ORIGINAL ARTICLE

POPULATION BASED SURVEY OF CHRONIC NON-COMMUNICABLE DISEASES AT GILGEL GIBE FIELD RESEARCH CENTER, SOUTHWEST ETHIOPIA

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ABSTRACT

BACKGROUND: Chronic Non-communicable Diseases are increasingly becoming more prevalent and burden to the health care system in developing countries including Ethiopia. However, evidences showing the magnitude of the problem in those countries are scarce particularly in a community setting. The objective of this study was to determine the magnitude of chronic non communicable diseases in a community.

METHODS: A population-based cross-sectional study was conducted in Gilgel Gibe Field Research Center from late September 2008 to end of January 2009. A random sample of 4,469 individuals aged 15-64 years was studied. Data on characteristics and chronic symptom inventories were collected by interviewing study participants. Blood pressure was taken three times from each individual and blood sugar and lipid levels were determined after an overnight fasting. Data were analyzed using SPSS for Windows version 16.0 and STATA 11.

RESULTS: The overall prevalence of CNCD was 8.9%* (7.8% men and 9.8% women). The specific observed prevalence were 0.5% for diabetes mellitus (DM), 2.6% for hypertension, 3.0% for cardiovascular diseases, 1.5% for asthma and 2.7% for mental illness. *In addition 3.1% and 9.3% of the study population had been informed to have DM and hypertension respectively.

CONCLUSION: There is a high prevalence of CNCD among the study population indicating an immediate need for preventive action and also warrant further nationally representative study.

KEYWORDS: CNCD, Non-communicable, Prevalence, Southwest Ethiopia

INTRODUCTION

Chronic Non-communicable Diseases (CNCDs) are by their nature lifelong or a condition as one of 3 months' duration or longer (1); most with long term complications resulting in disabilities affecting the quality of life and creating pressure on the health care systems. Because of the requirement for life long treatment and care, the cost implication on health sector is huge signifying the importance of determining the burden to plan prevention strategies. CNCDs include Diabetes mellitus, Cardiovascular diseases, (Rheumatic heart disease, Coronary heart disease), Cerebro-vascular disease (stroke), Mental illnesses (Schizophrenia, Bipolar, Depression), Neurologic disorders (Epilepsy, Dementias), Respiratory diseases (Asthma and COPD), Digestive System diseases, Congenital anomalies and Malignancy (2).

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The priority of health care in developing countries focuses on communicable diseases which are proportionally important than CNCDs. Though CNCDs are believed to be problem of affluent societies, in reality they represent an under reported and neglected burden on health in the developing countries and one that is ever-increasing (8). In absolute numbers, deaths from CNCDs are higher in sub-Saharan Africa than the other regions in the world (9). CNCDs are projected to be the leading cause of death in all income groups in 2015 (3).

There are proven preventive strategies for CNCDs. These measures would significantly prevent disease and delay complications that would otherwise demand costly and lifelong medical care. On the other hand, if the emergence and prevention of risk factors remain unintervened and the health services left undirected, the problem can increasingly cause more human suffering and escalate the cost of treatment (10).

In Ethiopia, declining mortality rates, rising life expectancy and increasing urbanization have been observed (11,12,13). As a result, Ethiopia is likely to be in a transition period with respect to the epidemiology of CNCDs (14). The few existing reports in Ethiopia are health facility based (15, 16) which do not show the magnitude of CNCDs at community level. Very limited community based studies tried to show the magnitude of the problem on specific diseases (17). Due to lack of data showing the real burden of CNCDs in the developing world in general and in Ethiopia in particular, there is no clear ground and guidance for policy makers to plan and implement intervention strategies.

Therefore, this study was conducted to determine the magnitude of CNCDs in a community setting to be a basis for decision making and policy formulations. Moreover, this study will serve as baseline information for further studies at national level.

SUBJECTS, MATERIALS AND METHODS

The study was conducted in Gilgel Gibe Field Research Center (GGFRC) of Jimma University (JU). The center serves as health and demographic surveillance system for the University and comprises of 8 rural and two urban kebeles (the lowest administrative unit in Ethiopia).

