1.06 to 2.93). The occupational status of adults is also significantly associated with the level of NCD knowledge. Employed adults are almost three times more likely to have NCD knowledge than adults with insecure jobs (AOR 2.91, 95% CI 1.52 to 5.57); Employed adults are also three times more likely to have diabetes knowledge than their counterparts (AOR 3.41, 95% CI 1.07 to 10.82).

NCD attitude is significantly associated with the weight status and alcohol use of adults. Normal-weight adults are three times more likely to express NCDs as dangerous than obese adults (AOR 3.23, 95% CI 1.42 to 7.39), and adults who use alcohol consider NCDs more dangerous than infectious diseases compared to non-drinkers (AOR 1.85, 95% CI 1.08 to 3.14).

Table 3 Knowledge and Attitudes of Participants About Selected Non-Communicable Diseases

General NCD Awareness and Attitude	Responses	Total n (%)	Non-Communicable Disease		p-value
			Yes	No	
A non-communicable disease is one that cannot be spread between people?	Yes	362 (86.8)	82 (82.0)	280 (88.3)	0.10
Chronic non-communicable diseases are more dangerous than communicable diseases?	In favour of the statement	316 (75.8)	66 (66.0)	250 (78.9)	0.01
Hypertension knowledge and attitude					
How much do you know about hypertension?	Know about it*	290 (69.5)	70 (70.0)	220 (69.4)	0.91
Do you think high blood pressure cause health problems?	Yes	391 (93.8)	94 (94.0)	297 (93.7)	0.91
How regularly do you think people should check their blood pressure?	Frequently	222 (53.2)	58 (58.0)	164 (51.7)	0.27
Which of the following is/are effective to prevent hypertension?	Reduce salt intake	387 (92.8)	92 (92.0)	295 (93.1)	0.72
	Avoiding alcohol	347 (83.2)	80 (80.0)	267 (84.2)	0.32
	Quitting tobacco	305 (73.1)	77 (77.0)	228 (71.9)	0.31
	Physical exercise	333 (79.9)	80 (80.0)	253 (79.8)	0.96
	Weight loss	324 (77.7)	76 (76.0)	248 (78.2)	0.64
Cardiovascular knowledge and attitude					
How much do you know about cardiovascular diseases?	Know about it	223 (53.5)	49 (49.0)	174 (54.9)	0.30
Have you ever concerned about developing cardiovascular diseases?	Yes	157 (37.6)	47 (47.0)	110 (34.7)	0.02
Do you think cardiovascular diseases are preventable?	Yes	276 (66.2)	70 (70.0)	206 (65.0)	0.36
Which of the following do you think would increases someone chance of getting cardiovascular diseases	Smoking	315 (75.5)	71 (71.0)	244 (77.0)	0.22
	Alcohol intake	305 (73.1)	71 (71.0)	234 (73.8)	0.57
	Physical inactivity	296 (71.0)	72 (72.0)	224 (70.7)	0.79
	Overweight	326 (78.2)	79 (79.0)	247 (77.9)	0.82
	Salty food	315 (75.5)	71 (71.0)	244 (77.0)	0.22
	Hypertension	224 (53.7)	56 (56.0)	168 (53.0)	0.59
	Stress	322 (77.2)	77 (77.0)	245 (77.3)	0.95
Cancer knowledge and attitude					
How much do you know about cancer?	Know about it	231 (55.4)	47 (47.0)	184 (58.0)	0.05
Do you worry about cancer affect you or your family?	Yes	135 (32.3)	32 (32.0)	103 (32.5)	0.92
Diabetes knowledge and attitude					
How much do you know about diabetes?	Know about it	300 (72.5)	73 (73.7)	227 (72.1)	0.88
Do you think diabetes is preventable?	Yes	314 (75.3)	80 (80.0)	234 (73.8)	0.21

(*Continued*)

Table 3 (Continued).

General NCD Awareness and Attitude	Responses	Total n (%)	Non-Communicable Disease		p-value
			Yes	No	
Which of these things can a person do to reduce their chances of getting diabetes?	Changing dietary habit	386 (92.6)	93 (93.0)	293 (92.4)	0.84
	Physical activity	349 (83.7)	78 (78.0)	271 (85.5)	0.07
	Losing weight	357 (85.6)	84 (84.0)	273 (86.1)	0.59
	Quitting smoking	286 (68.6)	70 (70.0)	216 (68.1)	0.72
	Avoiding alcohol use	299 (71.7)	74 (74.0)	225 (71.0)	0.55
Diabetes knowledge (using diabetes knowledge scale)	Adequate	371 (89.2)	90 (90.0)	281 (88.9)	0.76
Overall, awareness about non-communicable diseases	Know some about NCDs	144 (34.5)	25 (25.0)	119 (37.5)	0.02

Notes: *****These options are based participant response that they know some or well about the diseases; and p-values are from chi-square tests; n (%): number and percent.

