

Assessment of Prevalence and Risk Factors of Depression among Adults in Gilgel Gibe Field Research Center, South West Ethiopia

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Abstract

Depression is a significant contributor to the global burden of disease and affects people in all communities across the world. Previously conducted studies in Ethiopia have consistently shown that depression is common problem in the country. There is limited scientific data regarding the association of independent variables with depression in Ethiopia and study area.

Objective: To assess prevalence and associated factors with depression among adults in Gilgel-Gibe Field Research Center.

Method: Population based cross-sectional study on chronic non-communicable diseases was conducted in the study area in 2008. Data were collected from random sample of 4,371 individuals on major risk factors of these diseases. In our study we processed and analyzed these data using SPSS for windows version 16.0. Multivariate logistic regressions were carried out, association between independent variables and depression was measured using adjusted odds ratios and 95% confidence interval and P-value below 0.05 was considered statistically significant.

Results: Finding of the study showed that prevalence of reported and measured depression was 1.7% and 7.4% respectively. Females were 1.62 times more likely to have depression compared to males (AOR=1.62, 95% CI: 1.07, 2.44). Twelve months alcohol users were 3.23 times more likely to have depression compared to non-users (AOR=3.23, 95% CI: 1.17, 8.88). Respondents having two and above chronic diseases were 2.18 times more likely to have depression compared to those free of the diseases (AOR=2.18, 95% CI: 1.15, 4.13)

Conclusion: Sex, alcohol use and number of chronic diseases were found to be independent predictors of depression.

Keywords: Prevalence; Alcohol drinking; Khat chewing; Chronic non-communicable diseases; Depression

Abbreviations: BCC: Behavioral Change Communication; CIDI: Composite International Diagnostic Interview; CMDD: Chronic Major Depressive Disorder; CNCD: Chronic Non-Communicable Diseases; DALY: Disability Adjusted Life Year; DSM: Diagnostic Statistical Manual; ENHS: Ethiopian National Health Survey; GGFRC: Gilgel Gibe Field Research Center; ICD: International Classification for Diseases; IEC: Information Education Communication; JU: Jimma University; MDD: Major Depressive Disorder; MOH: Ministry of Health; NC-MDD: Non Chronic Major Depressive Disorder; NGO: Non-Governmental Organization; SES: Socio-Economic Status; SPSS: Statistical Package for Social Sciences; WHO: World Health Organization

Introduction

According to the Diagnostic and Statistical Manual of Mental Disorders, 4th edition, revised text (DSM-IV-TR), the two primary diagnostic criteria for major depressive disorder (MDD) are depressed mood and loss of interest or pleasure in most activities, at least one of which must occur for a duration of at least two weeks. Secondary symptoms include significant appetite change, weight loss, or both, sleep disturbance, psychomotor agitation or retardation, fatigue or energy loss, feelings of worthlessness or guilt, attention or concentration difficulties, and recurrent thoughts of death or suicide. Of these diagnostic symptoms, dysphonic mood, appetite and sleep change, and thoughts of death are most common, while loss of interest in activities and psychomotor change appear to be less common [1].

The World Health Organizations International Classification for Diseases and Related Disorders (ICD-10) describes the criteria for a depressive episode, where at least four items, such as sadness/sense of

empty/depressed mood, loss of interest in activities, fatigue or energy loss, lack of emotional reactions, sleep disturbance, loss of appetite, motor retardation, weight loss and loss of libido are present for a duration of two weeks. The first three symptoms mentioned above are known to be cardinal symptoms of depression in which presence of at least two of them for duration of at least two weeks indicate depression [1-3].

Depression is a significant contributor to the global burden of disease and affects people in all communities across the world [4,5].

Today, depression is estimated to affect 350 million people. The World Mental Health Survey conducted in 17 countries in 2004 found that on average about 1 in 20 people reported having an episode of depression in the previous year [4,5].

Worldwide estimates of the proportion of people who are likely to suffer from depression in their lifetime vary widely between about 4% and 10% [6], 0.3% to 3% [7] for major depression. It represents a major public health problem and leads to high mortality from suicide, accidental death, and somatic complication [7].

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There is now widespread recognition of the significant burden that depression imposes on individuals and their careers, health services and communities throughout the world and It is the most common mental disorder in community settings, start at a young age and is a major cause of disability across the world [8]. In 1990 it was the fourth most common cause of loss of disability-adjusted life years in the world [8], and by 2020 it is projected to become the second leading cause of disability [4,8,9] with estimates indicating that unipolar depressive disorders account for 4.4% of the global disease burden or the equivalent of 65 million disability adjusted life years (DALYs) [8].

Depression can also exacerbate the pain, distress and disability associated with physical diseases, as well as adversely affecting outcomes [6,9]. Combined with chronic physical disease incrementally worsens health compared with physical disease alone or even combinations of physical disease [6,9]. In addition, for a range of physical illnesses, findings suggest an increased risk of death when co morbid depression is present [6,9]. In coronary heart disease for example, depressive disorders are associated with 80% increased risk, both of its development, and of subsequent mortality in established disease, at least partly through common contributory factors [6,10-12].

