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COLLEGE OF MEDICINE AND HEALTH SCIENCE

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COGNITIVE IMPAIRMENT AND ASSOCIATED FACTORS AMONG ADULTS WITH TYPE TWO DIABETES MELLITUS IN BAHIR DAR CITY REFERRAL HOSPITALS, NORTHWEST ETHIOPIA, 2021.

BY: ENDALK GETASEW (BSC)

A THESIS SUBMITTED TO BAHIR DAR UNIVERSITY, COLLEGE OF MEDICINE AND HEALTH SCIENCES, SCHOOL OF HEALTH SCIENCE DEPARTMENT OF ADULT HEALTH NURSING IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR DEGREE OF MASTERS IN ADULT HEALTH NURSING.

JULY, 2021

BAHIR DAR, ETHIOPIA.

BAHIR DAR UNIVERSITY

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BAHIR DAR, ETHIOPIA.

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ADVISORS'APPROVAL FORM

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COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF HEALTH SCIENCE

DEPARTMENT OF ADULT HEALTH NURSING

I hereby certify that I have read and evaluate this Thesis entitled with "Cognitive impairment and associated factors among adults with type two diabetes mellitus in Bahir Dar city referral hospitals, northwest Ethiopia, 2021 prepared under my guidance by Endak Getasew Hiruy. I recommend that it be submitted as fulfilling the thesis requirement.

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As a member of the Board of Examiners of the MSc thesis open defence examination, I certify that I have read and evaluated the thesis prepared by Endak Getasew Hiruy and examined the candidate. I recommend that the thesis be accepted as fulfilling the thesis requirement for the degree of Master of Science in Adult Health and Nursing.

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Mr.Abere _____ _____

Signature Date

Internal Examiner

Mr.Henok Biresaw _____ _____

Signature Date

Chairperson

Mr.H/eyesus Gedamu _____ _____

Signature Date

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Table of Contents

List of Tables

List of Figures

Abbreviations and acronyms

AD	Alzheimer's Diseases
AOR	Adjusted Odds Ratio
BMI	Body Mass Index
BP	Blood Pressure
CI	Confidence Interval
CI	Cognitive Impairment
CKD	Chronic Kidney Diseases
COR	Crude Odds Ratio
CVD	Cardio Vascular Diseases
ESRD	End Stage Renal Disease
ETB	Ethiopian Birr
FBG	Fasting Blood Glucose
HTN	Hypertension
MCI	Mild Cognitive Impairment
SMMSE	Standardised Mini Mental State Examination
OHA	Oral Hypoglycaemic Agents
OPD	Out Patient Diagnosis
T1DM	Type One Diabetes Mellitus
T2DM	Type Two Diabetes Mellitus
USA	United States of America
VCI	Vascular Cognitive Impairment
WHO	World Health Organization

ABSTRACT

Background: Cognition is any intellectual process by which one becomes aware of perceiving, reasoning, judgment, memory, and thinking. Cognitive impairment is the major health problem particularly in elderly with type 2 diabetes mellitus. So, frequent screening of cognitive status is important for adults living with type 2 diabetes.

Objective: To assess prevalence of cognitive impairment and identify associated factors of adult with type 2 diabetes mellitus having follow up care in Bahir Dar city referral hospitals.

Methods: Institution based cross sectional study was conducted among 421 adults with type 2 diabetic mellitus from March 17th - April 24th /2021. Systematic random sampling technique was used to select the study participants. Structured and pretested questionnaire have been used to collect socio demographic and behavioural data. An adopted Standardised Mini Mental State Examination form was used for face-to-face interview. The standardised mini mental state examination scale ranges from 0 to 30 points, with higher score indicating better cognitive state. Binary logistic regression was used to see the association between each independent variable with the dependent variable. Variables with P-value < 0.25 during bivariate analysis were considered for multivariable logistic regression analysis. Level of significance was declared at P value ≤ 0.05 with 95% confidence interval.

Result: More than half 211 (52.0%) of the participants were males. The mean age of the study participants was 56.12±11.15 years. The median body mass index, fasting blood glucose, and duration of diabetics of the study subjects were 24.9 kg/m^2, 134.0 mg/dl, and 10 years respectively. The overall median cognitive score of adults with type 2 diabetes was found to be 26 with interquartile range of 3 points while measured with standardised mini mental state examination. Among the study participants 112 (27.6%) were found to have cognitive impairment. The study revealed that age greater than 60 with odds ratio of [4.6 (1.03, 2.9), 95% CI], single marital status [2.2 (1.6, 9.4), 95% CI], educational level less than grade 8 [3.3 (1.3, 8.0), 95% CI] and between grade 9 and 12 [2.8 (1.18, 6.5), 95% CI], being farmer [9.4 (2.1, 40.9), 95% CI], presence of comorbidity [3.5(1.7, 7.23), 95% CI], and doing moderate physical exercise [0.35(0.1, 0.9), 95% CI] were significantly associated with cognitive status of the participants.

Conclusion and recommendation: Cognitive impairment was common in the study population. Considering the factors that affect the respondents' cognitive status in this study, there was a significant difference on the cognitive status of the respondents among different age group, marital status, education level, occupation, presence of comorbidity, and doing physical activities. All responsible bodies have to give more emphasis for individuals with type 2 diabetes patients which were older age, lower educated, single, farmer, and had comorbidities.

Key words: Cognitive Impairment, associated factors, type 2 diabetes mellitus, Ethiopia.

1. Introduction

1.1 . Background

Cognition is a collective word for a range of higher brain functions containing language, memory, reasoning, and perception. Cognitive impairment is among the most feared and most common illnesses of old age, making the identification of changeable risk factors for them, a crucial public health importance. Diabetic patients may be susceptible to develop mental health problems because diabetes is counted as one of the most behaviourally and psychologically serious chronic medical illnesses (1, 2).

The concept analysis conducted in 2020 on cognitive dysfunction in T2DM patients defined it as, Cognitive dysfunction among persons with T2DM was interpreted as an emerging condition in T2DM but often remains undiagnosed, and should be considered as a long-term diabetic complication with dramatic consequences for the patients and their families (3).

