

**ASSESSMENT OF PREVALENCE AND RISK FACTORS
OF DEPRESSION AMONG ADULTS IN GILGEL GIBE
FIELD RESEARCH CENTER, SOUTH WEST ETHIOPIA**

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Assessment of prevalence and risk factors of depression among adults in Gilgel Gibe Field Research Center, South West Ethiopia

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Abstract

Background: 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 a very limited scientific data regarding the association of alcohol drinking, khat chewing and chronic non-communicable diseases with depression in Ethiopia and of course in the study area.

Objective: To assess prevalence and risk factors of depression among population aged 15-64 years in Gilgel Gibe Field Research Center of Jimma University.

Method: A population-based cross-sectional study on chronic non communicable diseases was conducted by staff of Jimma University in Gilgel Gibe Field Research center from late September 2008 to end of January 2009. Data were collected from a random sample of 4,371 individuals aged 15-64 years on major risk factors for public health important chronic non communicable diseases including depression. Data were processed & analyzed using SPSS for windows version 16.0. Descriptive statistics were used to describe the study sample. Bivariate and multivariate logistic regressions were carried out and association between independent variables and depression was measured using adjusted odds ratios (AOR) and 95% confidence interval (CI) and P- value below 0.05 was considered statistically significant.

Result: Finding of the study showed that prevalence of reported and measured depression was 1.7% and 7.4% respectively. Retired and unemployed respondents were 6.94 times more likely to have depressions compared to farmers (AOR=6.94, 95% CI: 2.10, 22.92) and females were 1.62 times more likely to have depression compared to males (AOR=1.62, 95% CI: 1.07, 2.44). Similarly, 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). Respondents having two and above chronic non-communicable 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: From socio-demographic factors, sex and occupation of respondents were found to be independent predictors of depression. In addition alcohol use and number of chronic non-communicable diseases were showed significant association with depression. Other variables like age, residence, educational status and khat chewing didn't show statistically significant association with depression.

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List 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

1. Introduction

1.1. Background

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, dysphoric 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 [2 & 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].

1.2. Statement of the problem

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] f o r major depression. It represents a major public health problem and leads to high mortality from suicide, accidental death, and somatic complication [7].

The WHO study of mental disorders in 14 centers across the world found that 50% still had a diagnosis of depression a year later and at least 10% of patients have persistent or chronic depression. At least 50% of people following their first episode of major depression will go on to have at least one more episode and after the second and third episodes, the risk of further relapse rises to 70% and 90% respectively[8]. Early onset depression (at or before 20 years of age) and depression occurring in old age have a significantly increased vulnerability to relapse. Thus, while the outlook for a first episode is good, the outlook for recurrent episodes over the long term can be poor, with many patients suffering symptoms of depression over many years [8].

There is now widespread recognition of the significant burden that depression imposes on individuals and their careers, health services and communities throughout the world [9]. It is the most common mental disorder in community settings, start at a young age [4] 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].

There is a clear dose-response relationship between illness severity and the extent of disability and onsets of depression are associated with onsets of disability, with an approximate doubling of both social and occupational disability [6 &9].

Depression causes a greater decrement in health state than other major CNCs. Apart from the subjective suffering experienced by people who are depressed, the impact on social and occupational functioning, physical health and mortality is substantial[6 ,9 &10]. Emotional,

motivational and cognitive effects substantially reduce a person's ability to work effectively, with losses in personal and family income as well as employment skills. Wider social effects include: greater dependence upon welfare and benefits with loss of self-esteem and self-confidence; social impairments, including reduced ability to communicate and sustain relationships during the illness with knock-on effects after an episode; and longer term impairment in social functioning, especially for those who have chronic or recurrent disorders [6, 9 &11]. The stigma associated with mental health problems generally and the public view that others might view a person with depression as unbalanced, neurotic and irritating may partly account for the reluctance of depressed people to seek help [6&9].

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 comorbid 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, 9 &12].

At its worst, depression can lead to suicide [4] which accounts for nearly 1% of all deaths, and nearly two-thirds of this figure occur in depressed people [8] , equivalently almost 1 million lives loss yearly , which translates to 3000 suicide deaths every day [4 &13].

Sometimes depression may also lead to acts of violence against others, and may even include homicide. Marital and family relationships are frequently negatively affected, and parental depression may lead to neglect of children and significant disturbances in children [6 &9].

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]. 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]. 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 2.2% [15]. A population-based cross-sectional study conducted at GGFRC of JU reported that prevalence of depression among study area was to be 1.7% [16].

Valid and representative epidemiological data on magnitude, patterns, predictors, and outcome of specific psychiatric disorders derived from community based surveys have important scientific and health policy implications. Studying community samples is especially important as the majority of people with severe mental disorders do not seek treatment, particularly in low-income countries [7].

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.

2. Literature review

Depression is a significant contributor to the global burden of disease and affects people in all communities across the world. Today, depression is estimated to affect 350 million people [4]. It often starts at a young age, reduces people's functioning and often is recurring. For these reasons, it is the leading cause of disability worldwide in terms of total years lost due to disability [4].

2.1. Prevalence of depression

The National Epidemiologic Survey on Alcohol and Related Conditions in USA Conducted in 2001- 2002 (n = 43,093) showed that the 12-month and lifetime prevalence of chronic major depressive disorder (CMDD) in the general population were 1.55% (95% CI: 1.41%-1.71%) and 3.18% (95% CI: 2.96%-3.41%), respectively. For NC-MDD, the 12-month and lifetime prevalence in the general population were 3.23% (95% CI: 3.00%-3.48%) and 10.05% (95% CI: 9.56%-10.56%), respectively. But this study had limitations like information was based on interviewed self-report which raises the possibility of misclassification and recall bias, sample only included populations 18 years and older, information was unavailable on adolescents and the cross-sectional design precludes identifying directionality between the variables associated to depression [17].