The study base was mapped, houses numbered and census carried out in August 2005. Since then, there is an ongoing demographic and health surveillance in the center. The study area comprised of about 11,000 households with a total population of 50,000 in the center. Out of the total population, age range of 15 to 64 years comprised of about 49%.

Majority of the residents live with subsistence agriculture producing mainly food crops. There were one health center, two health stations and 4 health posts in the center during the study period. There were two trained health extension workers in each kebele. In the urban kebeles the source of water was either shallow dug well, pipe water or protected springs whereas the major sources of water in rural kebeles were unprotected. All rural kebeles were accessible only during dry season by four-wheel drive. All the kebeles had access to mobile phone and in addition the urban kebeles had access to home phone.

This population-based cross-sectional study was conducted from September 2008 to January 2009. Individuals' age 15 to 64 years of both sex, who were residents of the 10 kebeles of the center were studied. The sample size was determined based on the WHO STEPS guideline stratifying the population by sex, age and residence (18). For both sexes, 250 individuals were taken from each age stratum giving a sample size of 2500. However, due to further stratification of the study population into urban and rural within age and sex, the sample size was doubled to 5,000. Taking 10% non-response rate, the total sample size became 5,500 (Table 1).

Table 1: Age and sex strata of study population, GGFRC, 2008.

Age group	Sex		Total
	Male	Female	
15-24	500	500	1000
25-34	500	500	1000
35-44	500	500	1000
45-54	500	500	1000
55-64	500	500	1000
Total	2500	2500	5000
Adding 10% for non-response			5500

To select the study participants, the 2008 updated census list of the population and households of the ten kebeles was used as sampling frame. Taking 25% urban and 75% rural population distribution in the center, the total sample was distributed proportionally. Then the sample was distributed to each kebele proportional to their population size. Using the age and sex stratified sampling frame obtained from the census list, individuals were selected randomly.

Blood samples for hematological and biochemical values determination was collected from 60% (3,300) of randomly selected (conditional probability sampling) individuals from the total sample as per the recommendation of WHO (18).

Interviewer administered structured questionnaires in English language were adapted from WHO STEPS instruments to collect data (18). All study instruments were translated into local languages (Amharic and Afaan Oromo) by native speakers and then back translated to English by two other competent persons. The questionnaires comprised of: socioeconomic and demographic variables, risk factors, and symptoms and history of CNCDs. Formats adapted from WHO STEPS guidelines were also used to measure blood pressure (BP), pulse rate, weight, height, waist and hip circumference, and biochemical markers such as fasting blood sugar level, total cholesterol and triglycerides values (18).

Field personnel had a minimum of high school completion and competent in Amharic and Oromifa languages. Fifteen interviewers, six physical measurement recorders and 3 supervisors were recruited for CNCDs survey. Two nurses and 2 laboratory technicians were recruited to collect blood samples. Training was given for data collectors and supervisors on the purpose of the study, how to get informed consent, on interviewing technique, physical measurements and recording data. Supervisors were additionally trained on supervision techniques. Blood sample collectors were also trained on obtaining informed consent, blood sample collection, blood sugar level measurement, and blood sample transportation and storage. Different training methods were employed, including interviewing practice and role playing. All data collectors were provided with manuals that covers the standard survey procedures and measurements.

Pre-test was conducted on the interview and measurement sections of the study instrument in urban and rural settings which are physically away from the study area. After the pre-test, data collectors, supervisors and investigators discussed on experiences and identified gaps. Re-training was conducted with a focus on resolving problematic issues and then study instruments were finalized.

Face to face interview was conducted at home level after the interviewers explained the purpose of the study and obtained the participant's signed consent to participate in the study. Eligible respondents were declared unavailable if they were not found on three separate visits. After completion of face to face interview, all respondents were given appointment for physical measurements. Additionally those respondents who were selected for biochemical tests were given instructions for overnight fasting (not to eat or drink after 8:00 pm) and early morning appointment given. Whole venous blood sample was collected in the morning (8:00am to 12:00 noon) after cleaning the cubital area by 70% alcohol and stored in 3 ml vacutainer tubes. Then the sample was placed in ice-box and transported to the JUSH laboratory where the laboratory procedures are performed. Fasting blood glucose was determined on site immediately after sample collection using Glucometer (Sensocard, Hungary). Individuals with high blood pressure, with FBS level above 126mg/dl and other serious ailments were referred to health centers or Jimma University Hospital for better investigation and management. Detail blood sample collection and laboratory processing methods are described in paper 4 & 5 of this special issue (Pages 41,52,53).