Risk factors for depression include gender (increased rate in females), experiencing a separation or divorce, chronic medical illnesses, low socioeconomic status, and age. Although major depression may develop at any age, the average age of onset is 15 to 19 years in females and 25 to 29 years for males with the average age of onset steadily decreasing over past decades [1,13]. According to study conducted using data from the Canadian National Population Health Survey Being young (aged 12 to 24 years), being divorced, separated, or widowed and having low family income level were positively associated with depression [14].

In low income countries, few resources are allocated to the health sector in general and only a tiny portion of these is allocated to mental health services [7,14]. This is very much the case in Ethiopia where health services are poorly developed, extremely understaffed, suffer from budgetary deficiencies, and mental health services are the least developed [7]. But previous studies conducted in Ethiopia have consistently shown that mental disorders particularly depression is common problem in the country [7]. Study conducted in Ethiopia showed the 12 month's prevalence of depression to be 4.4% among male and 4.8% among women [15]. Moreover, the life time prevalence of depression in general population was reported to be 2.2% [15].

To our knowledge, there is a very limited scientific data regarding the association of alcohol use, khat chewing and CNCDs with depression in Ethiopia and of course in the study area, while the increasing practice of alcohol drinking and khat chewing, the problems of emerging CNCDs and depression among adults are common. Therefore, the aim of this study was to assess the association of alcohol drinking, Khat chewing and chronic non- communicable diseases with depression among adults in rural community sample in south west Ethiopia.

Method and Materials

Overall about the data source

Population based survey on chronic non communicable diseases (CNCDs) was carried out by staffs of Jimma University (JU) college of public health and medical sciences in Gilgel Gibe Field Research Center (GGFRC) in 2008 /2009. Data were collected on major risk factors for public health important CNCDs including depression. Background

of study participants and reported prevalence of depression were determined [16].

For our current study which was conducted in 2013, we used data collected during the above mentioned period of time. Therefore the method and material sections reported in this manuscript are those used during the first survey except study variables and data processing and analysis.

Study area and period

The survey was conducted in GGFRC from late September 2008 to end of January 2009. The center is located around Gilgel Gibe Hydroelectric Dam, 55 kilometers Northeast of Jimma town on the way to Addis Ababa. The center serves as health and demographic surveillance system for the University and comprises of eight rural and two urban kebeles. 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 (Figure 1) [16].

Study design

Population-based cross-sectional study was employed on all individuals aged 15 to 64 years of both sexes (24,500), who were residents of the 10 kebeles during data collection period [16].

Study population

The study population for survey was all sampled individuals aged 15 to 64 years of both sexes (5,500), who were residents of the 10 kebeles during data collection period [16]. With regards to the current study, study population was all individuals who participated on the first step of the survey (4,371).

Sample size determination

Sample size was determined based on the WHO Steps guideline stratifying the population by sex, age and residence. For both sexes, 250 individuals were taken from each age-sex stratum giving a sample size of 2,500. 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) [16].

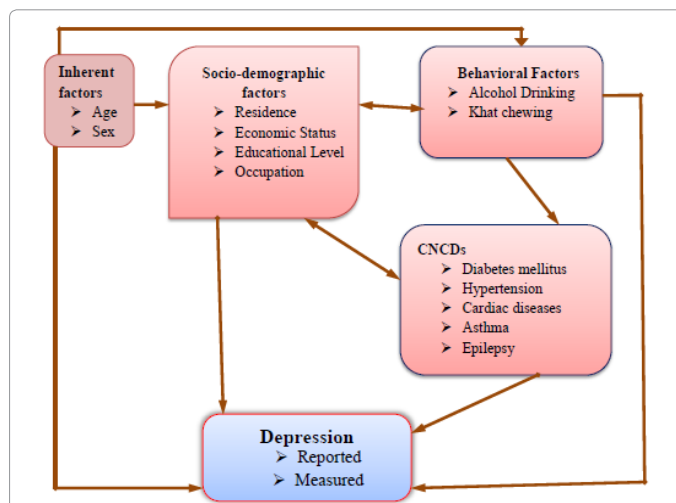


Figure 1: Conceptual framework for factors associated to depression among population aged 15-64 years, GGFRC, Sept 2008 - Jan 2009 (adapted after reviewing different literatures).

Age group	Sex		
	Males	Females	Total
15-24 yrs	500	500	1,000
25-34 yrs	500	500	1,000
35-44 yrs	500	500	1,000
45-54 yrs	500	500	1,000
55-64 yrs	500	500	1,000
Total	2,500	2,500	5,000
Adding 10% for non-response			5,500

Table 1: Age and sex strata of study population GGFC, Sept 2008- Jan 2009.

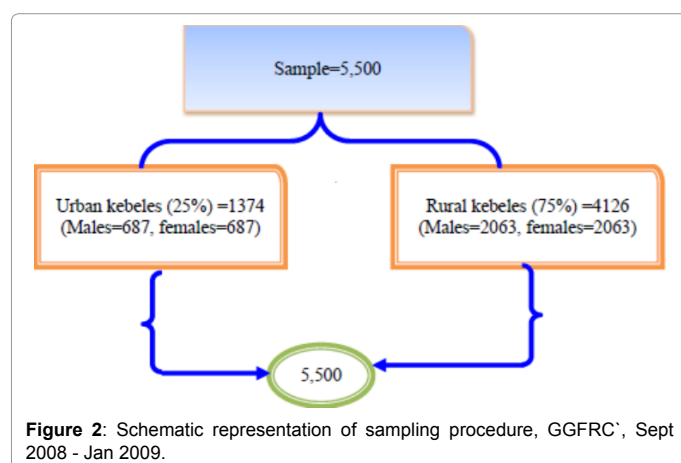


Figure 2: Schematic representation of sampling procedure, GGFC, Sept 2008 - Jan 2009.