In sub-Saharan Africa rates of depression range between 15% - 30% when assessed using diagnostic interviews, and 30% - 50% when using self- reports [18]. Another study conducted in sub-Saharan Africa shown that rate depression ranging from 20% to 60% [19].

Across-sectional study done among women in rural Ethiopia (n=1994) in 2009 showed that the 12-month prevalence of depressive episode among the women was 4.8% (95% CI, 3.9% and 5.8%) [20].

Another cross-sectional study done in Meskan and Mareko district, in South central Ethiopia in 2004 demonstrated that the life time prevalence of Bipolar I was 0.5% (n =315), 0.6% for men and 0.3% for women. Unavoidable recall bias of the retrospective design was the main limitation of the study [7].

A cohort study nested within a population-based survey of 68,000 participants, in Meskan and Mareko district of Ethiopia, was conducted using the Composite International Diagnostic Interview (CIDI). It showed that, among the 210 participants with no depression at baseline 5 (2.4%) had major depression at the time of the follow-up assessment or within the previous 12-month period (incident major depression). But this finding could reflect a limitation of CIDI performance in the study area where there is much illiteracy and mental health constructs and the phrases used to describe them may not be well understood. Other limitation of this study is that classification of outcome status was based on 12-month prevalence estimated at a single follow-up assessment, which may have missed fluctuations in clinical state over the whole follow-up period. High attrition rate (30%) was again limitation of the study [10].

2.2. Factors associated to depression

Study from both middle and high income countries have shown many risk factors for depression: Socio-demographic and Socio-economic factors such as age, sex, marital status, financial worries, years of formal education, employment status, poor social support and parental loss at childhood; non communicable disease such as diabetes mellitus, hypertension, cardiac diseases like stroke, asthma, neurological problems like epilepsy; and substance use such as alcohol and khat [15].

2.2.1. Socio-demographic factors

The follow up study conducted on offspring of participants (in which 4140 pregnancies were followed up to the first 7 years of age) in UK, Rhode Island cohort of the National Collaborative Perinatal Project demonstrated that risk of depression onset was significantly higher among individuals from lower SES backgrounds (hazard ratio (HR) = 1.57; 95% confidence interval (CI), 1.08, 2.29). The result of the study also demonstrated that females had an average lifetime risk of depression 75% higher than males and the emergence of the female preponderance in depression in adolescence (HR, 1.81; CI, 1.12, 2.92). With regards to educational status this study showed that individuals with 9 years of education were at more than twice the risk for recurrent depression (RR, 2.56; CI, 1.93, 3.41) than individuals with 13 years. However these findings were not without limitations. The reliance of analysis on the accuracy of subjects' recalling of the age of their first depressive symptoms occurrence and dependency on human

memory of the ability of instruments use to reliably assess the chronology of symptom onset are the limitations the study had [21].

The logistic regression model of the study conducted in USA in 2001- 2002 (n = 43,093) showed that age was an independent predictors of chronic major depression: (compared with individuals between 18 and 29 years old, those between 30 and 44 had OR=1.45, 95% CI=1.09–1.92; between 45 and 64 OR=2.13, 95% CI=1.61–2.86; and older than 65 OR=4.00, 95% CI=2.70–5.88) [17].

A cross-sectional study conducted between December 2005 and April 2006 among 160 diabetic patients at Jos university teaching hospital, Nigeria showed a statistically significant association between depression and gender of the respondents(df=1,x²=11.135,p=0.001), but no statistically significant association between depression and educational attainment of the respondents (df=1,x²=1.229,p=0.268) , employment status (df=1, x²=0.04,p=0.84), and the respondents age groups (df=1,x²=1.530,p=0.216). The major limitation of this study was that sample cannot be representative of the general population as subjects were selected from tertiary health care facility [22].

This cross-sectional community-based study carried out in Jimma City, Ethiopia (2009) revealed depression showed statistically significant association with age (p=0.025), educational level (p<0.001 and occupational status (p=0.022) but not with sex (P=0.514) . Possible presence of the third variables, coffee use and smoking and the inability of cross-sectional study in determining the direction of association were limitations of the study [23].

A cross-sectional study conducted in 2005 among randomly selected 250 newly registered patients at Wesley Guild Hospital, Nigeria showed a statistically significant association between depression and educational status and age. According to the study, depression was found to be commoner among subjects with no formal education. Forty-seven (87.0%) of 54 subjects with no formal education had depression, while depression was found in 102 (52.0%) of the 196 educated subjects (p = 0.000). The findings of the study also revealed that depression was more common in the age group 45 years and older, and there was a strong association between age and

depression ($p = 0.000$). But, employment status was found not to have a significant relationship with depression ($p = 0.265$), with the majority (79.6%) of the unemployed subjects being depressed in comparison to 139 (58.6%) from the employed group. Similarly, There was no significant association between depression and gender in this study ($p = 0.800$) [24].

A cross-sectional survey conducted on 10,468 rural and semi-urban adults in an Ethiopian district showed that the prevalence of mental distress was 17%. Mental distress was more prevalent among women. Part of the explanation was that women in the study population were older and that they were more often widowed or divorced. Illiteracy, which was more common among women and older individuals, was also independently associated with mental distress. The inability to determine direction of association of cross-sectional study was main limitation of the study [25].

Another community-based study conducted on women in reproductive age groups ($n= 3016$) of rural Ethiopia in 2008 revealed that the 12-month prevalence of depression among all women was 4.4%. According to the study, marital status showed a significant association with depressive episode in terms of higher odds ratios (ORs) for divorced/separated women and widowed women than for not-married women (4.05 and 4.24, respectively). Among currently married women, living in rural villages (OR=3.78) and having a seasonal job (OR=2.94) were independently associated with depression [26].