Cognitive impairment refers to abnormalities in advanced intelligence processing, including learning, memory and critical thinking, in the brain. It can lead to serious learning and memory disorders, along with other pathological processes, such as aphasia, apraxia, agnosia or misconduct (4). The number of cases of cognitive impairment among the elderly has gradually increased every year, along with the aging of the population (5).

Cognitive impairment is mainly classified into Alzheimer's disease, vascular dementia, dementia with Lewy bodies and frontotemporal dementia. Although Alzheimer's disease, the most common type, is considered to be a neurodegenerative disease, it is frequently accompanied by cerebrovascular lesions (2).Additionally, based on its severity cognitive impairment classified as Mild cognitive impairment (MCI), moderate, and severe cognitive impairment (6).Insulin resistance is common in T2DM and it is the most cause for the physiologic disturbance of cognitive function by exacerbating over deposition of beta amyloid (Aβ) and abnormally hyper phosphorylated tau phenotypes, thus affecting cognitive function (5).The rise of blood glucose level beyond the physiologic limits would result in complications to different body parts including kidney, heart, blood vessels, and central nervous system, which is the centre of cognition (7).

The relationship between T2DM and cognitive function has been explored in the study conducted in Ethiopia, as it suggest cognitive dysfunction is an important complication of T2DM (8). T2DM leads to disturbances of brain metabolites and neurotransmitters which are vital for cognition. Memory function appears to be affected in patients with T2DM. Cognitive impairment is the neurophysiologic disturbance caused due to neuronal damage and functional defect among neurotransmitters (7, 8). T2DM causes Impaired neurogenesis, blood brain barriers(BBB) dysfunction, Inflammation, Insulin resistance, Hyperglycaemia, and Vascular dysfunction then its ends with cognitive impairment (9).

As the 2020 guideline of diabetics care showed that Type 1 and type 2 diabetes are both associated with cognitive impairment (4). Although, Type 1 Diabetes mellitus (T1DM) is less prevalent than T2DM, which is less than 5% of all DM cases, due to this its effect on cognition function is not clearly stated by researchers , However, a meta-analysis study conducted in United States of America has shown early onset T1DM is associated with brain structural changes, which might have long-lasting effects on cognitive functions (10).

1.2. Statement of the problem

Cognitive dysfunction, including mild cognitive impairment and dementia, is increasingly recognised as an important comorbidity and complication of diabetes that affects an individual's well-being and diabetes management, and is associated with diabetes treatment related complications(8). Recent guideline therefore recommend screening for cognitive impairment in older individuals with diabetes. In addition, this guideline suggest that glucose-lowering treatment should be tailored in those diagnosed with cognitive impairment, to reduce the risk of hypoglycaemia and improve treatment adherence (4).

The World Health Organization estimates that in 2022 the prevalence of cognitive impairment [including, Alzheimer's disease (AD) and dementia] in the global population aged $\geq$ 65 years will be 4–7% (11). The study conducted in China in 2017 reported that the prevalence of dementia in the population aged $\geq$ 65 years was 7.8%, whereas the prevalence of AD was 4.8%, and after two years in China in 2019 similar study conducted among 256 T2DM patients reported that the prevalence of mild cognitive impairment were 21.6%(5, 12).

Similar study done in Spain in 2011 reported that the prevalence of Cognitive impairment among elders greater than 65 years was 19% (13). Type 2 diabetes is recognized as a serious public health concern with a considerable impact on human life and health expenditures.

Rapid economic development and urbanization have led to a rising burden of diabetes in many parts of the world . Diabetes affects individuals' functional capacities and quality of life, leading to significant morbidity and premature mortality . Recently, concerns have been raised that more than one-third of the diabetes-related deaths occur in people under the age of 60 (14).

People with type 2 diabetes are at increased risk of age-related cognitive decline and dementia. Hypoglycemia is a candidate risk factor, but the direction of association between episodes of severe hypoglycemia and cognitive decline in type 2 diabetes remains uncertain (15). As the study conducted in Singapour among diabetic patients and nondiabetics the prevalence of cognitive impairment was 11.5% more in diabetics than nondiabetics (16).

Two prospective epidemiologic studies have found that older adults with type 2 diabetes have an approximately twofold increased risk of dementia, but others have not, and the mechanism is controversial (15, 16). The prospective study conducted in Australia in 2013 indicated that Participants with diabetes had worse cognitive performance than participants who did not have diabetes (17).

Possible mechanisms linking type 2 diabetes to dementia and cognitive impairment include chronic hyperglycemia or hypoglycemia, hyperinsulinemia or insulin resistance, effects of inflammatory cytokines and oxidative stress, and b-amyloid deposition in the brain (18). Cognitive impairment may particularly affect verbal memory or complex information processing in type 2 DM (19). Although the rate of vascular complications of T2DM continues to rise, there is limited information about the problem. The magnitude of cognitive impairment in type 2 diabetus mellitus patients was 25% as the study done in Black Lion hospital reports(8, 20).

However, information gaps remain exist concerning on the cognitive impairment of type 2 diabetus mellitus patients, and related factors like; age of patients, drug side effect, length of morbidity, educational level and poor glyceamic control either hyperglceamia or hypoglycemia of the patients. Particularly, there is limitation of studies on cognitive impairment in northwestern Ethiopia related to diabetic complications and their associated factors. Therefore, this study expected to narrow the gaps by assessing the prevalence of cognitive impairment of Type 2 DM patients and identifying its associated factors using institution based cross sectional study in Bahir Dar city referral hospitals, northwest Ethiopia.

1.3. Significance of the study

Primarily the findings of this study help for T2DM patients with cognitive impairment and professionals who works in diabetic clinics, by filling the gap of information on prevalence and factors contributing to the development of cognitive impairment among diabetic patients in Bahir Dar city referral hospitals.

Also used as inputs for the policy makers, planners and NGOs participate in the area of diabetis mellitus program. It showed the risk factors of cognitive impairment related to T2DM and it's prevalence in T2DM patients. In the other way the finding of this study will help as reference for other interested researchers in the field.