Blood pressure apparatus was calibrated and standardized using mercury sphygmomanometer. Standardized and calibrated measuring instruments were used for physical measurements. Daily supervision was made in the field during data collection by field supervisors and investigators. Data collectors checked for data completeness and consistency before leaving each house. Field supervisors also checked the completeness and consistency of the data on daily basis and they returned to interviewers if the data were incomplete and inconsistent. Interviewers re-

administered the questionnaire to the respondent under supervision by the supervisors.

Data were double entered by trained data clerks using EpiDdata version 3.1. Incomplete and inconsistent data identified during data entry were returned to the data collectors for rectification. Moreover, data were checked for completeness, inconsistency and outliers by looking at their distribution. Incomplete and inconsistent data were excluded from the analysis. Data were properly filed and stored both in electronic copies with back up and hard copies.

Data were analyzed using SPSS for Windows version 16.0 and STATA 11. Background of study participants, overall prevalence of CNCDs, reported prevalence of specific CNCDs and measured prevalence of specific CNCDs were determined. Frequencies and summary values were determined when appropriate. Overall prevalence of CNCDs was defined as the presence of any of the studied CNCDs on interview among the study population. Reported prevalence of specific CNCDs was defined as the presence of particular CNCDs among interviewed population diagnosed by health professionals while visiting health institutions; while observed/measured CNCDs was the presence of actual CNCDs on physical or biochemical measurement among measured population.

The proposal was presented to Medical Sciences Faculty research committee for assuring scientific integrity and human subjects' protection. The proposal was then submitted to the University's Research and Publication Office for final ethical clearance and approval letter was obtained. Supportive letter was obtained from the university and given to the Jimma Zonal and to the four Woredas administrations. Two written consent formats were developed and used: one for interview and physical measurements and the second one for blood sample collection. Preliminary finding was communicated to the local authorities and Jimma University community.

Table 2 Interview response rate of study subjects by age sex and residence, GGFRC, Sept 2008- Jan 2009.

Sociodemographic variables	*Urban*			*Rural*			*Total*		
	Men n*=125	Women n*=125	Total n*=250	Men n*=375	Women n*=375	Total n*=750	Men n*=500	Women n*=500	Total n*=1000
Age in years									
15-24	74 (15.1)	105(17.1)	179(16.2)	295(18.5)	284(16.0)	579(17.2)	369(17.7)	389(16.3)	758(17.0)
25-34	91(18.6)	121(19.7)	212(19.2)	295(18.5)	378(21.4)	673(20.0)	386(18.5)	499(20.9)	885(19.8)
35-44	113(23.1)	129(21.0)	242(21.9)	327(20.5)	372(21.0)	699(20.8)	440(21.1)	501(21.0)	941(21.1)
45-54	98(20.0)	126(20.5)	224(20.3)	323(20.3)	342(19.3)	665(19.8)	421(20.2)	468(19.6)	889(19.9)
55 and above	114(23.3)	134(21.8)	248(22.4)	354(22.2)	394(22.3)	748(22.2)	468(22.5)	528(22.1)	996(22.3)
Total	490(100.0)	615(100.0)	1,105(100.0)	1,594(100.0)	1,770(100.0)	3,364(100.0)	2,084(100.0)	2,385(100.0)	4,469(100.)

n-for each strata

RESULTS

Response Rate

Of the planned sample size of 5,500 adults 15-64 years of age for the face-to-face interview, 4,469 (81.3%) were interviewed with male to female response rate of 75.8% and 86.7%. The response rate by age varies from 68.9% for 15-24 years to 90.5% for those who are 55 years and above. The response rate was more or less similar by residence (Table 2).