A cross-sectional study done using the data from the 2003 ENHS collected by Jimma University in collaboration with WHO ($n=4936$) showed that 12 months over all prevalence of depression to be 9.1 % (95% CI 8.31–9.90). The proportion among male and female was 8.7% (95% CI 7.66–9.83) and 9.5% (95% CI 8.36–10.64) respectively. Chi-square test for trend analysis of this study also showed that age is associated with the risk of depression episodes , the risk increasing with increasing age (P for trend <0.0001): those 55–64 years old had a higher risk (OR=1.4, 95% CI 1.01– 2.14), 65–74 years old (OR=1.8, 95% CI 1.21–2.81) and 75 years and older had a risk (OR=2.2, 95% CI 1.28–3.78) of developing depression episodes compared to those in age between 18 and 30 years, which was statistically significant association. According to this study there was no statistically significant association between depression and other socio-

demographic characteristics .i.e. sex, residence, educational level and job status (p-value > 0.05). However these findings were with a number of limitations: the identification of individuals with depression episodes by interviewing in the past 12 months which is subject to recall bias , Ethiopian national health survey (ENHS) was a cross-sectional study and didn't include questions on onset and duration of illness and details of health care use, the inappropriateness for the out-patient clients and lengthy questions of amharic version of CIDI and validity of the CIDI is also problem because of strict diagnostic rule [15].

2.2.2. Chronic non-communicable diseases

In context to this study chronic non-communicable diseases are diabetes mellitus, hypertension, cardiac diseases, asthma and epilepsy.

A cross-sectional study done using the data from the 2003 ENHS collected by Jimma University in collaboration with WHO clearly demonstrated that(n=4936) ,those study participants who were diagnosed with chronic non-communicable diseases (CNCDs) showed a significant trend association with depressive episodes (P for trend <0.0001), the risk increasing with increasing number of CNCDs . After fully adjusting for all variables, being having one diagnosis of chronic non communicable disease had a higher risk for presence of depression episodes (OR=2.6, 95% CI 2.03–3.25) and having two or more diagnoses of chronic non communicable diseases further increases the likelihood (OR=4.2, 95% CI 3.18–5.57) for the presence of depression episodes as compared to those with no life time diagnoses of non-communicable diseases [15].

A cross-sectional study conducted between December 2005 and April 2006 among 160 diabetic patients at Jos university teaching hospital, Nigeria showed that, a total of 31 of 160 diabetic subjects were identified as depressed using DSM-IV criteria giving 1-year prevalence rate of 19.4%. Twenty one (67.7%) of the 31 depressed subjects was rated as having minor depression, 10(32.5 %) as moderate to severe depression using the Hamilton depression rating scale (HDRS) [22].

A cross-sectional study conducted between 13 June and 10 September 2005 among randomly selected 250 newly registered patients at Wesley Guild Hospital, Nigeria showed significant association between depression and chronic health problems. The study demonstrated that majority of the depressed subjects had one or more chronic medical conditions, chief among which were hypertension and/or diabetes [24].

2.2.3. Behavioral factors

2.2.3.1. Alcohol use

According to epidemiological survey conducted in city of São Paulo, Brazil (n=2,083 adults), depression was associated with men. Among them, depression was associated with the alcohol consumption pattern ($p < 0.05$) with the highest rates among moderate drinkers (16.0%) and the lowest among mild drinkers (7.7%). Presenting more than a monthly binge drinking episode was also associated with depression with a prevalence rate of 16.3% ($p < 0.05$). Limitations of survey were: the inability of transversal design to allow casual interference as exposures and outcomes are simultaneously observed, the problem of reliability of self-reporting and people who agree to participate in surveys are usually more concerned with health and prone to avoid exposing themselves in risk situations [27].

A follow up study done on the sample of 6,355 alcoholics from 41 sites in Chicago, USA showed that the rate of lifetime diagnosis of major depression was 43.7% in the total sample (N=6,248); for subclinical depression (less than five criteria in DSMIII- R for major depression) the lifetime rate was 9.6%. Over half of the patients had two or more symptoms of depression and 35.9% had five or more symptoms of major depression. The limitations of this study were that only a history of a lifetime diagnosis of major depression was reported and not its direct relationship to alcohol use and the specific etiological roles in alcohol drinking causing depression or depression causing drinking were not examined [28].

A cross-sectional study conducted on 707 Spanish adolescents (365 boys and 342 girls) in Barcelona, Spain revealed that alcohol use is significantly associated with depression, i.e., users tended to score higher in depression than non-users ($OR = 0.94$, $CI\ 95\% 0.92-0.96$, $p < .01$). But this finding was from sample that was taken from a single municipality [29].

A Clinical trial conducted among 188 alcohol-dependent persons in Kangemi, Kenya demonstrated that there was a statistically significant association (P value 0.002) between depression and alcohol dependence. The study had limitations: sample was purposely selected, no past history or family history of depression was obtained from the participants at intake as such a sample may produce skewed prevalence rates of depression [30].

A cross-sectional study done using the data from the 2003 ENHS collected by Jimma University in collaboration with WHO ($n=4936$) showed that the risk of depression is significantly higher for the three groups alcohol users: for non-heavy drinker (OR=2.3, 95% CI 1.87–2.89), infrequent heavy drinkers (OR=2.5, 95% CI 1.54–4.09) and for frequent heavy drinkers (OR=1.9, 95% CI 1.42–2.79) after controlling for age and gender [15].

2.2.3.2.Khat use

A community-based study conducted on women in reproductive age groups of rural Ethiopia revealed khat-chewing habit (OR=1.61) was independently associated with depression [26].