With regards to the current study, sample size was 4,371 individuals who participated on the first step of the survey [16].

Sampling procedures

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 (Figures 1 and 2) [16].

Data collection instrument

Interviewer administered structured questionnaires in English language were adapted from WHO STEPS instruments to collect data [16]. 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, behavioral factors like alcohol consumption and khat chewing, and symptoms and history of depression [16].

Data collection

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 [16].

Study variables

Dependent variables: Reported and measured depression.

Independent variables: Socio-demographic variables, chronic

non communicable diseases and Behavioral factors were considered as independent variable.

Data quality control

Field personnel had a minimum of high school completion and competent in Amharic and Afaan Oromo languages. Fifteen interviewers and 3 supervisors were recruited for CNCDS including depressive disorder survey. 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 [16].

Data processing and analysis

All important data were identified and extracted from main data of the survey and then 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 in electronic copies with back up. Data were then analyzed using SPSS for Windows version 16.0. Descriptive statistics were used to describe the study sample. The results were then expressed as percentage, and respondents were aggregated into two groups consisting of those with depression and without depression.

Chi square analysis was also carried out for both reported and measured depression separately with respect to socio-demographic factors (age, sex, residence, educational status and occupation), chronic non communicable diseases, alcohol use and khat chewing. In addition, chi square for trend analysis was carried out for reported and measured depression with respect to age, educational level, number of CNCDS and frequency of alcohol drinking.

Bivariate logistic regression was carried out to see the association of each independent variable on the dependent variables and those which have p- values below 0.25 remained in to the final models. i.e. multivariate logistic regressions. Odds Ratios (OR) was generated for each variable and the independence of any association was controlled by entering all variables into the model using backward stepwise method. The magnitude of the association between the independent variables in relation to reported and measured depression was measured using adjusted odds ratios (AOR) and 95% confidence interval (CI) and P-values below 0.05 was considered statistically significant.

Results

Socio-demographic characteristics of study participants

Of the 4,371 respondents 2,274 (52%) were females and the rest 2,094 (48%) were males with female to male ratio of 1.1:1. One

Socio-demographic variables	Sex of respondents		
	Males Number (%)	Females Number (%)	Total Number (%)
Age in years			
15-24 yrs	351 (16.8)	360 (15.8)	711 (16.3)
25-34 yrs	390 (18.6)	468 (20.6)	858 (19.6)
35-44 yrs	439 (21.0)	467 (20.5)	906 (20.7)
45-54 yrs	419 (20.0)	436 (19.2)	855 (19.6)
55-64 yrs	495 (23.6)	543 (23.9)	1041 (23.8)
Total	2,094 (100.0)	2,274 (100.0)	4,371 (100.0)
Residence			
Urban	491 (23.4)	598 (26.3)	1,090 (24.9)
Rural	1,603 (76.6)	1,676 (73.7)	3281 (75.2)
Total	2,094 (100.0)	2,274 (100.0)	4,371 (100.0)
Educational level			
Unable to read and write	3,151 (64.5)	1,793 (78.8)	3,147 (72)
Only able to read and write	32 (1.5)	85 (3.7)	117 (2.7)
1-4	280 (13.4)	118 (5.2)	398 (9.1)
5-8	249 (11.9)	147 (6.5)	396 (9.1)
9 and above	182 (8.7)	131 (5.8)	313 (7.2)
Total	2,094 (100.0)	2,274 (100.0)	4,371 (100.0)
Occupation			
Farmer	1,434 (70.6)	475 (21.0)	1,909 (44.5)
Public servant	83 (4.1)	38 (1.7)	121 (2.8)
NGO employee	28 (1.4)	7 (0.3)	35 (0.8)
Merchant	134 (6.6)	79 (3.5)	213 (5.0)
Day laborer	93 (4.6)	30 (1.3)	123 (2.9)
Non-paid employee	14 (0.7)	13 (0.6)	27 (0.6)
Student	130 (6.4)	107 (4.7)	237 (5.5)
House wife	0	1404 (62.1)	1,404 (32.7)
Home maker	3 (0.1)	22 (1.0)	25 (0.6)
Retired	19 (0.9)	18 (0.8)	37 (0.9)
Unemployed	30 (1.5)	40 (1.8)	70 (1.6)
Other	64 (3.1)	29 (1.3)	93 (2.2)
Total	2,032 (100.0)	2,262 (100.0)	4,347 (100.0)

Table 2: Socio-demographic characteristics of study participants, GGFRCC, Sept 2008 - Jan 2009.

thousand forty one (23.8%) respondents were in the age group of 55-64 and 1,676 (73.7%) of females and 1,603 (76.6%) of male respondents were from rural area (Table 2).

Prevalence of depression by socio-demographic characteristics

Prevalence of reported and measured depression was assessed separately with respect to all independent variables. Reported depression was assessed if respondents were diagnosed to have depression by health professionals with in the past 12 months of data collection time whereas measured depression was assessed by asking participants if they had cardinal symptoms of depression that lasts more than two weeks with in the past 12 months of data collection time.