2. Litrature Review

2.1. Prevalence of cognitive impairment among type 2 diabetis mellitus patients

Poor cognitive performance of type 2 diabetes mellitus (T2DM) patients is mostly underreported in developing countries like Ethiopia (8). Type 2 diabetes has been linked with increased risk of dementia and cognitive impairment among older adults and with premature mortality in young and middle aged adults (18). A great deal of research has found that T2DM may double the incidence of mild cognitive impairment as well as dementia. Following 705 participants for 4.6 years indicated that the domains of verbal fluency, verbal memory, and working memory had a greater decline in patients with T2DM. Besides, they found that T2DM patients had both worse ventricular and brain volume at baseline (21).

Different scientific evidence revealed that cognitive impairment among T2DM patients were highly prevalent in different parts of the world. Institution based cross sectional study conducted in Romania in 2013 reported that among 287 participated T2DM patients 149 (69.0%) patients had mild cognitive, 13 patients (6.0%) reached scores indicative of moderate cognitive dysfunction and none had severe cognitive dysfunction (22).Similar study in Poland among 267 participants in 2014 showed that the prevalence of Cognitive impairment in elderly patients with type 2 diabetes was 31.5%(23).

Comparative Cross sectional study conducted in Brazil between T2DM and healthy individuals the cognitive function is lower in patients with T2DM than nondiabetic individuals with MMSE score of [25.7 in T2DM patients vs 27.6 in controls with (24). A recent comprehensive meta-analysis of population-based longitudinal studies in Japan showed that the pooled relative risk of cognitive impairment in subjects with T2DM (a total of 506 subjects) was 1.46 compared with the subjects without T2DM (36,191 subjects), For vascular dementia (VD), the relative risk was 2.5, based on ten studies including 3,519 subjects with T2DM and 23,026 subjects without (9).

Comparative cross sectional study done in Egypt in 2020 described that The subjective complaint of cognitive impairment among diabetics was significantly higher (34%) compared to non-diabetics [13.0%] (25).

Similar study conducted in Jimma, Ethiopia in 2017 showed that the joint education adjusted MMSE score of the study participants using the independent t-test, was 24.55 and significantly lower MMSE was observed among T2DM patients compared to the non-diabetic study participants. The burden of cognitive impairment among T2DM patients was significantly higher than for nondiabetes study participants [53.3% versus 31.4%] (7). Institution based cross sectional study conducted in the capital city of Ethiopia among 384 T2DM patients in 2013 described that 96 (25%) patients were cognitively impaired (8).

2.2. Factors associated with cognitive impairment among type 2 diabetus mellitus patients

2.2.1. Socio demographic factors related with cognitive impairment

In cognitive impairment age, sex, occupation, and educational status are among the most associated socio democratic factors (26) .

Cohort study conducted among T2DM patients in Mexico in 2015 showed that cognitive impairment was more common among older individuals[0% at an age <30years versus 10.4% at an age > 70years] (27). Recent study in India showed that the prevalence of cognitive impairments increases significantly with age of the individual. Age and certain lifestyle generated diseases including T2DM and AD are the primary risk factors for cognitive decline. Age was inversely related with performance on tasks for memory and information-processing speed in type 2 diabetic patients (28). The study done in Cairo, Egypt showed that diabetics aged above 50 and those with hypertension were the significant predicting factors for Cognitive impairment (1).

The study conducted among T2DM patients in India in 2017 showed that sex was a risk factor for cognitive impairment, as it stated being a diabetic woman was an independent risk factor for neurocognitive impairment which doubles the risk as compared to man (29). Similar study conducted in Ethiopia in 2013 indicated that male T2DM patients were 58% less likely to have impaired cognitive function than female T2DM patients (8).

Institution based cross sectional study conducted in Poland among T2DM educational level was associated with cognitive impairment (23).The study done in china in 2017 reported that educational level was a prevent measure for cognitive impairment among DM patient (5).

The study conducted in China showed that rural residence and unmarried status were significantly associated with cognitive impairment (30).
Comparative cross sectional study conducted in Jimma, Ethiopia in 2017 showed that being a farmer by occupation were higher odds for cognitive impairment compared to government employees in T2DM patients (7).

2.2.2 . Clinical related risk factors

Mostly cognitive impairment in diabetic patients is associated with poor glyceamic control among diabetic patients. Severe hypoglycemia and hyperglyceamia were associated with a decline in cognitive function. As Prospective cohort study conducted in United Kingdom showed severe hypoglycemia was associated with reduced cognitive function at follow-up was increased threefold for the severe hypoglycemia group(15).Similar study done in Spain showed that diabetes group had more pronounced levels of decline compared with no diabetes for global cognition as well as each of the considered cognitive domains, including episodic memory, learning, verbal fluency, and processing speed (31).

Similarly, in a prospective population based study conducted in United States of America(USA) in 2017 patients with any hypoglycemic episode had a twofold higher risk of developing cognitive impairment (32). Other Cross sectional study conducted in USA in 2012 reported that hyperglyceamia was associated with cognitive function, as it described a 0.14-point drop in Standardised Mini-Mental State Examination (SMMSE) score for each 1mg/dl increase in blood glucose level , and that its elevation impaired such aspects of cognitive function as psychomotor speed (Digital symbol substitution test [DSST]), memory and executive function), suggesting a significant nega- tive association between blood glucose level and cognitive function (2). Similar study conducted in Poland among T2DM previous CVD, duration of diabetic, presence of comorbidities, and hypoglycemia were significantly associated with cognitive impairment (23).
Treatment modalities for diabetic are significantly associated with cognitive impairment of the individuals with T2DM. The study conducted in Australia among participants with diabetes, worse cognitive performance was associated with metformin use (17).

The study conducted among T2DM patients in Malaysia in 2019 showed that statin use for diabetic patients was associated with cognitive impairment, as it stated the prevalence of cognitive impairment was 45.2% in statin users and 26.2% in non users (33).

The cross sectional study conducted in Ethiopia in 2013 showed patients who had taken insulin therapy were more likely to have impaired cognitive status than those who had taken oral hypoglycemic agents (OHA) (8). Although, similar study in Jimma, Ethiopia in 2017 showed that taking only OHA as a treatment modality were more likely to have impaired cognitive status than who had used insulin (7).

