UiT The Arctic University of Norway

Faculty of Health Sciences/Department of Community Medicine

Depression in an adult Norwegian population: prevalence and associated factors in the Tromsø Study 7

Renuka Dhakal

Master's thesis in Public Health, HEL-3950, December 2022

Supervisor: Sairah Lai Fa Chen

Co-supervisors: Marko Lukic/Anne Høye

Table of Contents

List of Tables

List of Figures

Acknowledgements

First, I would like to express my sincere gratitude to my supervisor Sairah Lai Fa Chen and co-supervisors Marko Lukic and Anne Høye for their valuable guidance and advice throughout this project. I will forever be grateful for their support, kindness, and patience.

I would also like to thank my husband Raj Kumar Dulal for his unconditional support and continuous encouragement during this work. Your love and support motivated me to complete this project.

Finally yet importantly, I would like to thank Data and Publication Committee (DPC) of the Tromsø study for providing me with the necessary dataset.

Abstract

Introduction: The burden of depression is considerable worldwide as it is one of the leading causes of disability. People with depression can experience symptoms like loss of interest, feeling sad or depressed, feeling worthless, unnecessary guilt, suicidal thoughts, fatigue, and decreased pleasure. Depression can affect the personal, social, and work life of people as well as may lead to self-harm and suicide. The prevalence of depression may vary with various associated factors. The main purpose of this study was to estimate the prevalence of depression in an adult population and to investigate the associated factors.

Materials and methods: A cross-sectional study design was used. Data was extracted from the seventh survey of Tromsø study (Tromsø 7) where 21,038 participants of age 40-90 participated. A total of 20,588 participants with valid symptom checklist (SCL-10) score were included in the analysis. The descriptive statistics were used to describe the characteristics of population and to calculate the distribution of depression among co-variables. The chi square test of independence was used to test whether there was statistically significant relationship between depression and each covariables. The association between depression and covariables was assessed using logistic regression analysis.

Results: Among 20588 participants, 11.4% of participants were depressed. The prevalence of depression was 14.0% for female and 8.0% for male. The prevalence of depression varied significantly with age, marital status, household income and chronic pain. Factors like male gender (OR= 0.59, 95% CI:0.53 – 0.64), being married [male: (OR= 0.54, 95% CI: 0.47-0.63), female: (OR= 0.74, 95% CI:0.66-0.83)] , having household income more than 1000000NOK per year [male: (OR= 0.39, 95% CI:0.32-0.48), female: (OR=0.45, 95% CI: 0.38-0.54)] were associated with lower chance of depression.

Conclusion: Factors such as age, sex, marital status, household income, chronic diseases, chronic pain, BMI, alcohol consumption, physical activity were associated with depression. The odds of having depression were higher among female, people who were living alone, people who had ever experienced chronic medical conditions like diabetes, cancer, asthma and chronic pain, people with lower low income and people who exercise rarely.

Abbreviations

APA	American Psychiatric Association
BDI	Beck Depression Inventory
CES-D	Center for Epidemiologic Studies Depression scale
DST	Dexamethasone Suppression Test
DSM	Diagnostic and Statistical Manual of Mental Disorders
DALYs	Disability Adjusted Life Years
HAM-D	Hamilton Depression Rating Scale
HSCL	Hopkins Symptoms Checklist
HADS	Hospital Anxiety and Depression Scale
ICD	International Classification of Diseases
MDD	Major Depressive Disorder
MADRS	Montgomery–Åsberg Depression Rating Scale
NSD	Norwegian Centre for Research Data
PHQ	Patient Health Questionnaire
QIDS	Quick Inventory of Depressive Symptomatology
REK	Regional Ethics Committee
WHO	World Health Organization
YLDs	Years Lived with Disability
Zung SDS	Zung Self-Rating Depression Scale

Chapter 1: Introduction

1.1 Background

Mental health is an important part of human health contributing to the well-being and productivity of each individual and the society.(1) Mental health can be defined as “a state of mental well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community”(2). In short, mental health includes cognitive, emotional and behavioral functioning. Significant disturbance on such functioning can be understood as mental disorders.

Mental disorders include a broad spectrum of disorders such as anxiety disorders, depression, bipolar disorder, post-traumatic stress disorder, schizophrenia and many more.(3, 4) Among these mental disorders, anxiety disorders and depression are often referred as common mental disorders and these disorders are contributing to a high proportion of disability and death worldwide as well as costing the global economy trillion of dollars each year.(5)

1.2 Depression

Depression is one of the leading mental health disorders and a major contributor to the overall global burden of disease affecting 280 million people worldwide.(6). The mortality risk for suicide in depressed patients is more than 20-fold greater than in the general population.(7) The most severe form of depression is classified as Major Depressive Disorder (MDD). Depression is characterized by broad spectrum of symptoms such as loss of interest, feeling sad, low self-worth, feeling excessive guilt, being hopeless about future, loss of appetite and recurrent thoughts of dying and suicide.(8)

Diagnosis of depression is usually based on psychological symptoms. Laboratory methods such as dexamethasone suppression test (DST), genomic methods, proteomic and metabolomic methods, and systematic biological pathways analysis are also being researched and adopted to assess depression.(9) Diagnostic criteria have been set by International Classification of Diseases (ICD) developed by World Health Organization (WHO) and Diagnostic and

Statistical Manual of Mental Disorders (DSM) developed by American Psychiatric Association (APA). A recent version of ICD, ICD-11, has used the term "depressive disorders" and has classified it under mood disorders category. According to ICD-11, depressive disorders can be characterized by the presence of depressed mood, decreased engagement in pleasurable activities, decreased energy level, and disruptions in sleep or eating resulting in significant impairment of functioning.(10)

Diagnostic and Statistical Manual of Mental Disorders 5th ed. (DSM-5) has indicated the condition as "Major Depressive Disorder" and criteria for diagnosis is presence of at least 5 key symptoms during same 2 weeks with change in normal functioning. Key symptoms are depressed mood, markedly diminished interest or pleasure, significant weight loss or weight gain, insomnia or hypersomnia, psychomotor agitation or retardation, fatigue or loss of energy, feelings of worthlessness or excessive or inappropriate guilt, diminished ability to think or concentrate, or indecisiveness and recurrent thoughts of death, recurrent suicidal ideation, or a suicide attempt.(11)

1.3 Measurement of Depression

Different instruments and tools have been developed to assess depression. These tools are being used to identify depressive symptoms and to grade the symptom severity. Some of these tools are clinician-administered questionnaires whereas some are patient self-reported questionnaires. Hamilton Depression Rating Scale (HAM-D), Montgomery–Åsberg Depression Rating Scale (MADRS), and Quick Inventory of Depressive Symptomatology (QIDS) are popular rating scales administered by clinicians. Some of the widely used self-report depression scales are Beck Depression Inventory (BDI), 9-item Patient Health Questionnaire (PHQ-9), 2-item Patient Health Questionnaire (PHQ-2), Zung Self-Rating Depression Scale (Zung SDS), Hospital Anxiety and Depression Scale (HADS), and the Center for Epidemiologic Studies Depression scale (CES-D).(12-17)