Background of study participants

Of the 4469 respondents, 2385 were female (female to male ratio of 1.14), 22% in the age group of 55 years and above and nearly 25% of the respondents were from urban area. Of the 4363 (2324 women, 2,039 men) respondents who reported about their educational status, 82% of the women and 60% of the men were unable to read and write. Out of 4446 study participants who reported about their occupation, 1949 (43.8%) were farmers (Table 3). Majority, 3994 (88.4%) of the 4440 individuals who reported their ethnic group were Oromo, whereas the remaining constituted Yem (4.5%), Amhara (3.2%) and Gurage (1.8%).

Table 3: Background characteristics of study participants, GGFRC, Sept 2008- Jan 2009.

	Men		*Women*		*Total*	
Socio-demographic variables	№	%	№	%	№	%
Age in years						
15-24	369	17.7	389	16.3	758	17.0
25-34	386	18.5	499	20.9	885	19.8
35-44	440	21.1	501	21.0	941	21.1
45-54	421	20.2	468	19.6	889	19.9
55 and above	468	22.5	528	22.1	996	22.3
Total	2,084	100.0	2,385	100.0	4,469	100.0
Residence						
Urban	491	23.5	615	25.8	1,106	24.7
Rural	1,594	76.5	1,770	74.2	3,364	75.3
Total	2,085	100.0	2,385	100.0	4,470	100.0
Educational level						
Unable to read or write	1,225	60.1	1,916	82.4	3,141	72.0
Able to Read & write only	92	4.5	19	0.8	111	2.5
1-4 grade	285	14.0	121	5.2	406	9.3
5-8 grade	256	12.6	150	6.5	406	9.3
9 or above grade	181	8.9	118	5.1	299	6.9
Total	2,039	100.0	2,324	100.0	4,363	100.0
Occupation						
Farmer	1,462	70.5	487	20.5	1,949	43.8
Housewife			1,492	62.9	1,492	33.6
Student	134	6.5	108	4.6	242	5.4
Merchant	134	6.5	81	3.4	215	4.8
Civil servant	86	4.1	40	1.7	126	2.8
Daily laborer	93	4.5	32	1.3	125	2.8
Unemployed	31	1.5	42	1.8	73	1.6
NGO employee	32	1.5	6	0.3	38	0.9
Unpaid employee	14	0.7	14	0.6	28	0.6
Housemaid	3	0.1	22	0.9	25	0.6
Pensioner	20	1.0	19	0.8	39	0.9
Other	65	3.1	29	1.2	94	2.1
Total	2,074	100.0	2,372	100.0	4,446	100.0

Table 4: Reported prevalence of CNCDs by age, residence and sex, GGFRC, Sept 2008- Jan 2009.

Variable	*Participant*	*Prevalence*	*95% CI*	
Overall Chronic Non-Communicable Diseases				
Male	2093	7.7	6.6	8.9
Female	2267	9.9	8.7	11.2
Urban	1082	16.4	14.2	18.7
Rural	3278	6.4	5.6	7.3
Total	4364	8.9	8.0	9.8
Total – Told to have				
DM	4364	0.5	0.3	0.8
HPN	4356	2.6	2.2	3.2
Cardiac	4339	3.0	2.5	3.5
Asthma	4331	1.5	1.1	1.9
Epilepsy	4333	0.5	0.3	0.8
Depression	4235	1.7	1.4	2.2
Male – Told to have				
DM	2093	0.7	0.4	1.1
HPN	2089	2.2	1.6	2.9
Cardiac	2079	1.7	1.2	2.3
Asthma	2077	1.5	1.0	2.1
Epilepsy	2077	0.6	0.3	1.0
Depression	2033	1.6	1.1	2.2
Female – Told to have				
DM	2267	0.4	0.2	0.8
HPN	2263	3.1	2.4	3.9
Cardiac	2256	4.2	3.4	5.1
Asthma	2250	1.5	1.0	2.1
Epilepsy	2252	0.5	0.2	0.9
Depression	2198	1.9	1.3	2.5
Urban – Told to have				
DM	1082	1.1	0.6	1.9
HPN	1081	5.8	4.5	7.4
Cardiac	1077	5.7	4.4	7.2
Asthma	1079	3.2	2.3	4.5
Epilepsy	1079	0.7	0.3	1.5
Depression	1046	2.4	1.6	3.5
Rural – Told to have				
DM	3278	0.3	0.2	0.6
HPN	3271	1.6	1.2	2.1
Cardiac	3258	2.1	1.6	2.6
Asthma	3248	0.9	0.6	1.3
Epilepsy	3250	0.5	0.3	0.8
Depression	3185	1.5	1.1	2.0