The study conducted in Mexico in 2015 described some chronic inflammatory diseases like, rheumatoid arthritis and astham were associated with cognitive impairment among T2DM patients rheumatoid arthritis (absent 2.1% vs. present 15.8%) and asthma [absent 2.1% vs.present 13%] (27). As Comparative Cross sectional study conducted in Iran among 350 T2DM patients in 2020 hypertensive diabetic patients showed, respectively, 53.2% and 17.7% mild and moderate cognitive impairment compared with normotensive diabetic patients showed 38.2%, and 12.9% mild, and moderate cognitive impairment respectively (34). A six year follow up study done among T2DM patients in Japan showed that higher diabetic blood pressure (DBP) was significantly associated with cognitive impairment,per 10mmHg increase for DBP the risk of developing cognitive impairment increased by five times (35).

A meta analysis study conducted in USA on behalf of American Acadamy of Neurology in 2019 stated that stroke was strongly associated with cognitive impairment. As the study showed 30% to 35% of individuals were having post stroke cognitive impairment(PSCI) after 2 to 6 month of incident case (36). Community based cross sectional study conducted in China indicated that stroke 1.71 times increase the risk of developing cognitive impairment in T2DM patient (37).

The study conducted in Malaysia in 2020 indicated that end stage renal disease(ESRD) was the risk factor for cognitive impairment, as the study result showed the prevalence of cognitive impairment was 48.2% among ESRD patients (38).

2.2.3 . Behavioural related factors

Behaviours like; dietary habit, smoking, alcohol consumption, and doing physical activities are some risk factors for cognitive impairment (39).

The study conducted in USA in 2017 showed that poor dietary habit can lead to an increase in cognitive dysfunction (40). Individuals who frequently took excess fat rich foods were exposed to develop cognitive impairment, particularly for VD. Midlife cholesterol levels in excess of 6·5 mmol/L are significantly associated with the risk of cognitive impairment in later life (41).

The study conducted in Brazil showed that current smoking conferred a risk for any dementia and for both AD and VCI compared to nonsmokers (42). The study conducted among T2DM patients in China in 2020 showed that smoking habit increase incident of cognitive impairment by twofold (43). Other study in China in 2019 showed that daily exercise <0.5 hr was double the risk of developing cognitive impairment among T2DM patients (37).

2.3. Conceptual Framework

Conceptual framework develop after reviewing different literatures describes the relationship of independent variables with the dependent variable. Independent variables influence the risk of congnitive impairment among T2DM patients directly or indirectly (Figure 1).

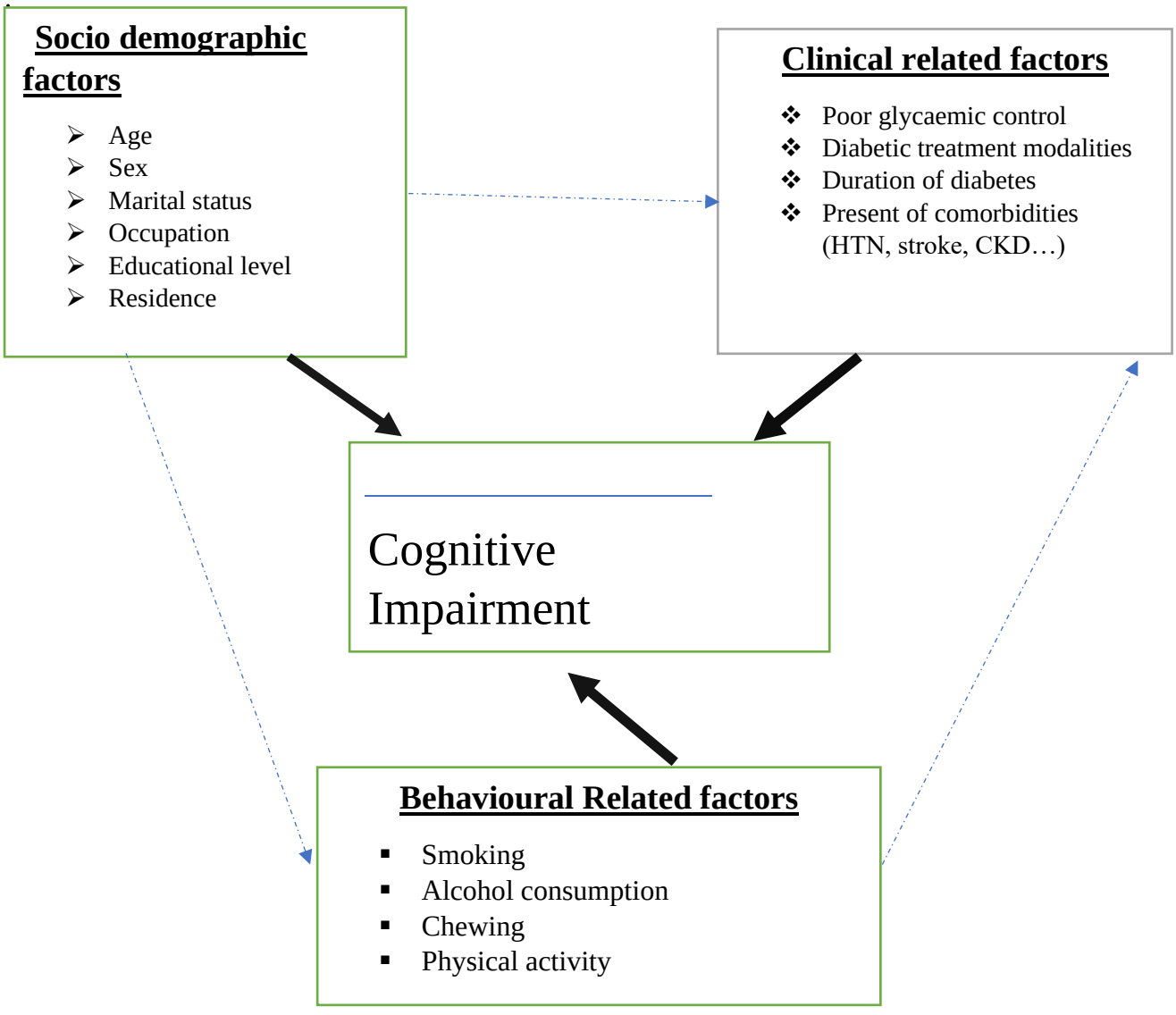

Figure 1:Conceptual framework on cognitive impairment and associated factors among adults with T2DM in Bahir Dar city referral hospitals, Bahir Dar, north west Ethiopia,2021.