Hopkins Symptoms Checklist (HSCL) is another popular self-report symptom inventory which was originally made of 58 items symptoms and five symptom dimensions. The revised and expanded version of HSCL was evolved later as symptom distress checklist (SCL-90) which was further revised to SCL-90-R (18-21). The shortened version of SCL-90-R comprised of anxiety and depression dimension, SCL-25 with 25 items, was designed later to assess anxiety

and depression in the general population. Other shortened versions with 10 items (SCL-10) and 5 items (SCL-5) are also being used as self-administered instruments.(22)

1.4 Risk factors of Depression

Several studies have been performed to study and identify the risk factors of depression. The combined results from several studies of risk factors for depression among elderly community subjects indicate that five factors (bereavement, sleep disturbance, disability, prior depression, and female gender) are significant risk factors for depression.(23) The most probable risk factors of depression are gender, history of prior depression, being divorced or separated, low socio-economic status, presence of other psychiatric conditions or medical illnesses, and experience of abuse, torture or negative life events.(24) There are several factors associated with depression which when occur as a chain of events can lead to depression.(25)

Prevalence of depression is found to be varied according to demographic factors such as age, sex and marital status as well as socio-economic factors such as education, employment and economic status.(26, 27) One study from China by Jing Liu et al. shows that female sex, old age, low family income and poor family relationship are risk factors of MDD.(28) The global and regional estimates of prevalence of depression by WHO has estimated that the prevalence of depression among female is 5.1% whereas prevalence among male is 3.6%.(29) The prevalence of depression is higher among the adults of age 50-69 compared to other age groups. In 2019, the prevalence of depression among 50-69 years adult was 5.82% in the world.(30)

1.5 Present Scenario

Globally, depression is affecting 5% of adults(6) and the trend in the prevalence of depression in general population is increasing.(31) The understanding of depression has also improved over the time and the testing and treatment of depression has become more advanced.(32)

In Norway, approximately 1 in 10 people are likely to suffer from depressive disorder for over a one year period.(33) Depressive disorder is a prime contributor in total burden of disease in Norway as it falls under the top ten causes of age-standardized Years Lived with Disability (YLDs) and Disability Adjusted Life Years (DALYs).(34) Mental health problems such as anxiety, depression and alcohol abuse are the biggest burden of the Norwegian population as

these mental health problems are contributing in the increased mortality, increased sick leave and early retirement.(35)

Prevalence studies provide a basis for the policy formulation and implementation of interventions. Based on current knowledge, there is only one previous research which studied the caseness of depression and related factors in Tromsø using HADS score.(36) This study aims to add more information to the findings that already exist by including wider range of associated factors and using different measurement scale.

1.5 Aims

The main aims of this study are:

- To estimate the prevalence of depression in an adult population in Tromsø, Norway using the SCL-10 self-rating scale in the seventh survey of the Tromsø Study
- To investigate factors associated with depression

1.6 Research Questions

This study aims to answer following research questions:

- What is the prevalence of depression among adults in Tromsø study 7?
- Is age, sex, marital status, diabetes, asthma, cancer, chronic pain, household income, alcohol consumption, physical activity and BMI associated with depression?
- What is the association between depression and covariables?

Chapter 2: Methods and Materials

2.1 Study Design

A cross-sectional study design was used in this study. The study is based on data collected in Tromsø study 7. The research data regarding socio-demographic factors, depression, chronic diseases, and other related variables was used to assess the prevalence of depression and associated factors.

2.2 Data Source

The Tromsø Study is a population-based study that started in 1974, which has collected comprehensive data on health and socio-demographic factors using various techniques such as questionnaires, biological samples, and clinical surveys. Several studies have been conducted based on the data from the Tromsø study. Since 1974, seven surveys have been conducted with 7-8 years apart. The seventh survey of the Tromsø Study (Tromsø 7) was conducted in 2015 and 2016. All inhabitants in the Tromsø municipality of age 40 years and older were invited by sending questionnaire and brochure by mail. Username and password were also sent for digital participation. In total, 21,083 male and female of age 40-90 participated. (37)

2.3 Study population

The study population for this study is the total 21,083 participants of Tromsø study 7. Participants who did not consent to medical research (N=13) were excluded from the study. Participants who didn't fill the questionnaire on depression (N=482) were also excluded. Thus, the total sample included in the study was 20588 with a valid SCL score. The flow diagram for study population is shown in figure 1.

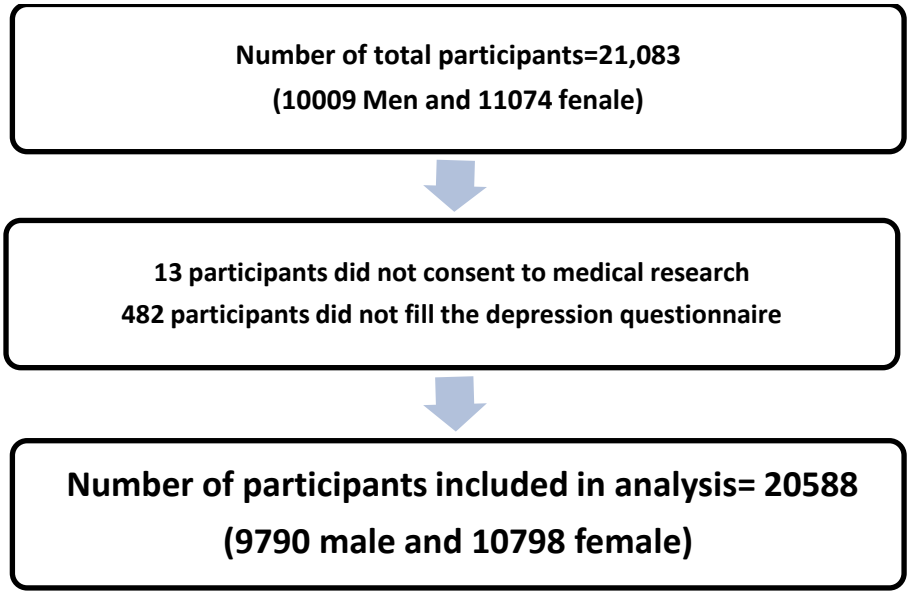

Figure 1: Flow diagram for study population

2.4 Study Variables

2.4.1 Measurement of Depression

Depression was assessed using the self-reported scale designed to assess symptoms associated with depression. Questionnaire Q2 of Tromsø Study 7 included anxiety and depression related questions with multiple response formats. The Tromsø study 7 has used the Hopkins Symptom Checklist (SCL-10) and Hospital Anxiety and Depression Scale (HADS) to measure depression and anxiety. HADS included 14 questions,7 related to anxiety and 7 related to depression, scaling from 0 = least depressed to 3= most depressed and the cut-off point is ≥8.(38) Meanwhile, the SCL-10 checklist contained 10 symptoms, of which 4 symptoms were used to measure anxiety and remaining 6 symptoms were used to measure depression.(39) All questions contained 4-point scale ranging from 1= “not at all” to 4 = “extremely”. The average score was then calculated and if the average score was more than 1.85, this was considered as valid predictor of anxiety and depression.(22) For this study, only symptoms related to depression were used from the SCL-10 score to assess the presence of depression.