This cross-sectional community-based study carried out in Jimma City, Ethiopia (2009) showed that from a total of 453 khat users, 157 (34.7%) had mental distress. According to the study, daily khat chewers and those who used khat for the last six months showed mental distress with a prevalence of 41.0% and 39.1%, respectively. Khat use, frequency and duration had significant association with mental distress ($P<0.001$) [23].

A secondary data analysis of multinomial logistic regression on a population sample of 180 Somali men and women living in South London show that current khat use is not associated with depressive symptoms. But this study had a number of limitations. Information bias which is common in studies of substance misuse, failure to determine better measures of khat use such as types of khat, strength of the specific type, and the manner in which it is chewed and absence measure of the strength of khat chewed as this could account for different effects in Somalia and in London were the main limitations [31].

According to an ethnographic research conducted between 2003 and 2005 among youth in Jimma, Ethiopia and a survey of approximately 1,600 youth in Jimma and the surrounding area

conducted in 2009 and 2010: there is no correlation between a high number of symptoms of depression and khat consumption i.e. khat chewing (chi-square test, $P = 0.83$) did not appear as a primary cause for symptoms of depression or that these symptoms necessarily lead to khat consumption [32].

2.3. Significance of the study

Depression is a significant contributor to the global burden of disease and affects individuals and their careers, health services and communities across the world. 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. Emotional, motivational and cognitive effects substantially reduce a person's ability to work effectively, with losses in personal and family income, employment skills, loss of self-esteem and self-confidence, social impairments; including reduced ability to communicate and sustain relationships during the illness and rates of treatment are often low. At its worst, it can even lead to suicide.

Valid and representative epidemiological data on magnitude and factors associated to depression derived from community have important scientific and health policy implications. There is a very limited scientific data regarding the association of alcohol use, khat chewing and CNCs 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 CNCs and depression among adults are common in the country.

Therefore, the aim of this study was to assess the association of alcohol drinking, khat chewing and chronic non-communicable diseases with depression among population aged 15-64 years old in Jimma University Gigele Gibe Field research center, south west Ethiopia. The finding of this study will be helpful for local health planners, local health department and those stakeholders working on mental health related areas to consider during their planning and designing an intervention strategies, monitoring and evaluation of their activities. This study will also provide baseline information and directions for further research activities in the area.

2.4. Conceptual Framework

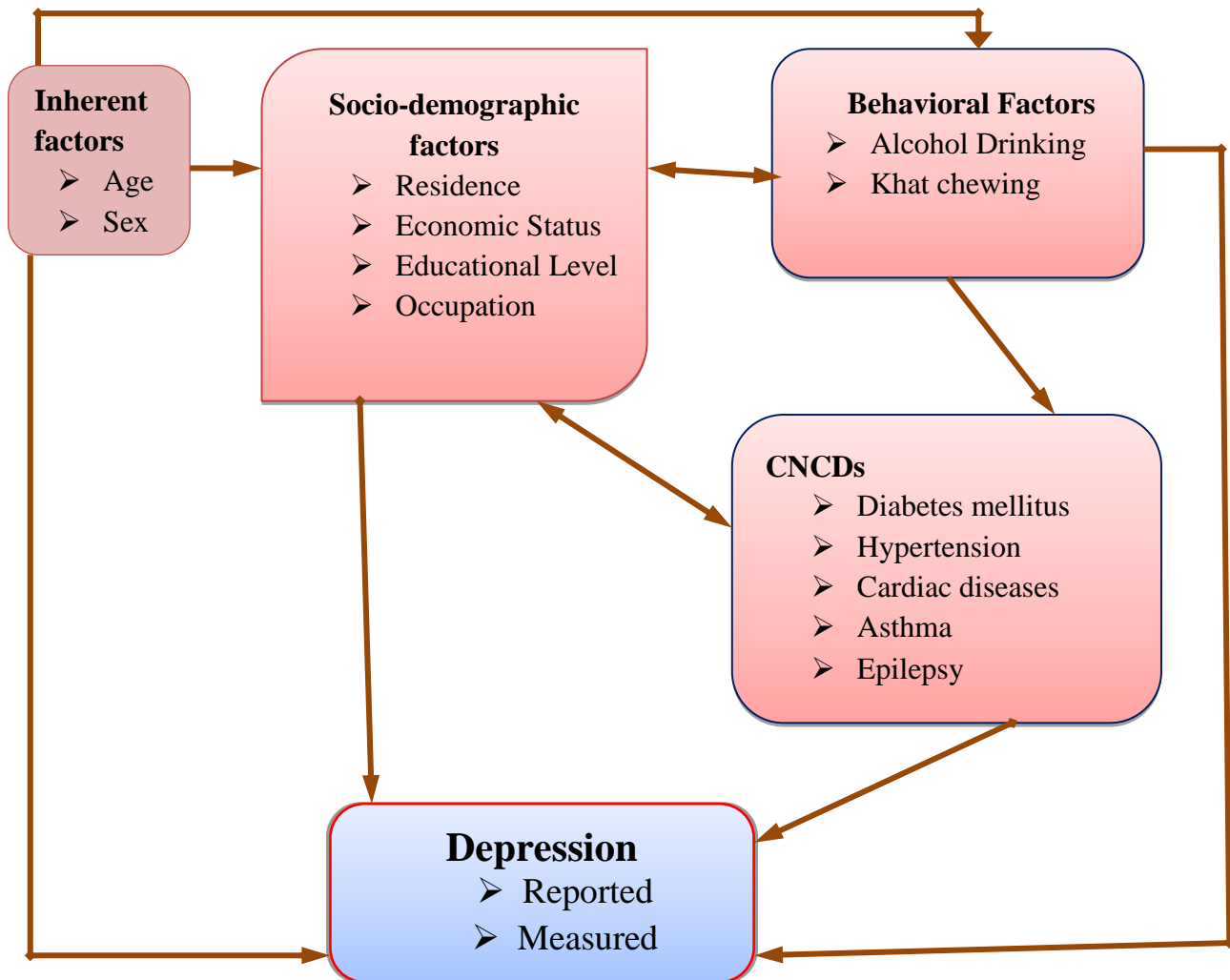


Figure 1:- Conceptual framework for factors associated to depression among population aged 15-64 years, GGFRC, Sept 2008- Jan 2009 (adapted after reviewing different literatures).