Of 4,371 respondents, 73 (1.7%) reported that they were told to have depression by health professionals. The prevalence among 2,094 males and 2,274 females respondents were 32 (1.5%) and 41 (1.8%) respectively. The prevalence among 1,090 urban and 3,281 rural respondents were 26 (2.4%) and 47 (1.4%) respectively. The prevalence among 711 respondents who were in age group 15-24 years, 858 (25-34 years), 906 (35-44 years), 855 (45-54 years) and 1,041 (55-64) were 10 (1.4%), 16 (1.9%), 16 (1.8%) 14 (1.6%) and 17 (1.6%) respectively (Table 3).

Prevalence of measured depression among 4,371 respondents was 323 (7.4%). The prevalence among 2,094 males and 2,274

females respondents were 126 (6.0%) and 197 (8.7%) respectively. The prevalence among 1,090 urban and 3,281 rural respondents were 70 (6.5%) and 253 (7.7%) respectively. The prevalence among 711 respondents who were in age group 15-24 years, 858 (25-34 years), 906 (35-44 years), 855 (45-54 years) and 1,041 (55-64) were 42 (6.0%), 52 (6.1%), 70 (7.8%), 72 (8.5%) and 87 (8.4%) respectively (Table 3).

Prevalence of depression by age and residence stratified by sex

Seven (1.4%) of urban males, 19 (3.2%) of urban females, 25 (1.6%) of rural males and 22 (1.3%) of rural females were told to have reported depression by health professionals. Five (1.4%) of males and 5 (1.4%) of females who were in age group 15-24 years and 5 (1.3%) of males and 11 (2.4%) of females who were in age group 25-34 years were told to have reported depression by health professionals (Table 4).

Twenty one (4.3%) of urban males, 49 (8.2%) of urban females, 105 (6.6%) of rural males and 148 (8.8%) of rural females had measured depression. Twenty (5.7%) of males and 22 (6.2%) of females who were in age group 15-24 years and 18 (4.6%) of males and 34 (7.3%) of females who were in age group 25-34 years had measured depression (Table 4).

Prevalence of depression by behavioral factors

Prevalence of reported depression were 10 (3.4%) and 9 (3.9%) among 298 alcohol users in the last 12 months and 230 alcohol users

Independent variables	Total respondents n=4371	Reported depression		Measured depression	
		Number (%) n=73		Number (%) n=323	
Sex of respondents					
Males	2094	32 (1.5)	126 (6.0)		
Females	2274	41 (1.8)	197 (8.7)		
Total	4371	73 (1.7)	323 (7.4)		
Age group of respondents in years					
15-24 yrs	711	10 (1.4)	42 (6.0)		
25-34 yrs	858	16 (1.9)	52 (6.1)		
35-44 yrs	906	16 (1.8)	70 (7.8)		
45-54 yrs	855	14 (1.6)	72 (8.5)		
55-64 yrs	1,041	17 (1.6)	87 (8.4)		
Total	4,371	73 (1.7)	323 (7.4)		
Residence					
Urban	1,090	26 (2.4)	70 (6.5)		
Rural	3,281	47 (1.4)	253 (7.7)		
Total	4,371	73 (1.7)	323 (7.4)		
Educational level					
Unable to read and write	3,132	52 (1.7)	273 (8.7)		
Only able to read and write	117	2 (1.7)	6 (5.1)		
1-4 Grade	396	5 (1.3)	16 (4.0)		
5-8 Grade	393	11 (2.8)	21 (5.4)		
9 grade and above	312	3 (1.0)	7 (2.3)		
Total	4,371	73 (1.7)	323 (7.4)		
Occupation					
Farmer	1,909	25 (1.3)	120 (6.3)		
Public & NGO servant	121	5 (4.1)	4 (3.3)		
Merchant	213	7 (3.3)	5 (2.3)		
Day laborer	123	4 (3.3)	13 (10.6)		
Non-paid	27	1 (3.7)	2 (7.4)		
Student	237	9 (3.8)	11 (4.6)		
House wife	1,457	25 (1.7)	141 (9.7)		
Home maker	25	1 (4.0)	2 (8.0)		
Retired	37	4 (10.8)	5 (13.5)		
Unemployed	70	6 (8.6)	14 (20.0)		
Other	93	2 (2.2)	4 (4.3)		
Total	4,358	73 (1.7)	323 (7.4)		

Table 3: Prevalence of depression by socio-demographic characteristics GGFR, Sept 2008- Jan 2009.

Independent variables	Depression					
	Males			Females		
	Total respondents	Reported depression No (%)	Measured depression No (%)	Total respondents	Reported depression No (%)	Measured depression No (%)
Residence						
Urban	491	7 (1.4)	21 (4.3)	598	19 (3.2)	49 (8.2)
Rural	1603	25 (1.6)	105 (6.6)	1676	22 (1.3)	148 (8.8)
Total	2094	32 (1.5)	126 (6.0)	2274	41 (1.8)	197 (8.7)
Age in years						
15-24 yrs	351	5 (1.4)	20 (5.7)	360	5 (1.4)	22 (6.2)
25-34 yrs	390	5 (1.3)	18 (4.6)	468	11 (2.4)	34 (7.3)
35-44 yrs	439	9 (2.1)	25 (5.7)	467	7 (1.5)	45 (9.7)
45-54 yrs	419	7 (1.7)	29 (6.9)	436	7 (1.6)	43 (9.9)
55-64 yrs	495	6 (1.2)	34 (6.9)	543	11 (2.0)	53 (9.8)
Total	2094	32 (1.5)	126 (6.0)	2274	41 (1.8)	197 (8.7)

Table 4: Prevalence of depression by age and residence stratified by sex of respondents, GGFR, Sept 2008 - Jan 2009.

in the last 30 days respectively. The prevalence among 1,812 ever khat chewers and 1,682 current khat chewers were 31 (1.7%) and 25 (1.5%) respectively (Table 5).