3. Objective

3.1. General objective

- To assess prevalence of cognitive impairment and identify its associated factors of adult with type 2 diabetis mellitus in referal hospitals of Bahir Dar city, northwest Ethiopia, 2021.

3.2. Specific objectives

- To determine prevalence of cognitive impairment of adults with type 2 diabetis mellitus in referal hospitals of Bahir Dar city, northwest Ethiopia.
- To identify factors associated with cognitive impairment of adults with type2 diabetis mellitus in referral hospitals of Bahir Dar city, northwest Ethiopia.

4. Method and materials

4.1. Study area

This study was conducted in Bahir Dar city referral hospitals. Bahir Dar is the capital of Amhara regional state which is 565 kilometres far from Addis Ababa. Felege Hiwot Hospital is a Comprehensive Specialized Hospital found in Bahir Dar city. The hospital was serving as a teaching hospital to Bahir Dar University until 2019. The hospital chronic diseases clinic serves average of 500 diabetes patients a month, among those 475 were T2DM patients. Tibebe Gion is also a comprehensive specialized hospital and teaching hospital of Bahir Dar University which starts its service in 2019. On chronic disease clinic of the hospital at least 160 T2DM patients have got service in a month. The city has two comprehensive specialized hospitals, one primary public hospital, ten health centres, and four private hospitals.

4.2. Study period

The study was conducted from March 17th – April 24th ,2021.

4.3. Study design

An institution based cross sectional study design was implemented.

4.4. Population

4.4.1. Source of population

All adults age ≥18 years with type 2 diabetic mellitus who had follow up in Bahir Dar city referral hospitals.

4.4.2. Study population

All adults age ≥18 years with type 2 diabetic mellitus who had follow up in Bahir Dar city referral hospitals and availabe during data collection period.

4.4.3. Study unit

All systematic randomly selected type 2 diabetic mellitus adults age ≥18 who have follow up in Bahir Dar city referral hospitals in the study period and fulfill the inclusion criteria.

4.5. Eligibility criteria

4.5.1. Inclusion criteria

All T2DM adults age ≥18 years attending in Bahir Dar city referral hospitals chronic diseases clinic, having the duration of 1 year and above from diagnosis and clinically stable adults during study period, and volunteers were participated.

4.5.2. Exclusion criteria

T2DM adults which were critically ill during the study period were not included in this study.

4.6. Sample size determination and sampling procedures

4.6.1. Sample Size Determination

Sample size was calculated using a single population proportion formula by using p-value of 53.3% (7). Using the assumptions, 5% marginal error, 95% CI, and 10% for non response.

$$n = \frac{Z_{a/2}{}^2 P(1-P)}{d^2}$$

Where: n = sample size

Za/2 = standard normal distribution corresponding 95% level significance= 1.96

P = prevalence of cognitive impairment among T2DM =53.3%

$$n = 1.96^2 \frac{(0.533)(0.467)}{0.05^2}$$

n=383

By adding 10% non response rate, the final sample size was 421.

To determine the required sample size for the second specific objective of this study different factors which are significantly associated with dependent variable were considered with the following assumption; 95% confidence level, 5% margin of error and power of 80% using an open Epi info version 8 software program, 10% for non-response. The calculated sample size for selected variables and maximum sample size is taken for the final required sample size (table 1).

Table 1**:** Sample size calculation for different factors associated with cognitive impairment among T2DM patients in Bahir Dar city referral hospitals, 2021.

Associated factors	Prevalence of cognitive impairment			Sample size	Reference
	% exposed	% of unexposed	AOR		
Age in year	72% (≥62)	38%(30-45)	7.54	78	(7)
Occupation	84.6%(farmer)	27%(Government employe)	7.38	44	(7)
FBG(in mg/dl)	54%(≥126)	51%(<126)	4.43	82	(7)
Treatment types	59%(OHA users)	43%(insulin users)	5.38	330	(7)

Finally the required sample size of this study was determined by taking the maximum sample size from the first objective (421) T2DM patients were included in this study.

4.6.2 . Sampling procedure

To select T2DM patients in each hospitals, the author used systematic random samplinig techinque by using k- value of two. This was by considering the population in each hospitals were homogenuos. Author used the patients chart order that was sent from card room to the OPD based on the patients time of arrival to the hospital for follow up as an order for selecting the study participants. Since the client flow rate was different in two hospitals. The author had used propotional allocation method.