3. Objective

3.1. General Objective

- To assess prevalence and risk factors of depression among population aged 15-64 years in Jimma University Gige Gibe Field Research Center, south west Ethiopia.

3.2. Specific objectives

- To determine prevalence of depression among population aged 15-64 years in Jimma University Gige Gibe Field Research Center, south west Ethiopia.
- To assess socio-demographic factors associated with depression among population aged 15-64 years in Jimma University Gige Gibe Field Research Center, south west Ethiopia.
- To determine association between alcohol drinking and depression among population aged 15-64 years in Jimma University Gige Gibe Field Research Center, south west Ethiopia.
- To determine association between khat chewing and depression among population aged 15-64 years in Jimma University Gige Gibe Field Research Center, south west Ethiopia.
- To determine association between CNCDS and depression among population aged 15-64 years in Jimma University Gige Gibe Field Research Center, south west Ethiopia.

4. Method and Material

4.1. 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].

In the current study, data of the above mentioned survey were used to answer our research questions.

4.2. 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. 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 at the time of data collection [16].

4.3. Study design

Population-based cross-sectional study was employed [16].

4.4. Source population

The source population was all individuals aged 15 to 64 years of both sexes (24,500), who were residents of the 10 kebeles during data collection period [16].

4.5. 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).

4.6. Eligibility criteria

4.6.1. Inclusion criteria

Subjects aged 15-64 years who were residents of GGFRC during data collection period were included in to the study [16].

4.6.2. Exclusion criteria

Subjects who couldn't respond to the questions: who were critically ill, and physically handicapped (cannot hear and speak) were excluded from the study [16].

4.7. Study variables

4.7.1. Dependent Variables

Depression: Reported and measured depression

4.7.2. Independent variables

4.7.2.1. *Socio-demographic variables:* age, sex, residence, educational level, economic and occupation status.

4.7.2.2. *Chronic non communicable diseases:* diabetes mellitus, hypertension, cardiac diseases, asthma and epilepsy.

4.7.2.3. *Behavioral factors:* alcohol drinking and khat chewing

4.8. 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 [16].

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

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

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

4.9. 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 [16].

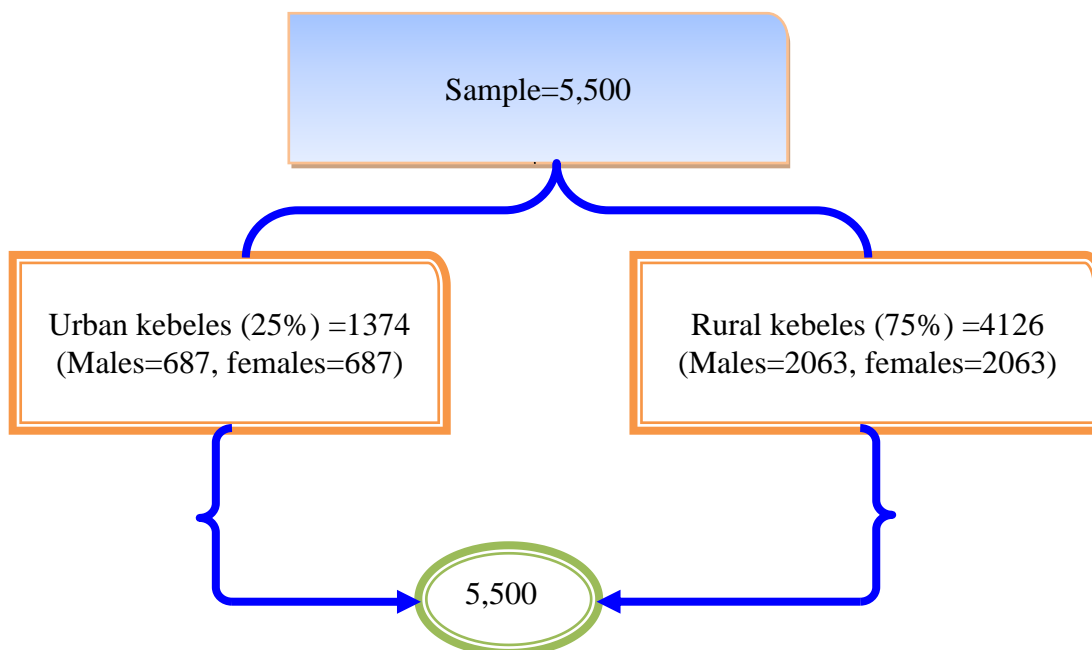


Figure 2: Schematic representation of sampling procedure, GGFRC, Sept 2008- Jan 2009

4.10. 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 [16]. The questionnaires comprised of socioeconomic and demographic variables, behavioral factors like alcohol consumption and khat chewing, and symptoms and history of depression [16].

The outcome variable, depression, was measured using step I of WHO STEPS guideline for surveillance of risk factors for CNCs since interview is enough to measure it i.e. physical and biochemical measurements are not needed to measure depression [16]. Instrument that was used to measure depression contained symptoms and history of depression like sadness/sense of empty/depressed mood, loss of interest or pleasure in activities that previously make him/her pleased while doing many time such as activities he/she do on his/her part-time and working with other people, fatigue or energy loss, loss of appetite, attention and concentration difficulties and duration and frequency of these symptoms [16].