Discussion

This study generates new evidence on the prevalence of NCDs, multimorbidity, and population awareness among adult residents in Bahir Dar, which will have a remarkable contribution to design appropriated prevention and control programs tailored to the population. The study evaluates associations with various independent variables (demographic, socioeconomic, individual risk factors, and biomedical risk factors). Age, family history, and presence of overweight/ obesity are significant predictors for the prevalence of NCD; sex and occupational status for NCD knowledge; and weight status and alcohol use for NCD attitude.

The prevalence of NCD among adults in the study population was 24%: 16.1% hypertension, 5.5% diabetes, 3.6% COPDs, 3.5% CVDs, and 1.7% cancer. In 2018 WHO reported almost similar prevalence of NCD in the country (CVDs 16%, cancer 7%, COPD 2%, and diabetes 2%),[54] and the recent systematic review of NCDs in Ethiopia reported the total NCD prevalence ranges from 29 to 35%; CVD from 13 to 32%; cancer from 4 to 18%; the pooled prevalence of diabetes is 5%; and COPD ranges between 1 and 18%,[55] but the current prevalence is higher than prevalence reports in Southwest Ethiopia (diabetes 0.5%, hypertension 3%, CVDs 3%, and COPDs 2%)[56] and from a total NCD prevalence (2%) in Northwest Ethiopia.[57] The difference might be due to variations over time and the participants' demographic and economic characteristics.[5] The previous studies were conducted with semi-urban and rural residents, while the current study involved only urban adults, which might increase risk factors like insufficient physical activity and dietary risks.[58,59] The country is also undergoing demographic transitions,[15] meaning that the proportion of the adult population is growing, which could increase the prevalence of some behavioral risk factors, such as alcohol consumption and tobacco use.[60,61] The presence of multiple triggers in the country, such as high unemployment rates, poverty, conflicts, and instability, might also increase the prevalence of these diseases.[62,63] This study also showed that the prevalence of multimorbidity of NCDs was 8% which is lower than reports in other countries, such as 16% in China[53] and 30.2% in Serbia.[52] This could be due to differences in population demography (age distribution), economy, health care service accessibilities, and variations in disease burden between the referenced countries and the study population.

The prevalence of NCD and multimorbidity are directly associated with the age of adults in this study. Despite differences in the method of analyses used, previous findings in Northern Ethiopia,[64] studies in Brazil and Canada,[65,66] and research based in low- middle- and high-income countries show that the prevalence of NCDs has a direct association with the age of participants.[29,67] NCDs are developed progressively over time. They are cumulative effects of multiple exposures, such as early developmental exposure to malnutrition, environmental risk factors, infectious diseases, poverty, and individual risk factors.[7,68] The chance of exposure to behavioral risk factors that are attributable to cause NCD, like

Table 4 Adjusted Odds Ratio (AOR) and 95% Confidence Intervals for Multivariable Logistic Regression for NCD Prevalence and Multimorbidity