Prevalence of measured depression among 298 alcohol users in the last 12 months and 230 alcohol users in the last 30 days were 23 (7.7%) and 20 (8.7%) respectively. The prevalence among 1,812 life time khat

chewers and 1,682 current khat chewers were 112 (6.2%) and 101 (6.0%) respectively (Table 5).

Prevalence of depression by CNCDs

Prevalence of reported depression among 115 hypertensive, 23 diabetic, 64 asthmatic and 23 epileptic respondents were 3 (2.6%), 1 (4.3%), 2 (3.1%) and 2 (8.7%) respectively. The prevalence among 130 respondents with heart disease was 10 (7.7%) (Table 6).

Prevalence of measured depression among 115 hypertensive, 23 diabetic, 64 asthmatic, 130 respondents with heart disease and 23 epileptic respondents were 11 (9.6%), 3 (13.0%), 7 (11.0%), 21 (16.2%) and 3 (13.0%) respectively (Table 6).

Factors affecting depression

Factors associated with depression were seen using chi square and binary logistic regression (both bivariate and multivariate). Chi-square for trend analysis was carried out for depression with respect to age, educational level, number of CNCDs and frequency of alcohol drinking.

From the above listed independent variables: resident, occupation, number of life-time CNCDs, 12 months alcohol drinking and current khat chewing showed association with reported depression ($p < 0.25$) on bivariate logistic regression and were candidate for multivariate logistic regression (Tables 7 and 8). With regards to measured depression: sex, age, educational level, occupational status, frequency of alcohol drinking in the last 12 months, life time and current khat using, duration of khat chewing and number of CNCDs were candidate for multivariate logistic regression (Table 7).

Multi-collinearity between alcohol drinking and khat chewing, socio-demographic factors (age, sex and residence) and CNCDs, alcohol drinking and CNCDs, khat chewing and CNCDs was checked. No multi-collinearity was found b/n the above mentioned independent variables.

Chi-square test for trend analysis showed that number of CNCDs is associated with the risk of reported and measure depression, the risk increasing with increasing number of CNCDs (P for trend < 0.001).

Independent predictors of depression

In this study occupation of respondents showed statistically significant association with reported depression i.e. retired and unemployed respondents were 6.94 times more likely to have depression compared to farmers (AOR=6.94, 95% CI: 2.10, 22.92) (Table 8). Similarly, alcohol using was found to be significantly associated with reported depression, i.e. 12 months alcohol users were 3.23 times more likely to have depression compared to non-users (AOR=3.23, 95% CI: 1.17, 8.88) (Table 8).

Sex of respondents showed statistically significant association with measured depression. Females were 1.62 times more likely to have depression compared to their counterparts (AOR=1.62, 95% CI: 1.07, 2.44) (Table 9). Similarly, statistically significant association was found between number of CNCDs and measured depression. Respondents having two and above CNCDs were 2.18 times more likely to have depression compared to those with no life time diagnosis of the diseases (AOR=2.18, 95% CI: 1.15, 4.13) (Table 9).

Discussion

The overall 12 months prevalence of reported depression among study population was found to be 1.7%. This finding is in line with the study done in USA which showed the 12-month prevalence of major

depressive disorder in the general population to be 1.55% [17-25], but a community-based study conducted on women in reproductive age groups of rural Ethiopia showed 4.4% of 12-month prevalence of depression [26]. The later mentioned study was done on specific group of population, women of reproductive age group, in which the difference in age and sex may be a reason for the inconsistency to our finding.

In our study, the prevalence of measured depression among study population was 7.4% which is much higher than the reported one. The implication of this large difference is, most of depressed individuals do not seek treatment due to the stigma and discrimination to depression [6,9] which is probably very common in our society. This finding is not supported by the study conducted in Southwest Ethiopia which showed 9.1% of 12-month prevalence of major depression in the general population [15]. Possible explanation of this discrepancy is the strict diagnostic rule of the tool the investigators used in the mentioned study. This finding is also inconsistent with survey conducted in south Ethiopia, Meskan and Mareko district which showed 2.4% prevalence of major depression within the previous 12-month period [10]. The later mentioned study was intended to measure the major depression specifically which could be a reason for the inconsistency to the current finding.

In this study, the risk of depression was significantly higher among female respondents compared to males (AOR=1.62, 95% CI: 1.07, 2.44). This finding is in agreement with studies conducted in UK [21], Nigeria [22] and Ethiopian [25-33]. Most of women are economically dependent on males particularly in our society. In addition they take most of responsibilities in the house like childbearing, rearing and others, and face dramatic hormonal shifts related to reproductive functioning [34]. All these factors could emotionally charge them frequently and depression may take hold which could be implications of our finding [34,35]. But another study carried out in Ethiopia revealed no statistically significant association between depression and sex [23]. The mentioned study was conducted at town setting but 75% of our study participants were from rural which could be explanation of the inconsistency. Finding of this study is also in contrast with the study conducted in Nigeria [24]. Possible explanation of this inconsistency is that our study was conducted in community setting on apparently healthy individuals whereas the above mentioned study was conducted in clinical setting using smaller sample size in which setting and diseases can be third variables that could distort the true association.