A criterion of ICD-10 was used in aggregating respondents into those with depression and without depression to assess measured depression. At least two of the three cardinal symptoms of depression (sadness/sense of empty/depressed mood, loss of interest/pleasure in activities and fatigue/energy loss) with a duration of more than two weeks was assessed with in the past 12 months of data collection time to classify respondents as having measured depression[2,3].

In addition the instrument contained reported depression if respondents were diagnosed as having depression by health professionals with in the past 12 months of data collection time. This was used as criteria to assess reported depression with in the past 12 months [16].

4.11. 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].

4.12. Training of data collectors and pre-testing

Training was given for data collectors and supervisors on the purpose of the study, how to get informed consent, on interviewing technique and recording data. Supervisors were additionally trained on supervision techniques. Different training methods were employed, including interviewing practice and role playing. All data collectors were provided with manuals that covers the standard survey procedures. Pre-test was conducted and then, 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 [16].

4.13. 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].

4.14. 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.

4.15.Operational definition

Depression: Presence of depression among interviewed population diagnosed by health professionals while visiting health institutions with in the past 12 months of data collection time (reported depression) and if an individual had at least two of cardinal symptoms and history of depression like sadness/sense of empty/depressed mood, loss of interest or pleasure in activities that previously make him/her pleased while doing many time such as activities he/she do on his/her part-time and working with other people and fatigue or energy loss for a duration of more than two weeks with in the past 12 months of data collection time (measured depression).

Alcohol drinking: refers alcohol drinking with in the past 12 months of data collection time.

Khat chewing: refers khat chewing with in the life of an individual and in the last 12 months of data collection time.

Diabetes mellitus: refers if an individual was diagnosed with diabetes mellitus by health professional with in life and in the past 12 months of data collection time (self-reported DM).

Hypertension: refers if an individual was diagnosed with hypertension by health professional with in life and in the past 12 months of data collection time (self-reported hypertension).

Cardiac diseases: if an individual was diagnosed with cardiac diseases by health professional with in life and in the past 12 months of data collection time (self-reported cardiac diseases).

Asthma: if an individual was diagnosed with asthma by health professional in life and in the past 12 months of data collection time (self-reported asthma).

Epilepsy: if an individual was diagnosed with epilepsy in life and within the past 12 months of data collection time (self-reported epilepsy).

Public and NGO servants: a category of occupational status of study participants having public and NGO employees.

Day laborer and non-paid: a category of occupational status of study participants having day laborer and non-paid.

House wife and home makers: a category of occupational status of study participants having house wife and home makers.

Retired and unemployed: a category of occupational status of study participants having retired and unemployed.

4.16. Ethical consideration

Proposal was presented to Jimma University College of Public Health and Medical Sciences, department of epidemiology. Then it was submitted to health research and post graduate coordinating office of the college for final ethical clearance and then approval letter was obtained. Finally, supportive letter was obtained from epidemiology department and submitted to GGFRC and then important data were obtained from the Center.

4.17. Dissemination of the results

The finding of the study will be submitted to College of Public Health and Medical Sciences of Jimma University in partial fulfillment of the requirements for the degree of the master of public health. The thesis will also be submitted to Federal MOH, Oromia regional health bureau, GGFRC, Jimma zone administration office, Jimma zone health office, local district administration office, local district health office and all kebeles in the center. The finding will also be presented for different work-shops and seminars and will be published in a peer reviewed journal.

5. Results

5.1. 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 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. Of 4,371 (2,274 females, 2,094 males) respondents who reported about their educational status, 1,793(78.8%) of the females and 3,151(64.5%) of the males were unable to read and write. Out of 4,347(2,262 females and 2,085 males) study participants who reported about their occupation, 1,434(70.6%) of males were farmers while 1,457(62.1%) of females were housewife (table 2).

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

Socio-demographic variables	Sex of respondents		
	Males Number (%)	Females Number (%)	Total Number (%)
Age in Years			
15-24	351(16.8)	360(15.8)	711(16.3)
25-34	390(18.6)	468(20.6)	858(19.6)
35-44	439(21.0)	467(20.5)	906(20.7)
45-54	419(20.0)	436(19.2)	855(19.6)
55-64	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)

5.2. 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).

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

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 year			
15-24	711	10(1.4)	42(6.0)
25-34	858	16(1.9)	52(6.1)
35-44	906	16(1.8)	70(7.8)
45-54	855	14(1.6)	72(8.5)
55 -64	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)

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).

Table 4: Prevalence of depression by age and residence stratified by sex of respondents, GGFRC, 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 year						
15-24	351	5(1.4)	20(5.7)	360	5(1.4)	22(6.2)
25-34	390	5(1.3)	18(4.6)	468	11(2.4)	34(7.3)
35-44	439	9(2.1)	25(5.7)	467	7(1.5)	45(9.7)
45-54	419	7(1.7)	29(6.9)	436	7(1.6)	43(9.9)
55-64	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)

5.3. 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 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).

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

Risk factors	Total users	With depression	
		Reported No (%)	Measured No (%)
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)

5.4. 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).

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

Self-report CNCDs	Total	With depression	
		Reported No (%)	Measured No (%)
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)

5.5. Prevalence of depression by number of CNCDs

Prevalence of reported depression with in the past 12 months among 3,966 respondents with no CNCDs, 281 with one CNCDs and 37 with two and above CNCDs were 53(1.4%), 13(4.6%) and 5(13.5%) respectively (table 7).

Prevalence of measured depression among 3,966 respondents with no CNCDs, 281 with one CNCDs and 37 with two and above CNCDs were 277(7.0%), 30(10.7%) and 10(27.0%) respectively (table 7).