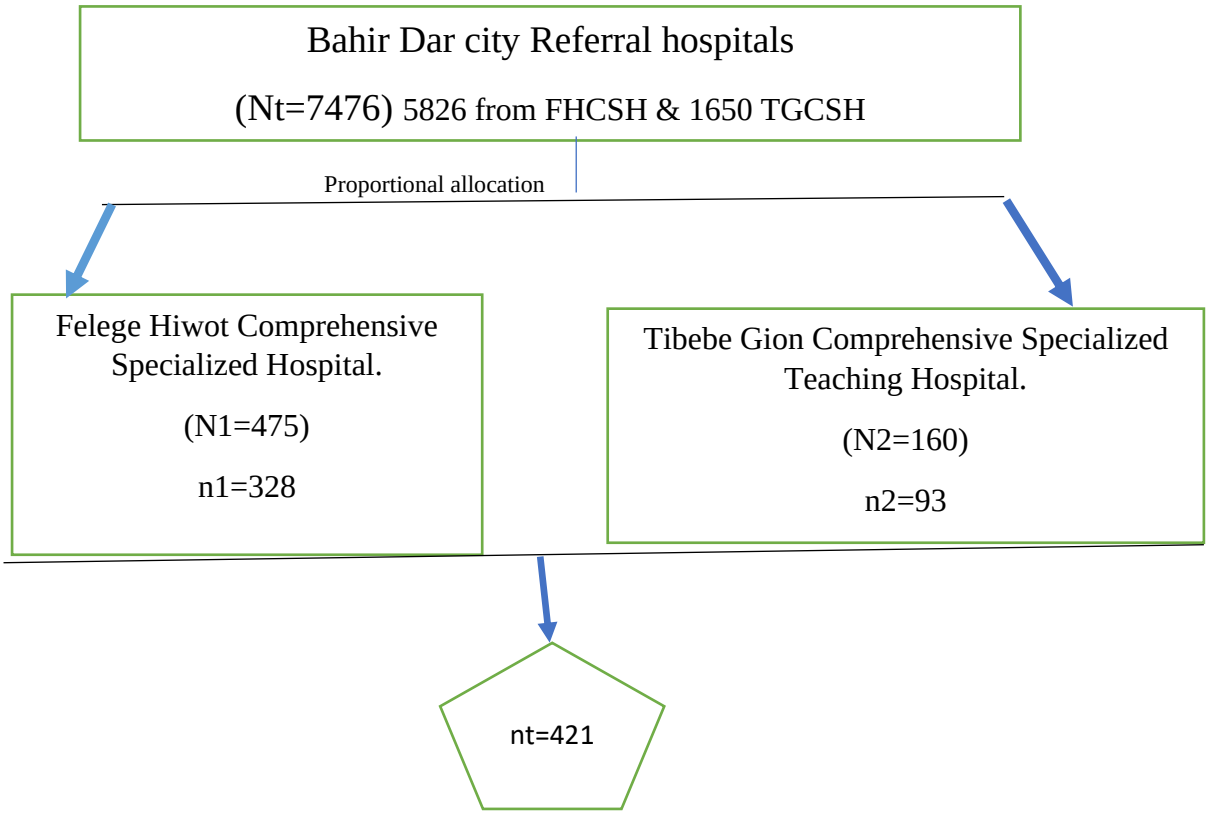

Figure 2: Schematic presentation of the sampling procedure on cognitive impairment among T2DM patients in Bahir Dar city referral hospitals, northwest Ethiopia, 2021.

4.7. Data collection methods

Three BSC nurses as data collectors and one MSc nurse for supervision were participated in the data collection process. Before directly going to actual data collection, the data collectors and the supervisor were trained for one day about the aim of the study and appropriate interaction during interview using a standardised minimental state examination(SMMSE) test. Training on SMMSE was given by psychiatry nurse. As a result, the data collectors were become familiar about each question and mechanism of minimize bias during the process of data collection.

Besides, the client was informed in detail about the purpose and the significance of the study then informed voluntary consent was obtained to undergo the SMMSE, with the highest pontuation of the test being 30 points, instructions was identical for each subject. To carry out the examination, the individual was seat in a quiet, well-light room.

The respondents were asked to listen carefully and to answer each question as accurately as they can. Then, the test results were immediately documented while individuals respond each question. At the end, the number of correct responses were added to score. In addition, the data collectors were obtained client's the last three FBG, and BP measures from chart that requested for checkup. Measure weight, and height of the patients.

4.8. Data collection instruments

Data on socio-demographic variables of T2DM patients were collected by interviewing using structured pretested Amharic version questionnaires adopted from a literature in Ethiopia (7) and author added some variables in which the literature not included. Data on behavioural variables were collected by using CAGE and international physical activity question (IPAQ) assessment tools which were validated and used by Ethiopian researchers. Data on cognition was collected by interview using a SMMSE form (Folstein test) which involves a related series of questions or commands which was previously used by the study in Ethiopia (8) and patients' charts were reviewed for FBG, and for diabetic related variables like, presence of comorbidities, .

The individual was received one point for each correct answer. A SMMSE form was interviewed to each of the 406 subjects. The SMMSE offered a quick and simple way to quantify cognitive function and screen for cognitive loss. The SMMSE scale ranges from 0 to 30 points, with higher score indicating better cognitive state. SMMSE designed to assess the patient's cognitive status various functions including arithmetic, memory and orientation; to screen for cognitive impairment and to estimate the severity of cognitive impairment at a given point in time. It is commonly used in medicine to screen for dementia..

The SMMSE consists 19 questions [30-point questionnaire test; orientation (10 points), registration (3 points), attention and calculation (5 points), recall (3 points), language and praxis [9 points; naming, repetition, 3-stage command, reading, writing and copying] (39).

This SMMSE was introduced by Folstein et al. in 1975. The SMMSE form which is currently published by Psychological Assessment Resources is based on its original 1975 conceptualization, with minor subsequent modifications by the author (6). It had also slightly modified based on the participants education background, and physical ablity of doing the tasks in the tool in order to fit with the purpose of this study and each question was tested about their relationship with variables and study objectives/questions.

4.9. Study variables

4.9.1. Dependent variable

Cognitive impairment.

4.9.2. Independent variables

Socio demographic variables; age, sex, marital status, educational level, occupation, and place of residence.

Cinical related variables; Blood glucose level, type of treatment modality for diabetes, Body mass index, durationa with diabetes, and presence of comorbidities.

Behavioural related variables; Chewing, smoking, alcohol consumption, and physical activity**.**

4.10. Operational Definitions

Cognitive Impairment: is the health disturbance in which the persons ability of thinking, remembering, coping, judgmental ability, and orientation is become decline (3, 44).

A SMMSE score of;

- ✓ ≥ 25 points (out of 30) by SMMSE was considered as effectively normal (intact) cognition.
- ✓ ≤ 24 points were have found cognitive impairment classified as,
    - severe (≤9 points)
    - moderate (10-20 points)
    - mild (21-24) points).

Body Mass Index: is an indicator of the individuals nutritional status which is normal from 18.5-24.9 Kg/m^2 for adults (45).

Good glyceamic control : is when the measure of fasting blood glucose is from 70-126 mg/dl for adults in three consecutive measurements.

Poor glyceamic control: is when the measurement of fasting blood glucose is above 130 mg/dl in three consecutive measurements.

Blood Pressure: is the pressure of the blood within the arteries exerted against the arterial wall which is normal from 85/60 to 130/85 mmHg for adults (46).

High (intensive) Physical Activity: Is an individual doing exercise of seven days of any combination of walking, moderate or vigourous intensity activities for achieving a minimum total of at least 3000 metabolic equivalent(METs).minutes/week.

Moderate Physical Activity: is doing exercise of five or more days of moderate activities or walking of 30 minutes per day and achieving 600METs.minutes/week.