Table 1: Measurement of depression (Depression symptoms and rating scale)

Depression symptoms	Rating Scales
BLAME_YOURSELF_T7: Have you easily blamed yourself during the last week?	1 : No complaint 2 : Little complaint 3 : Pretty much 4 : Very much
INSOMNIA_T7: Have you had sleeping problems during the last week?	1 : No complaint 2 : Little complaint 3 : Pretty much 4 : Very much
DEPRESSED_T7: Have you felt depressed or sad during the last week?	1 : No complaint 2 : Little complaint 3 : Pretty much 4 : Very much
USELESS_T7 : Have you felt useless, worthless during the last week?	1 : No complaint 2 : Little complaint 3 : Pretty much 4 : Very much
STRUGGLE_T7: Have you felt that everything is a struggle during the last week?	1 : No complaint 2 : Little complaint 3 : Pretty much 4 : Very much
FUTURE_T7: Have you felt hopelessness with regard to the future during the last week?	1 : No complaint 2 : Little complaint 3 : Pretty much 4 : Very much

2.4.2 Measurement of covariables

Variables including age, sex, BMI, marital status, physical activity, alcohol consumption, household income, and presence of chronic diseases (cancer, asthma, diabetes, and chronic pain) were selected as covariables for this study. In Tromsø study 7, general information such as age, sex, marital status, height, and weight were collected during the first on-site examination by Tromsø 7 project members. BMI was calculated using the information of height and weight (Kg/m^2). Information about household income, physical activity, alcohol consumption and presence of chronic diseases were collected from self-reported questionnaire Q1.

Age: Age was categorized into 10 years age group of 40-49, 50-59, 60-69, 70-79, and 80 above.

Sex**:** Sex was categorized as 1=male and 0= female.

Marital status: The marital status of the participants was categorized as single, married/registered partnership, widow/widower, divorced, and separated. For this study, these categories are re-coded into 2 categories "living alone" (merging single, widow/widower, divorced and separated) and "married/registered partnership."

BMI: BMI was presented as numerical value. BMI was re-coded into categorical variable using three categories: normal (up-to 24.9), overweight (25.0-29.9) and obesity (above 30) with the reference of WHO 's categories of nutritional status.

Diabetes: Diabetes was measured using question "Do you have, or have you had diabetes?" The answers were coded as '0=No", "1=Yes, now", and "2=Yes", previously which was re-coded into 0= never and 1= ever by grouping the latter two categories as one.

Asthma: Asthma was measured using question "Do you have, or have you had asthma?" The options were "no", "yes, now", and "yes, previously". Those categories were dichotomized into "ever and never."

Cancer: Cancer was measured using question "Have you ever had, or do you have cancer?" The answers were coded as "0=No", "1=Yes, now", and "2=Yes, previously". Those categories were recoded as "ever" (combining 1 and 2) and "never".

Chronic pain: The information on chronic pain was collected through question “Do you have persistent or constantly recurring pain that has lasted for 3 months or more?” The answers were coded as 0=No and 1=Yes.

Alcohol Consumption: Frequency of alcohol consumption was measured via question “How often do you usually drink?” The responses were categorized as “never”, “monthly or less frequently”, “2-4 times a month”, “2-3 times a week” and “4 or more times a week”. This variable was also re-coded into 3 categories and the new categories were “never or less frequently” (merging never and monthly or less frequently), “2-4 times a month” and “2 or more times a week” (merging 2-3 times a week and 4 or more times a week).

Household income: Information on household income was collected from the question “What was the households total taxable income last year include income from work, social benefits and similar?” The available options were “less than 150000 NOK”, “150000-250000 NOK”, “251000-350000 NOK”, “351000-450000 NOK”, “451000-550000 NOK”, “551000-750000 NOK”, “751000-1000000 NOK” and “more than 1000000 NOK”. These categories were recoded into 3 categories: “up to 550000 NOK”, “551000-1000000 NOK” and “above 1000000 NOK”

Physical activity: The assessment of physical activity was done via question “How often do you exercise (walking, skiing, swimming or training/sports?” The responses were “never”, “less than once a week”, “once a week”, “2-3 times a week”, and “approximately every day”. Merged categories were “once a week or less”, “2-3 times a week” and “approximately every day”.

2.5 Statistical Analysis

Frequencies, percentages, and distributions were calculated to describe the population for each categorical variable. Cross tabulation was done to measure the distribution of depression among independent variables (age, sex, marital status, household income, diabetes, asthma, cancer, chronic pain, alcohol consumption and physical activity) and the chi square test of independence was also performed to test if there was a statistically significant relationship between each independent variable and depression.

Binary logistic regression was used to estimate the associations between variables (age, sex, marital status, household income, diabetes, asthma, cancer, chronic pain, alcohol consumption and physical activity) and depression.(40) At first, the univariable associations between sex and depression was estimated. For the remaining variables, the univariable association to depression was estimated separately for males and females. Final model was sex separated age adjusted model.

Statistical software SPSS version 28 was used for analysis.

2.6 Ethical Aspects

All the personal information collected in The Tromsø study was collected with the consent of participants. The study has also assured the privacy and protection of collected information and use of information for only research purposes. Moreover, participants are also given the rights to access, change and delete the information provided and rights to withdraw the consent. The Tromsø study is already approved by Regional Ethics Committee (REK) and Norwegian Centre for Research Data (NSD). The project using anonymous data file doesn't require separate REK approval.(37)

Chapter 3: Results

3.1 Demographic and baseline characteristics

Among 20588 participants with complete SCL score, 10798 (52.4%) were female and 9790(47.6%) were male. Most of the participants were from the age groups 40-49 (30.7%), 50-59 (28.7%) and 60-69 (24.7%). Older age groups accounted for comparatively smaller proportion of the sample.More than half participants were married or in registered partnership (56.2%). 68.2% of participants had BMI more than 25 so classified under the categories overweight and obese. Relatively few participants were suffering from chronic conditions except for chronic pain where 37.5% of the participants had experienced chronic pain. Table 2 displays the demographic and baseline characteristics of the study population.