Finding of the current study showed statistically significant association between depression and occupational status of the respondents. According to the finding retired and unemployed respondents were 6.94 times more likely to have depression compared to farmers (AOR=6.94, 95% CI: 2.10, 22.92). This finding is consistent with studies carried out in Ethiopia [23,26]. Social and economic problems related to unemployment and retirement, such as lost productivity, lost output and income opportunity, lost self-esteem and dignity are implicated as possible causes for the association depression showed with unemployment and retirement [36,37]. But studies conducted in Nigeria showed no statistically significant association between depression and employment status [22,24]. Possible reason of this variation is that studies were done at clinical setting among patients using relatively small sample size in which diseases and setting could affect association between depression and occupational status of respondent's. The difference in genetic and environmental factors among Nigerian and Ethiopian population may also be a possible explanation of the inconsistency between the compared findings.

Risk factors	Total users	With depression	
		Reported N ₀ (%)	Measured N ₀ (%)
Alcohol users			
In the last 12 months	298	10 (3.4)	23 (7.7)
In the last 30 days	230	9 (3.9)	20 (8.7)
Frequency of alcohol drinking			
Daily	25	2 (8.1)	3 (12.0)
5-6 times a week	24	3 (12.5)	7 (29.2)
1-4 times a week	92	6 (6.5)	9 (9.8)
1-3 days a month	116	5 (4.3)	7 (6.1)
Less than once a month	52	4 (7.7)	3 (5.8)
khat chewers			
Ever	1,812	31 (1.7)	112 (6.2)
Current	1,682	25 (1.5)	101 (6.0)
Duration of khat chewing in year			
≤ 10	658	9 (1.4)	39 (5.9)
> 10	1,069	21 (2.0)	69 (6.5)

Table 5: Prevalence of depression by alcohol drinking and khat chewing, GGFRC, Sept 2008 - Jan 2009.

Self-report CNCDs	Total	With depression	
		Reported N ₀ (%)	Measured N ₀ (%)
Diabetes mellitus			
In life	23	1 (4.3)	3 (13.0)
Raised blood pressure			
In life	115	3 (2.6)	11 (9.6)
Heart diseases			
In life	130	10 (7.7)	21 (16.2)
In the last 12 months	84	6 (7.1)	13 (15.5)
Asthma			
In life	64	2 (3.1)	7 (11.0)
In the last 12 months	45	2 (4.4)	3 (6.7)
Epilepsy			
In life	23	2 (8.7)	3 (13.0)

Table 6: Prevalence of depression by chronic non-communicable diseases, GGFRC, Sept 2008 - Jan 2009.

Independent variables		Reported depression	Measured depression
		COR (95%CI)	COR (95%CI)
Sex	Males	1.00	1.00
	Females	1.178 (0.739-1.878)	1.475 (1.170-1.860)*
Age groups in years	15-24	0.854 (0.389-1.876)	0.719 (0.492-1.052)*
	25-34	1.134 (0.569-2.258)	0.733 (0.514-1.046)*
	35-44	1.074 (0.539-2.138)	0.919 (0.660-1.279)
	45-54	0.991 (0.486-2.022)	1.037 (0.748-1.437)
	55-64	1.00	1.00
Residence	Rural	1.00	1.00
	Urban	1.675 (1.032-2.717)*	0.917 (0.702-1.197)
Educational level	Unable to read and write	1.00	1.00
	1-4 grade	0.762 (0.303-1.915)	0.519 (0.318-0.845)*
	5-8 grade	1.715 (0.889-3.308)	0.646 (0.413-1.010)*
	9 and above grade	0.620 (0.193-1.996)	0.308 (0.151-0.628)*
Occupation	Farmers	1.00	1.00
	Public and NGO employees	2.495 (0.941-6.610)*	0.410 (0.149-1.127) *
	Merchants	0.709 (0.167-3.016)	0.526 (0.242-1.144)*
	Day laborer and non-paid	2.581 (0.973-6.841)*	1.721 (0.977-3.030)*
	Student	0.642 (0.151-2.730)	0.761 (0.403-1.434)
	Housewife and home maker	1.336 (0.769-2.324)	1.680 (1.302-2.167)*
	Others	1.663 (0.388-7.131)	0.890 (0.354-2.235)
Retired and unemployed	4.446 (1.784-11.081)*	3.344 (1.967-5.684)*	

Alcohol use in 12 months	Non-users	1.00	1.00
	Users	2.115 (1.074-4.164)*	1.107 (0.723-1.695)
Frequency of alcohol use in 12 months	Non-users	1.00	1.00
	5-7 days/week	2.911 (0.690-12.276)	2.648 (1.224-5.728)*
	1-4 days/week	1.489 (0.359-6.188)	1.087 (0.498-2.374)
	1-3 days/month	1.154 (0.279-4.777)	0.831 (0.383-1.801)
Khat in life	No-users	1.00	1.00
	Users	1.043 (0.653-1.666)	0.755 (0.596-0.957)*
Khat current	Non-users	1.00	1.00
	Users	0.334 (0.135-0.828)*	0.689 (0.369-1.287)*
Duration of khat chewing in year	Non-users	1.00	1.00
	≤10 years	0.832 (0.404-1.716)	0.706 (0.496-1.004)*
	>10 years	1.202 (0.710-2.036)	0.773 (0.583-1.024)*
CNCDS	No	1.00	1.00
	One	3.451 (1.862-6.396)*	1.593 (1.070-2.371)*
	Two and above	4.447 (1.040-19.016)*	4.797 (2.217-10.377)*

* Variables with p-value <0.25

Table 7: Bivariate table: Depression crude odds ratio (COR) and 95% CI, GGfRC Sept 2008 - Jan 2009.