Low (easy) physical Activities: if the individual not fit neither of the tha above two criterias.

Chat abuse/Dependence: if an individual score of 2 or more points By CAGE assessment indicates likelihood of chat abuse, i.e., individual has chat use disorder.

Tobacco Abuse/Dependence: if an individual score of 2 or more points By CAGE assessment indicates likelihood of tobacco abuse, i.e., tobacco use disorder.

Alcohol Abuse/Dependence: if an individual score of 2 or more points By CAGE assessment indicates likelihood of alcohol abuse.

4.11. Data processing and analysis

First data was checked for completeness and consistency before enter to the computer. Then it was coded and entered to Epi-Data version 3.1 software and exported to SPSS statistical software version 25 for analysis. Descriptive statistics like frequency, measure of central tendency was used to describe study participants.

The dependent variable was coded into dicotamous outcomes as they have intact cognition function(no cognitve impairment), and have cognitive impairment depending on the score of SMMSE. T2DM patients with SMMSE score (≥25) was considered as intact cognition and coded as ‘‘0’’, MMSE score (≤24) considered as cognitively impaired coded as “1”.

Independent variables were coded based on the interset of the principal investigator. Binary logistic regression was used to see the association between each independent variables with the outcome. Covariates with a p-value < 0.25 during binary regression analysis were candidates for a multivariable logistic regression analysis to control potential confounders and to identify associated factors for cognitive impairment. In multivariable analysis a significant association of variables with outcome were determined using 95 % confidence interval. Variables with P-value ≤ 0.05 were be declared as statistically significant.

Model fitness was checked by Hosmer and Lemeshow goodness model.

4.12. Data quality control

Data quality had assured through careful design of structured questionnaire and data collection procedure. To estimate the time required for one study participant, and check for its appropriateness pretest had done on 5 % of study sample in T2DM patients who have follow up in Addis alem primary hospital.

One day training had given for data collectors and supervisors regarding to data collection techiniques, SMMSE assessment tool, selection of study participants, ethical issues, and purpose of the study. The training had given by the principal investigator(PI), and pschciatry nurse. Supervision was carried out by one MSc nurse and he had checked completeness, accuracy, and consistency of data throughout data collection period. Overall supervision had done by principal investigator and data double entry had used in Epi data to check discrepancies.

4.13. Ethical considerations

Before the beginning of the data collection, it was reviewed and approved by Institutional Review Board of college of medicine and health science of Bahir Dar University. Official letter had sent to the two referral hospitals in Bahir Dar city. An informed, voluntary, consent had taken from each study participant who were selected for interview after explaining the purpose, benefits, duration and any possible risk of the study. Confidentiality of the study participants' information had ensured.

4.14. Information dissemination

The result of this study will be presented for Bahir Dar University College of Medicine and Health Sciences, Bahir Dar city health administration office and for other NGOs working on psychiatric and diabetic areas. All possible effort will be made to publish the findings on diabetic journal.

5.Result

5.1. Socio demographic characteristics of the participants

A total of 421 adults with type 2 diabetes mellitus were approached to participate in this study while 406 adults were participated giving a response rate of 96.4%. Slightly higher than half 211 (52.0%) of participants were males. Sociodemographic, clinical and behavioural characteristics of the patients are shown in tables and figures below.

The age distribution of the study population showed, the maximum age of the respondents was 85 and the minimum was 31 with the mean age of 56±11.15 SD years. Most of the respondents were found to the age group between 46 and 60 which accounts 183 (45.1%).

Regarding the result of marital status majorities of respondents were married which accounts 313 (77.1%). Additionally, the result on educational background showed that half 205 (50.5%) of the participants were accomplish their college education. Considering the residence of the study participants majority 355 (87.4%) were living in urban. Regarding the occupation of the participants the majority were governmental employers which accounts 139 (34.2%) followed by merchant 87 (21.4%) (Table 2).

Table 2: Socio demographic characteristics of T2DM out patients in two referral hospitals Bahir Dar, northwest Ethiopia March-April 2021 (n=406).

Variables	Category	Frequency (%)
Age in year	30-45	77 (19.0)
	46-60	183 (45.1)
	>60	146 (35.9)
Sex	Male	211 (52.0)
	Female	195 (48.0)
Marital status	Married	313 (77.1)
	Single	17 (4.2)
	Divorce	31 (7.6)
	Widowed	45 (11.1)

Educational level	≤ Grade 8	111 (27.3)
	9-12 Grade	90 (22.2)
	College and above	205 (50.5)
Occupation	Government employee	139 (34.2)
	Merchant	87 (21.4)
	Farmer	26 (6.4)
	House wife	49 (12.1)
	Daily labourer	11 (2.7)
	Others	94 (23.2)
Residence	Urban	355 (87.4)
	Rural	51 (12.6)

NB: *Others includes drivers, NGO workers, retired individuals.*

5.2. Clinical characteristics of the study participants

According to the result of BMI of the study participants the median BMI was 24.9 kg/m^2 with interquartile range of 4.4 kg/m^2 . The minimum of 16.53kg/m^2 and a maximum of 35.63 kg/m^2, and almost half 202 (49.8%) of the respondents were in the normal range (Figure 3).