Table 2: Baseline characteristics of the study population

Variables	Categories	Frequency N (%)	Missing N (%)
Age group (years)	40 – 49	6313(30.7)	0%
	50 – 59	5918(28.7)	
	60 – 69	5084(24.7)	
	70 – 79	2580(12.5)	
	80 above	693(3.4)	
Sex	Men	9790(47.6)	0%
	Female	10798(52.4)	
Marital status	Living alone	9091(43.8)	0%
	Married/ Registered partnership	11569(56.2)	
Household Income	Less than 550000 NOK	6600(33.4)	804(3.9)
	551000-1000000 NOK	8204(41.4)	
	More than 1000000 NOK	4980(25.2)	
Physical Activity	Once a week or less	6327(30.8)	50(0.2)
	2-3 times a week	8520(41.5)	
	Almost everyday	5691(27.7)	
BMI	Normal	6427(31.8)	360(1.7)
	Overweight	8873(43.9)	
	Obese	4928(24.3)	

Alcohol Frequency	Never or less frequently	6571(32.1)	120(0.6)
	2-4 times a month	7743(37.8)	
	2-4 times a week or more	6154(30.1)	
Diabetes	Never	18945(94.6)	571(2.8)
	Ever	1072(5.4)	
Asthma	Never	17738(88.8)	613(3.0)
	Ever	2237(11.2)	
Cancer	Never	18389(92.1)	622(3.0)
	Ever	1577(7.7)	
Chronic Pain	Never	11644(62.5)	1945(9.4)
	Ever	6999(37.5)	

3.2 Prevalence of Depression

Among 20588 participants with valid SCL score, 11.4% (N= 2355) of the participants had SCL score >1.85 thus found to be depressed.

Participants from age groups 40 – 49 and 50 – 59 had the highest prevalence of depression (13.4 %) followed by age groups 60 – 69 and 80 above with prevalence 9.1%. Participants from age group 70-79 had comparatively lower prevalence of depression of 7.1%. The prevalence of depression was higher among female (14.0%) than in male (8.7%). Participants who were living alone had a prevalence of 14.0% which is higher than the prevalence 9.4% among participants who were married or in registered partnership.

The prevalence of depression among participants who had chronic diseases were found to be 14.4% for diabetes, 15.5% for asthma, 12.2% for cancer which is slightly higher compared to prevalence of depression among participants who didn't have those conditions. Meanwhile, participants who had experienced the chronic pain were found to be more depressed (18.4%) than participants who had never experienced the chronic pain (7.2%).

The participants who had household income more than 100000 NOK per year were less depressed with prevalence of 6.8% compared to participants wo had yearly household income between 510000 – 100000 (11.1%) and less than 500000 (15.2%). The overall distribution of

depressed(D_1) and not depressed(D_0) according to the background variables is shown in Table 3 below:

Table 3: Distribution of depressed(D_1) and not depressed(D_0) according to the background variables

Variables	Categories		SCL<1.85 (D_0)	SCL>1.85 (D_1)	Chi-square (p-value)	Missing (%)
Age group	40 – 49		5465 (86.6%)	848(13.4%)	125.685 (<0.001)	0
	50 – 59		5124 (86.6%)	794(13.4%)		
	60 – 69		4621 (90.9%)	463(9.1%)		
	70 – 79		2398(92.9%)	182(7.1%)		
	80 above		625(90.2%)	68(9.1%)		
Sex	Male		8942(91.3%)	848(8.7%)	142.077(<0.001)	0
	Female		9291(86.0%)	1507(14.0%)		
Marital status	Living alone		7754(86.0%)	1265(14.0%)	106.055(<0.001)	0
	Married/ Registered partnership		10479(90.6%)	1090(9.4%)		
Diabetes	Never		17315(88.9%)	2201(11.1%)	11.009(<0.001)	571(2.8%)
	Ever		918(85.6%)	154(14.4%)		
Asthma	Never		16342(89.3%)	2009(10.7%)	44.770(<0.001)	613(3.0%)
	Ever		1891(84.5%)	346(15.5%)		
Cancer	Never		16849(81.9%)	2162(11.1%)	1.786(0.181)	622(3.0%)
	Ever		1337(87.8%)	193(12.2%)		
Chronic pain	Never		12520(92.8%)	1069(7.2%)	540.982(<0.001)	1945(9.4%)
	Ever		5713(81.6%)	1286(18.4%)		
Alcohol Frequency	Less frequently		5696(86.7%)	875(13.3%)	35.803(<0.001)	120(0.6%)
	2-4 times a month		6907(89.2%)	836(10.8%)		
	2 or more times a week		5528(89.8%)	626(10.2%)		
Income	Up to 550000 NOK		5596(84.8%)	1004(15.2%)	200.631(<0.001)	804(3.9%)

	551000-750000NOK		7292(88.9%)	912(11.1%)		
	More than 1000000 NOK		4642(93.2%)	338(6.8%)		
Exercise	Once a week or less		5455(86.2%)	872(13.8%)	50.042(<0.001)	50(0.2%)
	2-3 times a week		7643(89.7%)	877(10.3%)		
	Approximately every day		5092(89.5%)	599(10.5%)		
BMI	Normal		5696(88.6%)	731(11.4%)	16.694(<0.001)	360(1.7%)
	Overweight		7936(89.4%)	937(10.6%)		
	Obese		4294(87.1%)	634(12.9%)		

3.3 Logistic Regression

Table 4 displays the odds ratio and 95% confidence interval from the unadjusted and age adjusted logistic regression separated for male and female. The odds of having depression was found to be 0.41 times lower for male compared to female (OR=0.59, 95% CI: 0.53-0.64). The odds of having depression decreased with the increasing age for both female and male but the results were not statistically significant for 80+ group. Similarly, single people were more likely to be depressed compared to married people or people living in registered partnership which was also different for female (OR= 0.74, 95% CI:0.66-0.83) and male (OR=0.54, 95% CI: 0.47-0.63).

Diabetes, asthma, and cancer are associated with depression and people who had suffered from chronic diseases were more likely to have depression than people who had never suffered from chronic diseases. The odds of having depression was 1.31 times higher among female who ever had diabetes (OR=1.31, 95% CI: 1.037-1.68), 1.42 times higher among female who ever had asthma (OR =1.42, 95% CI: 1.22-1.66), and 1.07 times higher among female who ever had cancer (OR=1.07, 95% CI: 0.87-1.31) compared to female who did not report having the respective diseases. Similarly, the odds of having depression was 1.49 times higher among male who ever had diabetes (OR=1.49, 95% CI: 1.15-1.95), 1.59 times higher among male who

ever had asthma (OR= 1.59, 95% CI: 1.29-1.96) and 1.17 times higher among male who ever had cancer (OR=1.17, 95% CI: 0.91-1.51) compared to the male who never had the respective diseases.