Chronic Non-communicable diseases reported prevalence

The overall prevalence of chronic non-communicable disease was 8.9% (7.8% men and 9.8% women). Of the 4364 respondents, 23 (0.5%) reported that they were told to have diabetes mellitus by health professionals. The prevalence was 1.5% among urban and 0.4% for rural men and the corresponding values for urban and rural women were 0.8% and 0.2%, respectively. One hundred fifteen (2.6%) respondents, 4.6% of the urban men, 6.8% of the urban women, 1.5% of the rural men, 1.7% of the rural women reported that they were told by health professionals to have high blood pressure. Three percent of the total respondents, 2.7% of the urban men, 8.2% of the urban women, 1.2% of the rural men and 2.9% of the rural women reported as having CVD at the time of the interview. On the other hand, 1.5% reported to have been told as having asthma where the reported prevalence among urban men and women was 3.3% and 3.2% while for the rural men and women 1.0% and 0.8%, respectively. The prevalence of epilepsy and mental illnesses was reported to be 0.5% and 1.7%, respectively (Table 4).

Fifty two (3.1%) of those tested had elevated blood glucose of more than 125mg/dl (≥7.0 mmol/L) level and 301 (9.3%) had high blood pressure (SBP ≥ 140mmHg and/or DBP ≥ 90 mmHg). Both the prevalence of high blood sugar and high blood pressure showed increasing trend with age ($p < 0.001$), on the other hand raised blood pressure rate was significantly higher among urban residents ($p < 0.001$) (Table 5). Distribution of reported CNCDs by age is shown in table 6.

Table 5: Observed/measured prevalence of DM and hypertension by age, residence and sex, GGFRC, Sept 2008- Jan 2009.

CNCDs	*Prevalence*			
	Diabetes Mellitus		Hypertension	
	Number studied	Cases №(%)	Number studied	Cases №(%)
Total	1695	52 (3.1)	3223	301 (9.3)
Age (year)				
15-24	271	3 (1.1)*	494	17 (3.4)*
25-34	358	10 (2.8)	638	26 (4.4)
35-44	367	6 (1.6)	705	44 (6.2)
45-54	324	8 (2.5)	680	69 (10.1)
≥ 55	375	25 (6.7)	706	145 (20.5)
Sex				
Men	847	30 (3.5)	1541	158 (10.3)*
Women	848	22 (2.6)	1682	143 (8.4)
Residence				
Urban	117	7 (6.0)	541	94 (17.4)*
Rural	1578	45 (2.9)	2682	207 (7.7)

* Statistically significant ($p < 0.05$)

Table 6: Prevalence of CNCDs by age, residence and sex, GGFRC, Sept 2008- Jan 2009.

CNCDs	Total respondent	With CNCDs № (%)
Overall		
15-24years	736	38 (5.2)
25-34years	865	59 (6.8)
35-44years	920	81 (8.8)
45-54years	870	83 (9.5)
55 years and above	973	126 (12.9)
Total	4364	387 (8.9)
DM*		
15-24years	736	2 (0.3)
25-34years	865	3 (0.3)
35-44years	921	2 (0.2)
45-54years	870	10 (1.1)
55 years and above	972	6 (0.6)
Total	4364	23 (0.5)
HTN*		
15-24years	736	9 (1.2)
25-34years	863	14 (1.6)
35-44years	919	19 (2.1)
45-54years	865	30 (3.5)
55 years and above	973	43 (4.4)
Total	4356	115 (2.6)
CVD*		
15-24years	732	10 (1.4)
25-34years	861	20 (2.3)
35-44years	918	28 (3.1)
45-54years	864	25 (2.9)
55 years and above	964	47 (4.9)
Total	4339	130 (3.0)
Asthma*		
15-24years	730	5 (0.7)
25-34years	859	3. (0.3)
35-44years	914	17 (1.9)
45-54years	862	14 (1.6)
55 years and above	966	25 (2.6)
Total	4331	64 (1.5)
Epilepsy*		
15-24years	731	4 (0.5)
25-34years	861	7 (0.8)
35-44years	914	4 (0.4)
45-54years	866	2 (0.2)
55 years and above	961	6 (0.6)
Total	4333	23 (0.5)
Mental illnesses*		
15-24years	711	10 (1.4)
25-34years	814	16 (1.9)
35-44years	893	16 (1.8)
45-54years	849	14 (1.6)
55 years and above	942	17 (1.8)
Total	4235	73 (1.7)
Mental illnesses (Depression alone)*		
15-24years	722	5 (0.7)
25-34years	851	4 (0.5)
35-44years	911	5 (0.5)
45-54years	859	7 (0.8)
55 years and above	961	8 (0.8)
Total	4304	29 (0.9)