Variables	Variable Category	Non-Communicable Diseases		Non-Communicable Disease (1 NCD)				Multimorbidity (≥2 NCD)			
		Yes n (%)	No n (%)	AOR	95% CI		p-value	AOR	95% CI		p-value
Age (in years)	18–40	48 (15.4)	264 (84.6)	0.17	0.07	0.39	<0.01	0.08	0.03	0.26	0.00
	41–55	17 (32.1)	36 (67.9)	0.27	0.10	0.71	<0.01	0.18	0.05	0.61	0.06
	56+	35 (67.3)	17 (32.7)	Ref				Ref			
Marital status	Married	60 (25.5)	175 (74.5)	1.78	0.86	3.70	0.12	0.91	0.27	3.05	0.88
	Others	21 (44.7)	26 (55.3)	1.70	0.53	5.49	0.37	0.56	0.11	2.94	0.49
	Single	19 (14.1)	116 (85.9)	Ref				Ref			
Educational status	Primary/lower	38 (40.4)	56 (59.6)	0.94	0.43	2.06	0.87	0.79	0.28	2.24	0.66
	Secondary	17 (17.7)	79 (82.3)	0.75	0.36	1.58	0.44	0.23	0.05	1.09	0.06
	Post-secondary	45 (19.8)	182 (80.2)	Ref				Ref			
Health care affordability	Yes	54 (20.3)	212 (79.7)	0.72	0.39	1.32	0.28	0.50	0.21	1.23	0.13
Family history	Yes	75 (45.2)	91 (54.8)	7.71	4.23	14.06	<0.01	-	-	-	-
Salt use	Yes	35 (18.5)	154 (81.5)	0.83	0.46	1.48	0.52	0.82	0.34	2.00	0.67
Sweet diet intake	Yes	22 (16.2)	114 (83.8)	1.36	0.71	2.60	0.36	0.87	0.33	2.30	0.78
Alcohol use	Yes	44 (19.9)	177 (80.1)	1.17	0.60	2.07	0.60	0.42	0.18	1.03	0.06
Weight status	Normal	61 (21.0)	229 (79.0)	0.27	0.10	0.77	0.01	0.95	0.26	3.49	0.93
	Overweight	21 (24.1)	66 (75.9)	0.32	0.10	0.97	0.04	1.23	0.30	5.11	0.77
	Obese	18 (51.4)	17 (48.6)	Ref				Ref			
NCD attitude	More dangerous	66 (20.9)	250 (79.1)	0.84	0.44	1.58	0.58	0.65	0.26	1.59	0.34
NCDs knowledge	Good	119 (82.6)	25 (17.4)	1.65	0.87	3.16	0.13	1.98	0.73	5.35	0.18

Notes: NB: Family history of NCD is not adjusted for multimorbidity due to small observation in a cell (<5).
Abbreviations: Ref, reference; NCD, non-communicable disease; Model I, adjusted model for NCD; Model II, adjusted model for multimorbidity; AOR, adjusted odds ratio; CI, confidence interval.

alcohol consumption and physical inactivity,[69] and metabolic risks such as overweight/obesity and hypertension are also directly associated with the age of participants.[70] Our exploratory analysis presented in Supplementary Tables 1 and 2 shows that the age of adults is associated with employment status, family history of NCD, salt intake, alcohol consumption, khat use, and overweight and obesity; and with cardiovascular health concerns, cancer knowledge, physical activity, all which could augment the influence of age on the prevalence of NCD.

Family history of chronic diseases is a strong predictor of the prevalence of NCD among adults in the current study. Chronic diseases such as diabetes and CVD have strong genetic predispositions.[71,72] The combination of genetic, physiological, environmental, and individual risk factors facilitates the development of chronic diseases.[68] Risk behaviors like poor dietary habits also cluster in families;[73] if a family practices unhealthy dietary habits, the offspring have a higher chance of following unhealthy dietary habits.[74,75] This also applies to other risk behaviors such as alcohol consumption and tobacco use.[76,77]

The presence of overweight/obesity is significantly associated with the prevalence of NCD among adults. Excess weight gain alters normal body physiology in various ways by increasing the chance of insulin resistance at skeletal

Table 5 Adjusted Odds Ratio (AOR) and 95% Confidence Intervals for Multivariable Logistic Regression for NCD Knowledge, Diabetes Knowledge, and Attitude