Chronic pain was strongly associated with depression in both male (OR= 2.71, 95% CI: 2.33-3.15) and female (OR= 2.79, 95% CI: 2.48-3.15).Similarly, female with obesity were 1.29 times more likely to have depression (OR= 1.29, 95% CI: 1.11-1.48) compared to female with normal BMI and male with obesity had 1.14 times higher odds of depression (OR= 1.14, 95% CI: 0.94-1.39) compared to male with normal BMI.

Table 4: Association of Depression with background variables, Output from logistic regression

Variables		
	Unadjusted	**Age Adjusted**
Sex		
Female	1	1
Male	0.59(0.53 – 0.64)	0.59(0.54-0.64)

Variables	**Female**		**Male**	
	Unadjusted	**Age Adjusted**	**Unadjusted**	**Age Adjusted**
Age group				
40-49	1		1	
50-59	0.99(0.86 - 1.12)		0.99(0.84-1.18)	
60-69	0.72(0.62 - 0.83)		0.54(0.44-0.66)	
70-79	0.57(0.46 – 0.71)		0.37(0.27-0.49)	
80+	0.72(0.52–1.001)		0.66(0.43-1.02)	
Marital status				
Single	1	1	1	1
Married/ Registered partnership	0.74(0.66-0.83)	0.75(0.67-0.84)	0.54(0.47-0.63)	0.60(0.52-0.69)
Diabetes				
Never	1	1	1	1
Ever	1.31(1.037-1.68)	1.46(1.14-1.86)	1.49(1.15-1.95)	1.79(1.37-2.35)

Asthma				
Never	1	1	1	1
Ever	1.42(1.22-1.66)	1.45(1.24-1.69)	1.59(1.29-1.96)	1.54(1.25-1.90)
Cancer				
Never	1	1	1	1
Ever	1.07(0.87-1.31)	1.20(0.98-1.48)	1.17(0.91-1.51)	1.68(1.28-2.19)
Chronic Pain				
Never	1	1	1	1
Yes	2.79(2.48-3.15)	2.78(2.48-3.14)	2.71(2.33-3.15)	2.63(2.26-3.07)
Alcohol frequency				
Less frequently	1	1	1	1
2-4 times a month	0.86(0.76-0.97)	0.82(0.72-0.93)	0.77(0.65-0.93)	0.73(0.61-0.87)
2 or more times a week	0.78(0.68-0.90)	0.76(0.66-0.88)	0.79(0.66-0.95)	0.78(0.65-0.94)
Income				
Up to 550000 NOK	1	1	1	1
551000-1000000 NOK	0.80(0.71-0.90)	0.68(0.60-0.77)	0.63(0.53-0.74)	0.46(0.39-0.54)
More than 1000000 NOK	0.45(0.38-0.54)	0.35(0.29-0.42)	0.39(0.32-0.48)	0.25(0.20-0.31)
Exercise				
Once a week or less	1	1	1	1
2-3 times a week	0.65(0.57-0.74)	0.64(0.56-0.73)	0.72(0.61-0.84)	0.71(0.60-0.84)
Almost everyday	0.65(0.56-0.75)	0.65(0.56-0.75)	0.74(0.62-0.89)	0.77(0.64-0.94)
BMI				
Normal	1	1	1	1
Overweight	1.12(0.98-1.27)	1.15(1.02-1.31)	0.87(0.72-1.04)	0.85(0.71-1.01)
Obese	1.29(1.11-1.48)	1.33(1.15-1.53)	1.14(0.94-1.39)	1.10(0.91-1.34)

Chapter 4: Discussion

4.1 Main findings

This study aimed to assess the prevalence of depression among adults using the data of Tromsø study 7. In Tromsø study 7, two self- assessment instruments (SCL-10 and HADS) are used to measure depression and anxiety. The results of this study are based on SCL-10 score. The research found that the current prevalence of depression among adults is 11.4%. This is slightly higher than the prevalence 6.9% mentioned in the recent research paper based on Tromsø study 7 published by Ole Kristian Grønli et al using HADS score(36). Another study has found 8.1% of self-diagnosed depression in Norwegian general population using one-item self- evaluation measure.(41) In contrast to these findings, using same SCL 10 scale with same cut off value of 1.85 resulted in the same prevalence of 11.4% in Norwegian population.(22) This difference in the prevalence can be explained by the use of different measurement instruments.

4.2 Gender and Depression

The prevalence of depression was higher among female (14.0%) than in male (8.7%) in this study. The gender difference in the prevalence of depression is supported by the findings of several studies which have shown that the female has higher prevalence of depression than male(42-45). Many possible explanations have been given to justify this difference by many reviewers. Some of them have pointed towards sex hormones, hormonal changes during different stages of life such as pregnancy and pre-menopause, female's way of responding to stress, higher risk of abuse and body shaming as the potential risk factors for higher prevalence of depression among females.(46-48)

4.3 Age and Depression

In this study, prevalence of depression has varied across the different age groups. The prevalence was 13.4% among participants of age group 40-49 and 50-59 which dropped to

9.1% among 60-69 age group and 7.1% among 70-79 age group and again increased to 9.1% among 80 above. This finding is consistent with the findings from several other studies and reviews where the prevalence has reached a peak at certain age and then started to decline.(49, 50) The research paper examining the association between age and depression in general population using HUNT 1995-1997 has shown that the prevalence of depression followed increasing trend first up to age group 40-49 and then started to decrease gradually. (51, 52) The other studies have shown that the prevalence of depression decreases with the age.(53) Different explanations have been suggested by researchers to explain the higher risk of depression among old people. The possible reasons behind the higher risk can be diminished health, more medical illnesses, decreased financial stability, more chances of being alone at old age due to loss of partner.(54-56)

4.4 Marital status and Depression

The distribution of depression among married/registered partnership and single (unmarried, divorced, separated, and widowed) was analyzed in this study and the result showed that the prevalence of depression is higher among single than in those who were married or in registered partnership. This finding is consistent with the results of some other research where separated and divorced people had higher rates of depression and married people had lowest rate of depression.(57, 58) One research had shown that the risk of depression was 1.8 times higher among divorced or separated compared to married group among the people of age group 18-44 years.(27) Two studies had also shown the bidirectional association between marital status and depression stating that the being depressed decreases the chance of being married.(59, 60)

4.5 Chronic diseases and Depression

The prevalence of depression was found to be higher among the patient who are suffering from chronic diseases such as Diabetes, Cancer and Asthma.(61, 62) The research findings had suggested that the prevalence of depression in 44% higher among the people exposed to at least one chronic disease.(63) This study has also found out that the rate of depression was higher among the people who ever had these chronic diseases.