*Study participants reported as they are diagnosed by health professionals.

Prevalence of cardiovascular diseases (p< 0.001), hypertension (p< 0.001), asthma (p< 0.001), diabetes mellitus (p=0.061) and overall CNCDs (< 0.001) appeared to have an increasing trend with age (Fig 2).

DISCUSSION

The main objective of this study was to describe the distribution of CNCDs by age, sex and residential areas. The response rate of the study was 81%**.** The use of WHO STEPS methods and instruments that was standardized, population based nature of the study alongside with the use of random selection of study subjects and multidisciplinary composition of the research team are the strengths of this study. This study is one of the first of its kind in the country to undertake the three components of WHO STEPS (I, II, and III) (18) at community setting. Nevertheless, as the study has employed self-reporting as a proxy measure for the study of CNCDs, it is liable to self-report bias which can either underestimate or overestimate the prevalence of the diseases under study. The possible sources of bias could be problems in recall, misdiagnosis or misreporting. Underreporting could happen due to social desirability bias associated with stigma and discrimination especially in diseases like epilepsy and mental illnesses. Moreover, lack of equivalent local terminologies for different diseases, mainly mental illnesses, could also affect the estimate of the real prevalence of the problems. The finding of this result should be interpreted in light of these limitations.

The overall reported prevalence of the CNCDs (Diabetes mellitus, hypertension, cardiovascular disease, Asthma, epilepsy, depression and mental illness) was found to be 8.9%. The prevalence is higher in urban (16.4%) than in rural (6.4%) areas. This variation might be explained by urbanization associated with sedentarily lifestyle, lack of exercise and more stressful lifestyle. On the other hand, people living in urban area have better recognition of disease symptoms and better access to medical services compared to people living in rural areas. Thus, the prevalence of CNCDs in rural areas could be underestimated **(**19). The prevalence is higher among women (9.9%) as compared to men (7.7%). But this doesn't hold true for each of the specific CNCDs as discussed below. As age increases the prevalence of CNCDs increases linearly which is consistent with a previous report (20).

Hypertension

The prevalence of high blood pressure by self-report and physical measurement was 2.6% and 9.3 %, respectively. About four fold difference between the two measures indicates that a significant number of the population was not aware of their health status which calls for appropriate and timely intervention. The phenomenon called White Coat hypertension is less likely to attribute these big differences as the necessary procedures were followed during blood pressure measurement. Most individuals with high blood pressure do not have symptoms until complication arises to result in sudden death from heart attack or sudden intracranial bleeding or developed severe disability such as stroke as well heart failure. The observed prevalence of high blood pressure was more than two times higher in urban (17.0%) than rural (7.8%) areas. This finding is similar to finding of meta-analysis of studies in sub-Saharan countries (20) and Tanzania where prevalence of hypertension was observed to be higher in the urban compared with the rural population (21). High blood pressure was more prevalent among men (10.3%) than women (8.4%). This finding is in line with previous research report (20, 21). The pattern of increase with age was in the expected direction with marked increase in the age group 55 years and above (20.5%) (20).

The prevalence of high blood pressure as obtained by physical measurement using blood pressure apparatus is higher than the findings in Ghana (22), Nigeria (23), and Lesotho (24). However, it is lower than the findings in Cameroon (25), and USA. Canada and Europe (26, 27). The findings were similar with the findings in rural Zulu (28). The possible reason is due to the older study age groups in the latter studies.