Variables	Variables Category	Total n (%)	NCD Knowledge		Diabetes Knowledge		NCD Attitude	
			AOR (95% CI)	P-value	AOR (95% CI)	P-value	AOR (95% CI)	P-value
Age	18–40	312 (74.8)	0.93 (0.39, 2.17)	0.87	0.39 (0.09, 1.67)	0.21	1.07 (0.46, 2.48)	0.87
	41–55	53 (12.7)	1.131 (0.41, 3.15)	0.81	0.84 (0.17, 4.05)	0.83	0.91 (0.35, 2.34)	0.84
	56+	52 (12.5)	Ref		Ref		Ref	
Gender	Male	189 (45.3)	1.76 (1.06, 2.93)	0.03	1.82 (0.79, 4.16)	0.16	0.70 (0.39,1.24)	0.23
	Female	228 (54.7)	Ref		Ref		Ref	
Marital status	Married	235 (56.4)	1.34 (0.73, 2.47)	0.34	2.14 (0.80, 5.73)	0.13	0.90 (0.44, 1.82)	0.77
	Others	47 (11.3)	0.34 (0.09, 1.23)	0.10	1.22 (0.29, 5.13)	0.79	0.49 (0.17, 1.39)	0.18
	Single	135 (32.4)	Ref		Ref		Ref	
Education	Primary or lower	94 (22.5)	0.56 (0.25, 1.22)	0.14	0.80 (0.27, 2.43)	0.70	0.61 (0.28, 1.34)	0.23
	Some/secondary	96 (23.0)	0.703 (0.38, 1.28)	0.25	0.78 (0.32,1.92)	0.59	0.76 (0.39, 1.50)	0.44
	Post-secondary	227 (54.4)	Ref		Ref		Ref	
Occupation	Securely employed	137 (32.9)	2.91 (1.52, 5.57)	0.01	3.41 (1.07,10.82)	0.04	0.77 (0.38,1.58)	0.49
	Unemployed	121 (29.0)	2.55 (1.27, 5.11)	0.01	1.07 (0.43, 2.65)	0.89	0.56 (0.27, 1.16)	0.12
	Insecure jobs	159 (38.1)	Ref		Ref		Ref	
Income (ETB)	≤2250	53 (13.7)	0.79 (0.36,1.73)	0.56	0.72 (0.25, 2.10)	0.55	0.89 (0.41,1.95)	0.78
	2251–5000	126 (32.6)	0.82 (0.48,1.39)	0.45	0.58 (0.27, 1.28)	0.18	1.38 (0.76, 2.48)	0.28
	≥5001	208 (53.9)	Ref		Ref		Ref	
Fruit/vegetable intake	Adequate	18 (4.3)	0.97 (0.29, 3.18)	0.96	2.67 (0.31, 23.10)	0.37	2.42 (0.52, 11.40)	0.45
	Inadequate	399 (95.7)	Ref		Ref		Ref	
Salt intake	Yes	366 (87.8)	1.90 (0.87, 4.16)	0.11	2.37 (0.92, 6.18)	0.08	0.91 (0.42, 1.98)	0.81
	No	51 (12.2)	Ref		Ref		Ref	
Physical activity	Active	259 (62.1)	0.72 (0.44, 1.21)	0.22	1.85 (0.87, 3.93)	0.11	1.07 (0.62,1.85)	0.81
	Inactive	158 (37.9)	Ref		Ref		Ref	
Alcohol use	Yes	221 (53.0)	1.05 (0.65, 1.71)	0.84	1.04 (0.49, 2.20)	0.92	1.85 (1.08,3.14)	0.02
	No	196 (47.0)	Ref		Ref		Ref	
Khat chewing	Yes	21 (5.0)	0.62 (0.21, 1.78)	0.37	1.73 (0.45, 6.59)	0.42	0.94 (0.32, 2.78)	0.92
	No	396 (95.0)	Ref		Ref		Ref	
Overweight/obesity	Normal	290 (70.4)	1.32 (0.51,3.44)	0.57	1.71 (0.46,6.29)	0.42	3.23 (1.42, 7.39)	0.01
	Overweight	87 (21.1)	1.01 (0.35, 2.89)	0.99	0.51 (0.14,1.91)	0.32	2.00 (0.80, 4.97)	0.14
	Obese	35 (8.5)	Ref				Ref	

Abbreviations: Ref, reference; AOR, adjusted odds ratio; CI, confidence interval; ETB, Ethiopian birr.

muscles, which leads to impaired glucose homeostasis and diabetes.[78,79] When glucose metabolism is affected, excess glucose and fat metabolites are accumulated in the blood vessels. This causes the narrowing of blood vessels and atherosclerosis, which increases the risk of hypertension, CVDs, and stroke.[78,79] Overweight/obesity worsens the outcome of chronic diseases, such as COPD and cancer.[80–82] Risks associated with excess weight gain will continue to be a huge burden in developing countries unless appropriate attention is given.[83,84] Exploration of significant variables presented in Supplementary Tables 1 and 2 shows that overweight and obesity are associated with adult health care affordability, salt intake, sweet food intake, NCD knowledge, and attitude, which may explain the effects of overweight and obesity on the prevalence of chronic diseases.