The prevalence of depression among people with Type 1 Diabetes (T1DM) was 12% compared with 3% in control population and prevalence of depression among people with Type 2 diabetes was nearly twice high compared with people without the condition.(64-66) The rate of

depression among cancer patients was found be varied widely ranging from 3- 38%(67) and 7-50%(68). Some research had pointed out that the prevalence of depression among cancer patient was found to be up to four times higher than general population and the rate varies according to the time of diagnosis, progression, and types of cancer.(69, 70) Similarly, evidence had shown that the depression was also common in people with asthma and the around 50% of people with asthma are at the risk of being clinically depressed. The uncomfortable and painful symptoms of asthma were found to be cause of an increased risk of depression among asthma patients.(71, 72)

4.6 Chronic pain and Depression

There is a well-established association between chronic pain and depression, but the association is complex as depression and pain can occur independently or secondary to each other depression or can also co-exist. Evidence had suggested that about 40% to 60 % of patients with Chronic pain have depression.(73-75) In this study, the rate of depression is highest among the participants who ever had chronic pain which is consistent with the findings from other studies.

4.7 Household income and Depression

Our study observed that the prevalence of depression was highest in the lowest household income group and the risk of depression has decreased with increased income. This result is consistent with the finding of other research examining the relationship between depression and sociodemographic factors which has shown that the people with household income less than $10,000 per year have highest depression rate of 18.4%.(57)

4.8 Physical activity and Depression

Physical activity is another associated factor studied in this study. The results showed that people who rarely exercise were more likely to have depression compared to people who exercise at least 2 times a week or more. Many studies have given results consistent with this finding. Some of metanalysis studies have analyzed the relation and concluded that regular physical activity decreases the risk of depression.(76, 77) Another population study has suggested that people not involved in physical activity are two times more likely to show the symptoms of depression.(78)

4.9 BMI and Depression

Many studies have shown bidirectional relationship between obesity and depression meaning that the obesity increases the risk of depression while depression also increases the risk of obesity(79). Obese people had a 1.57 times higher risk of getting depression whereas depression increases the risk of obesity by 1.58 times.(80) Other two studies were also consistent with this finding.(81, 82)-The result of this study is not consistent with these results. There was no significant association found between obesity and depression.

4.10 Consideration for multivariable analysis

A multivariable analysis was not performed in this study. Generally, we need a multivariable analysis when we try to assess the relationship between number of variables and to assess the independent relationship while adjusting for confounders.(83) This is not the case in this research. This study aims to describe the distribution of depression according to the covariables and to investigate the association between depression and covariables which do not require control of additional variables (84).

4.11 Strengths and limitations

The dataset used in this study is drawn from the large-scale, population-based survey. The on-site examination of height and weight and use of validated measures to assess physical activity and depression increases the strength of the study.

However, this study has some limitations. The main variable of interest and covariables are defined but the term used in title "associated factors" is very vast and it is impossible to include every factor associated with depression. Despite including wide range of associated factors, some of important risk factors like disability, presence of other psychiatric disorders, experience of abuse, trauma and other negative life events(24) were not included in this study.

Also, this study poses risk of selection bias and information bias. The overall attendance rate in Tromsø study 7 is 65% and the attendance rate of age group 80 above is noticeably low.(85) Non-responders usually have different baseline characteristics than responders.(86) People who are depressed and suffering from chronic diseases might not be motivated enough to respond to the survey. Similarly, there is missing information on some variables in this study. The missing data can reduce the statistical power, increase chance of bias in estimation of parameters and can reduce the representativeness of the samples.(87) These shortcomings have given ground to suspect the presence of potential bias in the study.

Moreover, the measurement of depression and some of associated factors was based on self-reported information which increases the chance of recall and reporting bias. Social desirability can also induce self-report bias.(88) Some studies have shown that under-reporting of depressive symptoms is more common in men because they might find it socially undesirable to admit that they have mental health problems.(89) There is higher chance that the prevalence estimate from this study might not be the exact estimation.

Chapter 5: Conclusion

This study found that the prevalence of depression was 11.4% among adults aged 40 and above in the Tromsø 7 Study. Depression was found to be associated with factors, including age, sex, marital status, household income, some chronic health conditions, BMI, physical activity, and alcohol consumption. Female, people living alone, people with lowest household income, people who had experienced chronic diseases, people who exercise occasionally were more likely to have depression.

This study can be the basis for future studies seeking to explore depression in more depth and studies trying to find out the causal inferences. Based on current knowledge, this study is the first study to include a wide range of associated factors to describe depression using Tromsø study 7. Thus, the results of this study can be of use for everyone interested in working in the field of depression using Tromsø study.

References:

1. World Health Organization. Promoting mental health: Concepts, emerging evidence, practice: Summary report: World Health Organization; 2004.
2. World Health Organization. Mental health: strengthening our response 2022 [Available from: https://www.who.int/en/news-room/fact-sheets/detail/mental-health-strengthening-our-response.
3. Centers for Disease Control and Prevention. Mental Health 2021 [Available from: https://www.cdc.gov/mentalhealth/learn/index.htm.
4. World Health Organization. Mental disorders 2022 [Available from: https://www.who.int/news-room/fact-sheets/detail/mental-disorders.
5. World Health Organization. Mental health 2021 [Available from: https://www.who.int/health-topics/mental-health#tab=tab_1.
6. World Health Organization. Depression 2021 [Available from: https://www.who.int/news-room/fact-sheets/detail/depression.
7. Lépine J-P, Briley M. The increasing burden of depression. Neuropsychiatr Dis Treat. 2011;7(Suppl 1):3-7.
8. Marcus M, Yasamy MT, van Ommeren Mv, Chisholm D, Saxena S. Depression: A global public health concern. 2012.
9. Smith KM, Renshaw PF, Bilello J. The diagnosis of depression: current and emerging methods. Comprehensive psychiatry. 2013;54(1):1-6.
10. World Health Organization. International Classification of Diseases for Mortality and Morbidity Statistics 2019 [Eleventh edition:[Available from: https://icd.who.int/browse11/l-m/en#/http%3a%2f%2fid.who.int%2ficd%2fentity%2f1563440232.
11. American Psychiatric Association. Diagnostic and statistical manual of mental disorders, 5th ed.: American Psychiatric Association,; 2013.
12. Behera P, Gupta SK, Nongkynrih B, Kant S, Mishra AK, Sharan P. Screening instruments for assessment of depression. Indian Journal of Medical Specialities. 2017;8(1):31-7.
13. Uher R, Perlis RH, Placentino A, Dernovšek MZ, Henigsberg N, Mors O, et al. Self-report and clinician-rated measures of depression severity: can one replace the other? Depression and anxiety. 2012;29(12):1043-9.