Table 7: Prevalence of depression by number of chronic non-communicable diseases, GGFRC, Sept 2008- Jan 2009

Number of CNCDs	Total respondents	Depression	
		Reported No (%)	Measured No (%)
No	3,966	53(1.4)	277(7.0)
One	281	13(4.6)	30(10.7)
Two and above	37	5(13.5)	10(27.0)
Total	4,284	71(1.7)	317(7.4)

5.6. Factors affecting depression

Different variables which are thought to be associated with depression were identified for the study. These were socio demographic characteristics (age, sex, residence, educational level, and occupation & economic status), CNCDs (diabetes mellitus, hypertension, cardiac diseases, asthma and epilepsy) and behavioral factors (Alcohol and khat using). From the above mentioned factors age, sex, residence, occupational status, educational level ,alcohol drinking in the last 12 months, frequency of alcohol drinking in the last 12 months , current and ever khat chewing, duration of khat chewing and number of CNCDs in life were included in to the analysis. Other factors like economic status, number of CNCDs in the last 12 months, amount and duration of khat chewing were excluded from the analysis due to high missing value they had.

Sample adequacy was checked before doing all chi-square and bivariate logistic regression analysis. And sample of each association was found to be adequate i.e. more than 80% of expected frequencies had a count greater than 5 and none of them had a count less than 1.

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 (table 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 8).

Multicollinearity 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 multicollinearity 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).

Table 8: Bivariate table: Depression crude odds ratio (COR) and 95% CI, GGFRC September 2008-January 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	Non-users	1.00	1.00

12 months	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

Age, sex and residences were checked if they modified the association between candidate independent variables and depression because, they were thought to be potential effect modifiers in this particular study. Unfortunately, none of these variables was found to be effect modifier.

Goodness of the test used was checked using hosmer and lemeshow test for both outcome variables separately. The value of chi-square, degree of freedom and p value of the test was 0.18, 1 and 0.893 respectively for measured depression and 0.395, 3 and 0.941 respectively for reported one. Therefore, logistic regression model was fitted.

5.7. 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 9). 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 9).

Table 9: Independent predictors of reported depression, GGFRS September 2008-January 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 khat chewers	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

In this study, 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 10). 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 10).

Table 10: Independent predictors of measured depression, GGFRC September 2008-January 2009

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	0.719(0.492-1.052)	1.355(0.639-2.871)
	25-34	0.733(0.514-1.046)	1.167(0.609-2.238)
	35-44	0.919(0.660-1.279)	1.524(0.854-2.722)
	45-54	1.037(0.748-1.437)	1.467(0.817-2.634)
	55-64	1.00	1.00
Educational level	Unable to read and	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

6. 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], 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, and 35] 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, female respondents were at higher risk to depression 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]. 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]. 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 occupational status of the respondents and depression. 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 respondents. 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.

This study demonstrated no statistically significant association between age of participants and depression. 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, educational level of study participants showed no statistically significant association with depression ($P>0.05$). 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 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 assisted 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].

7. Strength and limitations of the study

7.1. Strength

The study was conducted as per WHO's STEPS methods and instruments that are standardized and population based which can be mentioned as a major strength of this study.

7.2. Limitations

The limitation of our study is data on important variables such as marital status, participants' parental loss during childhood and family history of depression are absent from the survey data. The high non-response rate (>58%) on important independent variables like family income, 12 months CNCDs, amount and frequency of khat using was another important limitation of the study.

On the other hand, as the study has employed self-reporting for the assessment of depression, it is liable to either underestimating or overestimating of the findings. This could be due to problems in recall or misreporting. Underreporting could happen due to social desirability bias associated with stigma and discrimination to depression. Moreover, lack of equivalent local terminologies for depression and its symptoms, could also affect the estimate of the real findings.

Therefore, finding of this study should be interpreted in consideration of these important limitations.

8. Conclusion and recommendation

8.1. Conclusion

From the socio-demographic characteristics, sex and occupation of respondents were found to be independent predictors of depression. Female respondents were 1.62 times more likely to have depression compared to their counterparts and retired & unemployed respondents were 6.94 times more likely to have depression compared to farmers. In addition alcohol use and number of CNCDS showed statistically significant association with depression. Alcohol users were 3.23 times more likely to have depression compared to non-users and respondents having two and above CNCDS were 2.18 times more likely to have depression compared to those free of life time diagnosis of the diseases.

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

8.2. 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. Responsible organizations for these activities are federal

MOH, Oromia Regional Health Bureau, Jimma zone health office, local district health office, health extension workers and health development armies of all kebeles in the district.

Moreover, another studies with stronger design need to be carried out in the area considering our limitations.

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Annex

To Gilgel Gibe Field Research Center

Jimma

From: Gebi Hussein Jima, department Epidemiology, A/Year 2012/2013,

E-mail: gebihussen@yahoo.com

I kindly request the center to provide me data (from the data of survey that was conducted on risk factors of public health importance CNCDs from late September 2008 to early January 2009) on the under listed variables in table for the study that I'm going to conduct in your center.

Title: “Assessment of prevalence and risk factors of depression among adults in Gilgel Gibe Field Research Center, South West Ethiopia”

With Regards

Name_____

Sign_____

Date_____

Data requesting template

Code	Variables		Remark
	1. Demographic Information		
201	Sex of participant		
202	<i>Age of participant</i>		
203	Ethnicity of participant		
204	Ability to read and write of the participant		
205	Formal education attended by participant		
206	Highest level of education completed by participant		
207	Main work of participant over the past 12 months		
208	Number of people older than 15 years, including participant, live in his/her household.		
209	The average earnings of the household of the participant over the a past year in birr		
2. Behavioral Factors			
2.1. Alcohol Consumption			
309	Have you ever consumed an alcoholic drink like beer, wine, Tela, tej, local Areke?		
310	During the past 12 months, how frequently have you had at least one alcoholic drink?		
311	While drinking alcohol, how many standard drinks of any alcoholic drink did you have each day?		
312	Have you consumed an alcoholic drink within the past 30 days?		
313	During each of the past 7 days, how many standard drinks of any alcoholic drink did you have each day?		
314	During the past 12 months, what was the largest number of standard alcoholic drinks you had on a single occasion, counting all types of alcoholic drinks together?		
2.2. Khat chewing			
336	Have you ever had khat chewing behavior in your life time, even if you are not doing so now?		
337	For how much time you chewed khat?		