This study reveals that only one-third of adults in the study population have some knowledge about NCDs. This is lower than the 81% reported NCD knowledge in Malaysia,[85] 56% CVD knowledge in Nepal,[86] but comparable to studies done in African countries such as <50% NCD knowledge in Cameroon,[87] 23% NCD knowledge in Kenya,[35] and 32% CVD knowledge in university students in Ethiopia;[88] and with the 27% diabetes knowledge in Kenya,[89] and 56% diabetes knowledge in Southern Ethiopia.[90] Overall, people in low-income countries, like in sub-Saharan African regions, have inadequate knowledge about chronic NCDs, such as cardiovascular diseases.[91] The current study found that employed and male adults have better NCD knowledge than their counterparts. This might be because employed people are more educated and more likely to be exposed to health information and healthy lifestyles at work and in the media, consistent with studies that showed a strong correlation between employment status and health literacy.[92,93] In Ethiopia, men are more educated and employed than women, which undeniably impacts all-rounded health knowledge.[94]

This study shows that three-quarters of adults consider NCDs more dangerous than communicable diseases. This finding is higher compared to the 53% NCD attitude in Malaysia,[85] 20% CVD attitude in Nepal,[86] <50% in Cameroon,[87] and 39% in Kenya.[35] The multivariable logistic regression analysis reveals that overweight/obese adults have lower concerns about NCDs than normal adults. This could be due to people in low-income countries preferring to be overweight, as some associate it with beauty and wealth[95,96] and are less concerned about its health effects.[97]

Overall, the findings of this study can help public health professionals, health offices, and concerned stakeholders to plan targeted health interventions for older adults, people with a family history of chronic diseases, and having excess weight gain to reduce NCD burden; and for women and adults with insecure jobs to raise NCD knowledge, and to obese adults to raise NCD attitude.

Strengths and Limitations of the Study

This study provides relevant information about the community-level prevalence of NCD in a developing country and explores the prevalence using various population characteristics: demographic, SES, individual risk factors, knowledge, and attitudes. Nevertheless, the study has the following limitations: 1) prevalence estimates are based on self-report of adults, not laboratory tests, and might have underestimated the actual prevalence;[98] 2) some of the explanatory variables, like health care affordability, were self-rated by adults and might be subject to social desirability bias; 3) although data collectors received rigorous training and close supervision during the conduct of the study for collecting anthropometric measurements (such as height, weight, and hip/waist circumference), a risk of some measurement bias remains; 4) although our sample size was met, the strength of our estimates might be limited and apparent in variables with wider confidence intervals;[99,100] 5) this study might have involved prevalence-incidence (Neyman) bias;[101,102] 6) causal inference is limited due to the cross-sectional nature of the study;[103] 7) the study only involved urban residents in Bahir Dar in Northwest Ethiopia, although the age and sex structure of the population is similar to the general population of the country, prevalence estimates might be influenced by the effects of urbanization and cannot reflect the reality of rural areas; and 8) the study was conducted in Bahir Dar town Northwest Ethiopia thus generalizing the findings to the whole Ethiopian adults and beyond needs cautious interpretation.

Conclusion

This study reveals a high prevalence of NCDs and overall low NCD awareness amongst participating adults in Bahir Dar, Ethiopia; one in four have an NCD, and one in ten have multimorbidity. One-third of adults have some NCD knowledge and 75% consider NCDs to be more dangerous than communicable diseases. Amongst those aged over 55, this increases

to more than 32% for NCD prevalence and multimorbidity. Age above 55 years, family history of NCD, and overweight or obese weight categories are significant predictors for the prevalence of NCD. Male and employed adults have better NCD knowledge, while normal weight status and alcohol use of adults for NCD attitude.

Data Sharing Statement
All data relevant to this study are included in the manuscript.

Ethics Approval and Informed Consent
This study methods and procedures were performed in accordance with the Helsinki Declaration for biomedical research. This study received ethics approval from the Australian National University Human Research Ethics Committee (protocol number 2020/558) and local approval from the Amhara Public Health Institute Research Ethics Committee (protocol number 1/10523), Bahir Dar, Ethiopia. Informed written consent was obtained from participants prior to starting data collection. For participants who could not read and write, informed oral consent was obtained. The data collectors read the information sheet to these types of participants and for those who agreed to participate, their response was recorded in the oral consent form prepared for this purpose. The oral consent form included information such as the title of the project, information that the participant is provided with clear information about the aims of the research, confidentiality of the collected information, and the data collection date. All these procedures were approved by the above-mentioned ethics committees.

Author Contributions
All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure
The authors declare no competing interests in this work.

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