Independent variables		Reported depression	
		COR (95% CI)	AOR (95%CI)
Residence	Rural	1.00	1.00
	Urban	1.675 (1.032-2.717)	0.535 (0.184-1.555)
Occupation	Farmers	1.00	1.00
	Public and NGO employees	2.495 (0.941-6.610)	1.521 (0.310-7.457)
	Merchants	0.709 (0.167-3.016)	0.607 (0.077-4.769)
	Day laborer and non-paid	2.581 (0.973-6.841)	2.331 (0.603-9.019)
	Student	0.642 (0.151-2.730)	0.532 (0.063-4.819)
	Housewife and home maker	1.336 (0.769-2.324)	1.824 (0.680-4.887)
	Others	1.663 (0.388-7.131)	1.091 (0.103-8.089)
	Retired and unemployed	4.446 (1.784-11.081)	6.935 (2.099-22.918)*
Alcohol in 12 months	Users	2.115 (1.074-4.164)	3.225 (1.171-8.880)*
	Non-users	1.00	1.00
Current khatchewers	Non-users	1.00	1.00
	Users	0.334 (0.135-0.828)	0.443 (0.169-1.160)
CNCDS	No	1.00	1.00
	One	3.451 (1.862-6.396)	1.566 (0.440-5.565)
	Two and above	4.447 (1.040-19.016)	9.872 (1.014-96.08)

*Statistically significant at p value <0.05

Table 8: Independent predictors of reported depression, GGfRC September 2008 - January 2009.

This study demonstrated no statistically significant association between depression and age of participants. This finding is supported by the study conducted in Nigeria [22]. Contrary to this finding; studies done in Ethiopia [15,23] reported a significant association between age and depression. Possible reason of this variation is that our study was done at community level with large sample size of which most of them (75%) were from rural. Our finding is again in contrast with the study done in Nigeria [24]. Current study was conducted in community setting on apparently healthy individuals but, the above mentioned study was conducted in clinical setting on patients using smaller sample size in which sample size, the diseases respondents had, setting and country difference might be the reason for the inconsistency.

Participant's residence showed association with depression on bivariate analysis i.e. urban residents were more likely to have depression compared to rural residents (COR=1.68, 95% CI=1.03, 2.72). But taking to the final model, this association is no longer statistically significant. This finding is consistent with the study conducted in Ethiopia [15], but in contrast with another study conducted in Ethiopia [26]. The

later mentioned study was conducted among women of reproductive age group, but ours was conducted among population 15-64 years age of both sexes. Therefore, difference in sex and age can affect the true association which could be explanation for the inconsistency.

In this study, depression showed no statistically significant association with educational level of study participants (P>0.05). This finding is in agreement with the study conducted in Nigeria [22] but not with the studies conducted in UK [21] and Nigeria [24]. Possible reason of this variation is that the mentioned study was done at clinical setting among patients using smaller sample size. Finding of our study was also inconsistent with the study done in Ethiopia [25]. Possible explanation of this dissimilarity is that the mentioned study was conducted among older women who were widowed and divorced in which age, sex and marital status can affect the association.

Moreover, this study revealed statistically significant associated between 12 months alcohol drinking and depression. According to the finding, alcohol users were more likely to have depression compared to non-users (AOR=3.23, 95% CI: 1.17, 8.88). This finding is consistent