14. Morgan JH. Depression measurement instruments: An overview of the top depression rating scales. 2016.
15. Gelenberg AJ. Using assessment tools to screen for, diagnose, and treat major depressive disorder in clinical practice. The Journal of clinical psychiatry. 2010;71(suppl E1):26567.
16. Anderson JE, Michalak EE, Lam RW. Depression in primary care: tools for screening, diagnosis, and measuring response to treatment. British Columbia Medical Journal. 2002;44(8):415-9.
17. Pettersson A, Boström KB, Gustavsson P, Ekselius L. Which instruments to support diagnosis of depression have sufficient accuracy? A systematic review. Nordic journal of psychiatry. 2015;69(7):497-508.
18. Derogatis LR. Hopkins Symptom Checklist. 2000.
19. Derogatis LR, Lipman RS, Rickels K, Uhlenhuth EH, Covi L. The Hopkins Symptom Checklist (HSCL): A self-report symptom inventory. Behavioral science. 1974;19(1):1-15.
20. Derogatis LR, Rickels K, Rock AF. The SCL-90 and the MMPI: A step in the validation of a new self-report scale. The British Journal of Psychiatry. 1976;128(3):280-9.
21. Holi M. Assessment of psychiatric symptoms using the SCL-90. 2003.
22. Strand BH, Dalgard OS, Tambs K, Rognerud M. Measuring the mental health status of the Norwegian population: a comparison of the instruments SCL-25, SCL-10, SCL-5 and MHI-5 (SF-36). Nordic journal of psychiatry. 2003;57(2):113-8.
23. Cole MG, Dendukuri N. Risk factors for depression among elderly community subjects: a systematic review and meta-analysis. American journal of psychiatry. 2003;160(6):1147-56.
24. Dobson KS, Dozois DJ. Risk factors in depression: Elsevier; 2011.
25. Almeida OP. Prevention of depression in older age. Maturitas. 2014;79(2):136-41.
26. Busch M, Maske U, Ryl L, Schlack R, Hapke U. Prevalence of depressive symptoms and diagnosed depression among adults in Germany. 2013.
27. Anthony JC, Petronis KR. Suspected risk factors for depression among adults 18–44 years old. Epidemiology. 1991:123-32.
28. Liu J, Yan F, Ma X, Guo H-L, Tang Y-L, Rakofsky JJ, et al. Prevalence of major depressive disorder and socio-demographic correlates: Results of a representative household epidemiological survey in Beijing, China. Journal of affective disorders. 2015;179:74-81.

29. World Health Organization. Depression and other common mental disorders: global health estimates. World Health Organization; 2017.
30. Our World in Data. Prevalence of depression by age [Available from: https://ourworldindata.org/grapher/prevalence-of-depression-by-age.
31. Moreno-Agostino D, Wu Y-T, Daskalopoulou C, Hasan MT, Huisman M, Prina M. Global trends in the prevalence and incidence of depression:a systematic review and meta-analysis. Journal of Affective Disorders. 2021;281:235-43.
32. Herrman H, Kieling C, McGorry P, Horton R, Sargent J, Patel V. Reducing the global burden of depression: a Lancet–World Psychiatric Association Commission. The Lancet. 2019;393(10189):e42-e3.
33. Norwegian Institute of Public Health. Mental illness among adults 2016 [Available from: https://www.fhi.no/en/op/hin/mental-health/psykisk-helse-hos-voksne/.
34. Clarsen B, Nylenna M, Klitkou ST, Vollset SE, Baravelli CM, Bølling AK, et al. Changes in life expectancy and disease burden in Norway, 1990–2019: an analysis of the Global Burden of Disease Study 2019. The Lancet Public Health. 2022;7(7):e593-e605.
35. Sommer M. Mental health among youth in norway. Nordic Centre of Welfare and Social Issues,; 2016.
36. Grønli OK, Bramness JG, Wynn R, Høye A. Depressive symptoms in the general population: The 7th Tromsø Study. Journal of Affective Disorders Reports. 2022;8:100322.
37. UiT The Arctic University of Tromsø. The Tromsø Study [Available from: https://uit.no/research/tromsostudy.
38. Søgaard AJ, Bjelland I, Tell GS, Røysamb E. A comparison of the CONOR Mental Health Index to the HSCL-10 and HADS. Norsk epidemiologi. 2003;13(2):279-84.
39. Kleppang AL, Hagquist C. The psychometric properties of the Hopkins Symptom Checklist-10: a Rasch analysis based on adolescent data from Norway. Family Practice. 2016;33(6):740-5.
40. Vetter TR, Schober P. Regression: the apple does not fall far from the tree. Anesthesia & Analgesia. 2018;127(1):277-83.
41. Bonsaksen T, Ekeberg Ø, Skogstad L, Heir T, Grimholt TK, Lerdal A, et al. Self-rated global health in the Norwegian general population. Health and Quality of Life Outcomes. 2019;17(1):1-7.

42. Lim GY, Tam WW, Lu Y, Ho CS, Zhang MW, Ho RC. Prevalence of Depression in the Community from 30 Countries between 1994 and 2014. Scientific Reports. 2018;8(1):2861.
43. Van de Velde S, Bracke P, Levecque K. Gender differences in depression in 23 European countries. Cross-national variation in the gender gap in depression. Social science & medicine. 2010;71(2):305-13.
44. Hilt LM, Nolen-Hoeksema S. Gender differences in depression. 2014.
45. Goodwin RD, Gotlib IH. Gender differences in depression: the role of personality factors. Psychiatry Research. 2004;126(2):135-42.
46. Albert PR. Why is depression more prevalent in women? Journal of psychiatry & neuroscience: JPN. 2015;40(4):219.
47. Riecher-Rössler A. Sex and gender differences in mental disorders. The Lancet Psychiatry. 2017;4(1):8-9.
48. Kuehner C. Gender differences in unipolar depression: an update of epidemiological findings and possible explanations. Acta Psychiatrica Scandinavica. 2003;108(3):163-74.
49. Jorm AF. Does old age reduce the risk of anxiety and depression? A review of epidemiological studies across the adult life span. Psychological medicine. 2000;30(1):11-22.
50. Snowdon J. Is Depression More Prevalent in Old Age? Australian & New Zealand Journal of Psychiatry. 2001;35(6):782-7.
51. Stordal E, Bjartveit Krüger M, Dahl NH, Krüger Ø, Mykletun A, Dahl A. Depression in relation to age and gender in the general population: the Nord-Trøndelag Health Study (HUNT). Acta Psychiatrica Scandinavica. 2001;104(3):210-6.
52. Stordal E, Mykletun A, Dahl A. The association between age and depression in the general population: a multivariate examination. Acta psychiatrica scandinavica. 2003;107(2):132-41.
53. Christensen H, Jorm AF, Mackinnon AJ, Korten A, Jacomb P, Henderson A, et al. Age differences in depression and anxiety symptoms: a structural equation modelling analysis of data from a general population sample. Psychological medicine. 1999;29(2):325-39.
54. Snowdon J. The prevalence of depression in old age. International Journal of Geriatric Psychiatry. 1990.
55. Zhao K-X, Huang C-Q, Xiao Q, Gao Y, Liu Q-X, Wang Z-R, et al. Age and risk for depression among the elderly: a meta-analysis of the published literature. CNS spectrums. 2012;17(3):142-54.