338	Are you using khat now?	
339	How many days you chew khat in a week?	
340	While chewing khat, in average for how many hours you chew khat in a day?	
341	While chewing khat, what amount of khat you use?	
342	What was your age when you started chewing khat?	
343	If you don't remember, how much time is it since you started khat chewing?	
344	How much time is it since you stopped chewing khat?	
3.Chronic non-communicable diseases		
3.1. Diabetes mellitus		
345	Have you ever been told by a doctor or other health worker that you have raised blood sugar or diabetes?	
346	Have you been told by a doctor or other health worker that you have raised blood sugar or diabetes in the past 12 months?	
347	Are you currently receiving any of the following treatments/advice for diabetes prescribed by a doctor or other health worker?	
347.1	Insulin	
347.2	Drugs (medication) that you have taken in the past two weeks	
347.3	Special prescribed diet	
347.4	Advice or treatment to lose weight	
347.5	Advice or treatment not to smoke or to stop smoking	
347.6	Advice to start or do more exercise	
348	Have you seen a traditional healer for diabetes or raised blood sugar with in the past 12 months?	
349	Are you currently taking any herbal or traditional remedy for your diabetes?	
3.2. History of Raised Blood Pressure		
350	Have you ever had your blood pressure measured by a doctor or other health worker?	
351	When was your blood pressure measured by a doctor or other health worker for the last time?	
352	Have you been told by a doctor or other health worker that you have raised blood pressure or hypertension in the past 12 months?	
353	Are you currently receiving any of the following treatments/advice for high blood	

	pressure prescribed by a doctor or other health workers?	
353.1	Drugs (medication) that you have taken in the past two weeks	
353.2	Special prescribed diet	
353.3	Advice or treatment to lose weight	
353.4	Advice or treatment not to smoke or to stop smoking	
353.5	Advice to start or do more exercise	
354	Have you ever seen a traditional healer for raised blood pressure or hypertension with in the past 12 months?	
355	Are you currently taking any herbal or traditional remedy for your raised blood pressure or hypertension?	
3.3. Heart Diseases		
356	Have you had chest pain while walking rapidly or stepping up with in the past 12 months?	
357	Have you had chest pain with your usual walking style on flat surface with in the past 12 months?	
358	What do you do when you feel chest pain while walking?	
359	Do you feel free of chest pain while stop walking?	
360	Would you show me the area of your chest where you feel pain?	
361	Have you ever been told by a doctor or other health worker that you have heart disease?	
362	Have you been told by a doctor or other health worker that you have heart disease with in the past 12 months?	
363	Have you ever had treatment (medication/drug) for your heart disease?	
364	Have you had any kind of treatment for your heart disease with in the past 2 weeks?	
365	Have you ever seen a traditional healer for your heart disease with in the past 12 months?	
366	Are you currently taking any herbal or traditional remedy for your heart disease?	
3.4. Asthma		
367	Have you had wheezing while breathing out with in the past 12 months?	
368	Was this wheezing after you stop physical fitness or any other kind of physical exercises?	
369	Have you had tightness on the chest with in the past 12 months?	

370	Have you woken up from sleep due to chest tightness with in the past 12 months?	
371	Have you had shortness of breathing with unknown reason and without doing any physical exercise with in the past 12 months?	
372	Have you ever been told by a doctor or other health worker that you have asthma?	
373	Have you been told by a doctor or other health worker that you have asthma with in the past 12 months?	
374	Have you ever been treated for your asthma?	
375	Have you had any kind of treatment for your asthma with in the past 2 weeks?	
376	Have you seen a traditional healer for your asthma with in the past 12 months?	
377	Are you currently taking any herbal or traditional remedy for your asthma?	
3.5. Epilepsy		
378	Have you lost conscious accompanied seizure and rigid body with in the past 12 months?	
379	Have you lost conscious even for a short period of time which was not accompanied seizure with in the past 12 months?	
380	Was there any time that you faced seizure (may not be the whole body) but no conscious lost with in the past 12 months?	
381	Have you seen a traditional healer for your seizure with in the past 12 months?	
382	Have you ever been told by a doctor or other health worker that you have epilepsy?	
383	Have you been told by a doctor or other health worker that you have epilepsy with in the past 12 months?	
384	Have you ever been treated for your epilepsy?	
385	Have you had any kind of treatment for your epilepsy with in the past 2 weeks?	
386	Are you currently taking any herbal or traditional remedy for your epilepsy?	
3.6. Depression		
387	Have you ever had sadness, sense of empty and depressed mood that lasts for many days?	
388	Have you ever had loss of interest or pleasure in activities that previously make you pleased while doing many time such as activities you do on your part-time and working with other people?	

389	Have you ever had fatigue or energy loss or sadness that lasts for many days?	
390	Was loss of interest or sadness lasts more than two weeks?	
391	Was feeling of loss of interest or loss of energy or sense of sadness happens daily / most of the days?	
392	Were these feelings accompanied loss of appetite?	
393	Have you had attention or concentration difficulties while feeling the above mentioned feelings	
394	Have you ever been told by a doctor or other health worker that you have depression?	
395	Have you ever been treated for depression?	
396	Have you had any kind of treatment for your depression with in the past 2 weeks?	