Independent variables		Measured depression	
		COR (95% CI)	AOR (95%CI)
Sex	Males	1.00	1.00
	Females	1.475 (1.170-1.860)	1.618 (1.072-2.443)*
Age group in years	15-24 yrs	0.719 (0.492-1.052)	1.355 (0.639-2.871)
	25-34 yrs	0.733 (0.514-1.046)	1.167 (0.609-2.238)
	35-44 yrs	0.919 (0.660-1.279)	1.524 (0.854-2.722)
	45-54 yrs	1.037 (0.748-1.437)	1.467 (0.817-2.634)
	55-64 yrs	1.00	1.00
Educational level	Unable to read and write	1.00	1.00
	1-4 grade	0.519 (0.318-0.845)	0.593 (0.289-1.219)
	5-8 grade	0.646 (0.413-1.010)	0.671 (0.297-1.517)
	9 and above grade	0.308 (0.151-0.628)	0.680 (0.225-2.057)
Occupation	Farmers	1.00	1.00
	Public and NGO employees	0.410 (0.149-1.127)	0.204 (0.028-1.500)
	Merchants	0.526 (0.242-1.144)	0.732 (0.228-1.860)
	Day laborer and non-paid	1.721 (0.977-3.030)	1.426 (0.594-3.423)
	Student	0.761 (0.403-1.434)	0.707 (0.168-2.980)
	Housewife and home maker	1.680 (1.302-2.167)	1.052 (0.525-2.110)
	Retired and unemployed	3.344 (1.967-5.684)	2.367 (0.936-5.986)
	Others	0.890 (0.354-2.235)	0.698 (0.162-2.997)
Frequency of alcohol use in 12 months	Non-users	1.00	1.00
	5-7 days/week	2.648 (1.224-5.728)	2.199 (0.438-11.032)
	1-4 days/week	1.087 (0.498-2.374)	1.154 (0.255-5.223)
	1-3 days/month	0.831 (0.383-1.801)	1.434 (0.418-4.913)
Khat in life	No-users	1.00	1.00
	Users	0.755 (0.596-0.957)	1.199 (0.149-9.636)
Khat current	Non-users	1.00	1.00
	Users	0.689 (0.369-1.287)	0.829 (0.431-1.596)
Duration of khat chewing in year	Non-users	1.00	1.00
	≤10 years	0.706 (0.496-1.004)	0.786 (0.323-1.912)
	>10 years	0.773 (0.583-1.024)	0.775 (0.325-1.848)
CNCDs	No	1.00	1.00
	One	1.593 (1.070-2.371)	1.672 (0.205-13.636)
	Two and above	4.797 (2.217-10.38)	2.176 (1.146-4.132)*

*Statistically significant at p value <0.05.

Table 9: Independent predictors of measured depression, GGFRCC September 2008 - January 2009.

with the studies conducted in Brazil [27], Spain [29], Kenya [30] and Ethiopia [15]. Alcohol drinking disrupts balance of the delicate chemicals (neurotransmitters like serotonin and nor-epinephrine) and processes which our brains rely on. This disruption affects thoughts, feelings and actions which might be implicated as cause of long term mood depression [38].

In this study, current khat chewing was found to be protective to depression on bivariate analysis. But after controlling for all other variables, this association is no longer statistically significant ($p > 0.05$). This finding is in line with the studies conducted in South London [31] and Ethiopia [32]. But it is inconsistent with another study done in Ethiopia [23]. Possible explanation of this difference is that all participants of the mentioned study were from town in which use of other substances (coffee, cigarette, shisha and others) might assist the effect of khat. The difference of setting under which compared studies done is also possible explanation for the inconsistency. The finding of our study is also in contrast with another study conducted in Ethiopia [26]. The later mentioned study was conducted merely among women of reproductive age group who were different from our

study participants in age and sex composition. This could be possible explanation for the inconsistency between the compared studies.

According to the finding of our study, those study participants who were diagnosed with CNCDs showed direct trend association with depression (P for trend < 0.0001), the risk increasing with increasing number life-time diagnosis of CNCDs. Logistic regression analysis also showed similar finding: respondents having two and above CNCDs were 2.18 times more likely to have depression compared to those free of diseases (AOR=2.18, 95% CI: 1.15, 4.13). This finding is in line with studies conducted in Ethiopia [15] and Nigeria [24]. The long-lasting and incurable nature of CNCDs, the unaffordable cost of health services, premature deaths and disabilities attributed to the diseases are possible implications for the cause of depression among respondents having CNCDs [39].

Conclusion

The prevalence of measured depression among study population was high in this study. From the socio-demographic characteristics,

sex and occupation of respondents were found to be independent predictors of depression. In addition alcohol use and number of CNCDs showed statistically significant association with depression.

Other variables like age, residence, educational status, and khat chewing didn't show statistically significant association with depression.

Recommendations

Alternative working and recreational environment need to be arranged by concerned bodies (local government and non-government organizations) for the retired segment of the society. In addition, the problem of unemployment in the society needs to be resolved by Federal Ministry of Labor and Social Affairs, Oromia Regional State Labor and Social Affairs Agency, Jimma zone administration office, local district administration office, kebele administrations, local private and NGOs.

We also recommend on the need of intensive and continued BCC/IEC on the danger of unhealthy alcohol consumption by Federal MOH, Oromia Regional Health Bureau, Jimma zone health office, Jimma University, local district health office, health extension workers and health development armies of all kebeles in the district. We again recommend that interventional activities for depression to be incorporated in to prevention and control programs targeted to CNCDs in all aspects. We mean, individuals with CNCDs coming to health facilities for help need to be screened for depression and important measures should be taken accordingly. Moreover, another studies with stronger design need to be carried out in the area considering our limitations.

Ethical Considerations and Consent To Participate

Proposal was presented to Jimma University College of Public Health and Medical Sciences, department of epidemiology. Then it was submitted to Ethical clearance board of Jimma University for final ethical clearance and then approval letter was obtained. Finally, supportive letter was obtained from epidemiology department and submitted to GGFRCC and then important data were obtained from the Center.

Consent to Participant

Not applicable.

Availability of Data and Materials

Data supporting the findings is available upon request. Please contact the Principal Investigator of the study, Gebi Husein (gebihusseini@gmail.com).

Competing Interests

The authors declare that they have no competing interests.

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Authors' Contributions

GH, MT and DH have participated on design of the study, analysis and

preparations of the manuscript. HF conceived of the study, and participated in its design and coordination and helped to draft the manuscript. And all authors contributed to critically revising the paper. Finally, all authors read and approved the final version of the manuscript.

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