56. Roberts RE, Kaplan GA, Shema SJ, Strawbridge WJ. Does growing old increase the risk for depression. 1997.
57. Akhtar-Danesh N, Landeen J. Relation between depression and sociodemographic factors. International Journal of Mental Health Systems. 2007;1(1):4.
58. Weissman MM, Bland RC, Canino GJ, Faravelli C, Greenwald S, Hwu H-G, et al. Cross-National Epidemiology of Major Depression and Bipolar Disorder. JAMA. 1996;276(4):293-9.
59. Bulloch AG, Williams JV, Lavorato DH, Patten SB. The relationship between major depression and marital disruption is bidirectional. Depression and anxiety. 2009;26(12):1172-7.
60. Yan XY, Huang S, Huang C-Q, Wu W-H, Qin Y. Marital status and risk for late life depression: a meta-analysis of the published literature. Journal of International Medical Research. 2011;39(4):1142-54.
61. Moussavi S, Chatterji S, Verdes E, Tandon A, Patel V, Ustun B. Depression, chronic diseases, and decrements in health: results from the World Health Surveys. The Lancet. 2007;370(9590):851-8.
62. Cassano P, Fava M. Depression and public health: An overview. Journal of Psychosomatic Research. 2002;53(4):849-57.
63. Boing AF, Melo GR, Boing AC, Moretti-Pires RO, Peres KG, Peres MA. Association between depression and chronic diseases: results from a population-based study. Revista de saude publica. 2012;46:617-23.
64. Ali S, Stone M, Peters J, Davies M, Khunti K. The prevalence of co-morbid depression in adults with Type 2 diabetes: a systematic review and meta-analysis. Diabetic medicine. 2006;23(11):1165-73.
65. Barnard K, Skinner T, Peveler R. The prevalence of co-morbid depression in adults with Type 1 diabetes: systematic literature review. Diabetic medicine. 2006;23(4):445-8.
66. Roy T, Lloyd CE. Epidemiology of depression and diabetes: A systematic review. Journal of Affective Disorders. 2012;142:S8-S21.
67. Kissane DW, Maj M, Sartorius N. Depression and Cancer. 2011.
68. Li H, Ge S, Greene B, Dunbar-Jacob J. Depression in the context of chronic diseases in the United States and China. International Journal of Nursing Sciences. 2019;6(1):117-22.

69. Evans DL, Charney DS, Lewis L, Golden RN, Gorman JM, Krishnan KRR, et al. Mood Disorders in the Medically Ill: Scientific Review and Recommendations. Biological Psychiatry. 2005;58(3):175-89.
70. Linden W, Vodermaier A, MacKenzie R, Greig D. Anxiety and depression after cancer diagnosis: Prevalence rates by cancer type, gender, and age. Journal of Affective Disorders. 2012;141(2):343-51.
71. Chapman DP, Perry GS, Strine TW. The vital link between chronic disease and depressive disorders. Prev Chronic Dis. 2005;2(1):A14.
72. Janson C, Björnsson E, Hetta J, Boman G. Anxiety and depression in relation to respiratory symptoms and asthma. American journal of respiratory and critical care medicine. 1994;149(4):930-4.
73. Brown GK. A causal analysis of chronic pain and depression. Journal of abnormal psychology. 1990;99(2):127.
74. Romano JM, Turner JA. Chronic pain and depression: does the evidence support a relationship? Psychological bulletin. 1985;97(1):18.
75. Surah A, Baranidharan G, Morley S. Chronic pain and depression. Continuing Education in Anaesthesia, Critical Care and Pain. 2014;14(2):85-9.
76. Dishman RK, McDowell CP, Herring MP. Customary physical activity and odds of depression: a systematic review and meta-analysis of 111 prospective cohort studies. British Journal of Sports Medicine. 2021;55(16):926.
77. Pearce M, Garcia L, Abbas A, Strain T, Schuch FB, Golubic R, et al. Association Between Physical Activity and Risk of Depression: A Systematic Review and Meta-analysis. JAMA Psychiatry. 2022;79(6):550-9.
78. De Mello MT, Lemos Vde A, Antunes HK, Bittencourt L, Santos-Silva R, Tufik S. Relationship between physical activity and depression and anxiety symptoms: a population study. J Affect Disord. 2013;149(1-3):241-6.
79. Blasco BV, García-Jiménez J, Bodoano I, Gutiérrez-Rojas L. Obesity and Depression: Its Prevalence and Influence as a Prognostic Factor: A Systematic Review. Psychiatry Investig. 2020;17(8):715-24.
80. Luppino FS, de Wit LM, Bouvy PF, Stijnen T, Cuijpers P, Penninx BW, et al. Overweight, obesity, and depression: a systematic review and meta-analysis of longitudinal studies. Archives of general psychiatry. 2010;67(3):220-9.

81. Sharafi SE, Garmaroudi G, Ghafouri M, Bafghi SA, Ghafouri M, Tabesh MR, et al. Prevalence of anxiety and depression in patients with overweight and obesity. Obesity Medicine. 2020;17:100169.
82. Almarhoon FH, Almubarak KA, Alramdhan ZA, Albagshi RS, Alotayriz JK, Alqahtani AH. The Association Between Depression and Obesity Among Adults in the Eastern Province, Saudi Arabia. Cureus. 2021;13(10).
83. Hidalgo B, Goodman M. Multivariate or multivariable regression? Am J Public Health. 2013;103(1):39-40.
84. Conroy S, Murray EJ. Let the question determine the methods: descriptive epidemiology done right. British journal of cancer. 2020;123(9):1351-2.
85. Hopstock LA, Grimsgaard S, Johansen H, Kanstad K, Wilsgaard T, Eggen AE. The seventh survey of the Tromsø Study (Tromsø7) 2015–2016: study design, data collection, attendance, and prevalence of risk factors and disease in a multipurpose population-based health survey. Scandinavian Journal of Public Health. 2022:14034948221092294.
86. Alexander LK, Lopes B, Ricchetti-Masterson K, Yeatts KB. Selection bias. ERIC Notebook 2nd ed Chapel Hill, NC: The University of North Carolina at Chapel Hill. 2015.
87. Kang H. The prevention and handling of the missing data. Korean J Anesthesiol. 2013;64(5):402-6.
88. Althubaiti A. Information bias in health research: definition, pitfalls, and adjustment methods. Journal of multidisciplinary healthcare. 2016;9:211.
89. Hunt M, Auriemma J, Cashaw AC. Self-report bias and underreporting of depression on the BDI-II. Journal of personality assessment. 2003;80(1):26-30.