Diabetes Mellitus

The reported prevalence of diabetes mellitus was 0.5% while the observed was 3.1% which is lower than the finding from Turkey where the crude prevalence of diabetes was 7.2% (previously

undiagnosed, 2.3%) (19), however, the proportion of undiagnosed DM is not comparable. As there is no age appropriate screening, many individuals with impaired glucose level might not be aware of their DM because of lack knowledge of symptoms and lack of information about the disease to seek treatment at the health care facilities. On the other hand, Type 2 DM may not manifest until blood glucose level is significantly raised compared to type one. These with Type 2 DM might as a result be silent for many years until macro-vascular complication and micro-vascular complication arises. It is therefore very important that early screening at the recommended age and appropriate intervention has to be implemented to avert the fatal and disabling complications. The urban prevalence (6.0%) is twice higher than the rural (2.9%). Urbanization could be the reason for the variation which is consistent with findings of other studies. Diabetes is more frequent among men (3.6%) than women (2.5%). Increasing trend of diabetes prevalence with age was observed and this is similar to another report (29).

The prevalence of DM was much lower than the findings in Turkey, Canada and Greek (19, 30, 31). This may be due to the fact that the screening of diabetes mellitus is offered at the age of 45 and then every five years for most developed countries and difference in life expectancy which might explain the higher prevalence of DM in developed countries (32, 33).

The finding of this study is similar with finding in Brazilian study (34). This could be due to similarity in socio-demographic characteristics as both are developing countries.

Cardiovascular Disease

Self-reported CVD was 3.0%. Our observation in the areas of hypertension and diabetes mellitus above showed that self-reported prevalence of the two chronic illnesses was lower than the observed. This implies that the real magnitude of CVD could have been higher as both of these are risk factors to it. Only patients with full blown symptoms that are significant enough to affect individual's daily activities and level of functioning might report their symptoms. This might result in a significantly lower prevalence of CVD. On the other hand, there are neither sensitive nor specific questions used to determine the magnitude of cardiovascular disease. For example patients with chronic respiratory disease or anemia might be misclassified as CVDs which may overestimate the magnitude of the problems.

Asthma

Asthma had prevalence of 1.5% in the study population. However, the prevalence of asthma might have been underestimated as the symptoms are episodic, seasonal and diseases with less severe symptoms might not have been reported. However, reported prevalence of Asthma in this study area is similar with a study done in Jimma town and surrounding rural areas in Ethiopia (35). It is also similar with findings of study done in Estonia (36).

Epilepsy and Mental Illness

Epilepsy, depression and mental illnesses were also reported by 0.5%, 1.7%, and 0.7% of the study population, respectively. Reported prevalence of Epilepsy is similar with the study done in rural Tanzania (37) but lower than the finding of the study among the Zay society in Ethiopia and in Benin (38, 39). However, the actual magnitude of the problems in the study population could have been higher like that of hypertension and Diabetes Mellitus. Features of 'Tonic clonic' seizures only might have been reported as other categories have subtle clinical features that are not recognized by the study participants or their health providers. On the other hand, epilepsy is one of a disease associated with witchcrafts and with 'demonic possession' in our community which might result in under reporting by the study participants.

Mental illnesses on the other hand present a totally different challenge as they do not have litmus test like the others discussed which could lead to in under-reporting of the condition. Therefore the probability of reporting milder forms of mental illnesses could be less likely. Similar to epilepsy, mental illness have stigmata in our study community which further result in under reporting of these diseases. Therefore it would be very prudent to claim that they might be under reported

In conclusion, this article reports one of the largest population-based studies ever conducted on the prevalence of CNCDs. High blood pressure was the commonest CNCD in the population followed by diabetes mellitus and CVD. High

blood pressure and diabetes mellitus were more common among urban residents and men as compared to their counterparts. The pattern of occurrences for both diseases showed increasing trend with age. These findings clearly indicate that CNCDs require due emphasis in prioritizing for prevention and control. As this study revealed high magnitude of CNCDs in the study setting, conducting nationally representative multicenter studies is required.

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