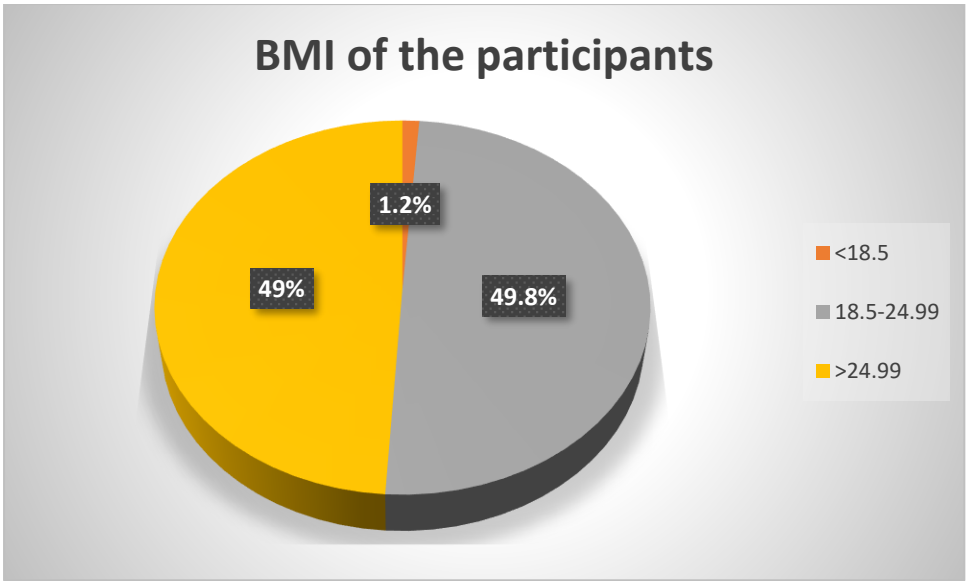

Figure 3**:** BMI of T2DM out patients in two referral hospitals, Bahir Dar, Northwest, Ethiopia from March-April, 2021 (n=406).

Regard to the result of blood glucose level the median FBS was 134.0 mg/dl with interquartile range of 57.4 mg/dl. More than half of the respondents were hyperglycaemic accounts 217 (53.4%) (Figure 4).

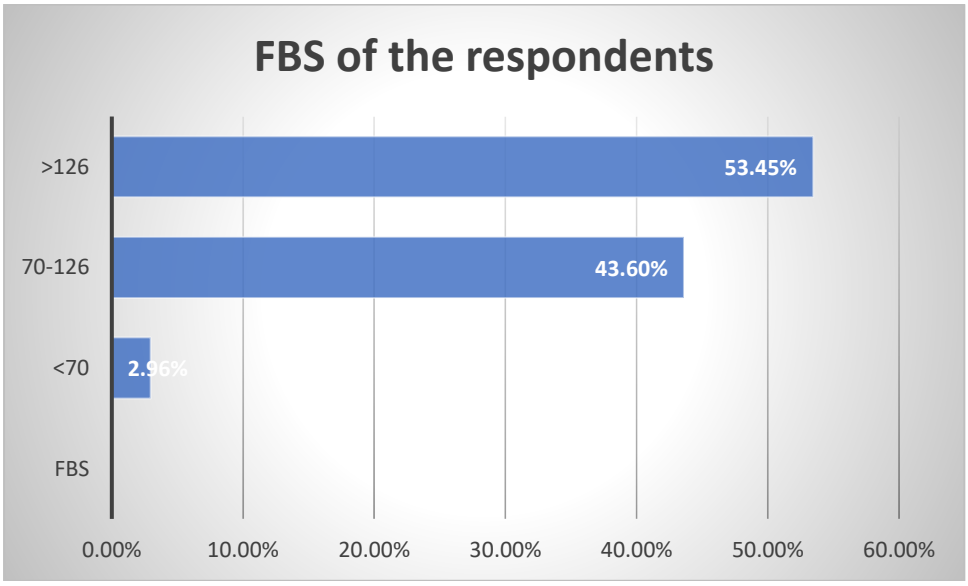

Figure 4**:** FBS of T2DM outpatients in two referral hospitals Bahir Dar, northwest Ethiopia March-April, 2021.

The result on duration of diabetes of the participants indicated that the median duration was 10 years with interquartile range of 7 years, and the minimum duration of diabetes was one year with a maximum of 30 years, similarly 166 (40.9%) of individuals have more than 10 years of diagnosis with diabetic (Figure 5).

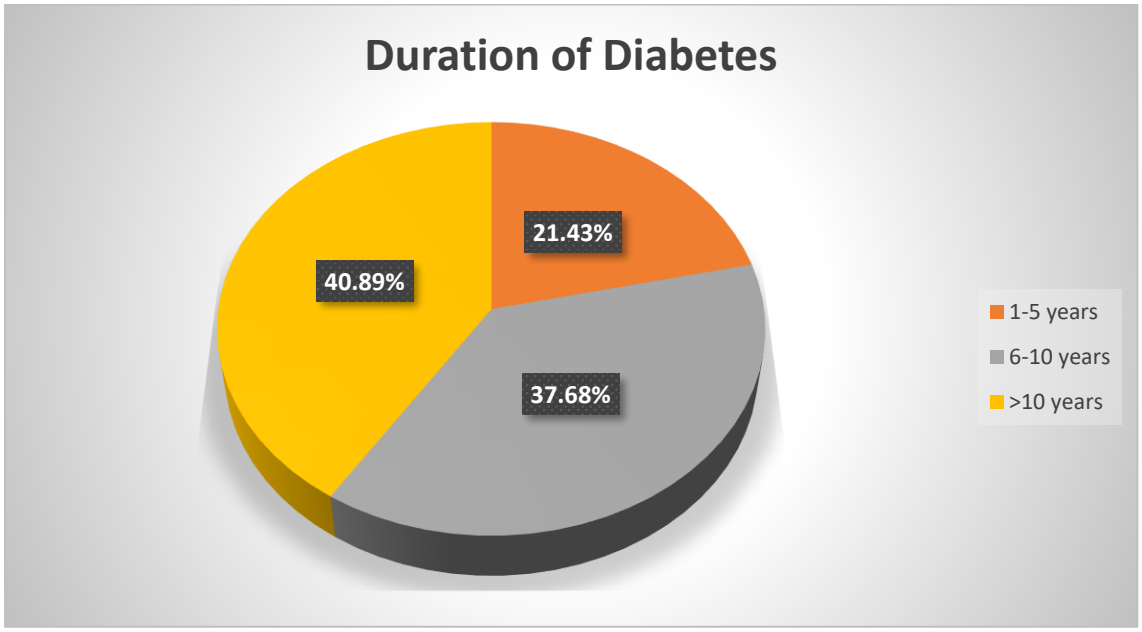

Figure 5**:** Duration of diabetes of T2DM outpatients in two referral hospitals, Bahir Dar, northwest Ethiopia March-April, 2021 (n=406).

Regard to the result of comorbidity more than half 217 (53.4%) of the respondents had comorbidities. The result also showed that hypertension was the leading comorbid which accounts 136 (63%) followed by CVD 38 (17.6%).

Considering the result of the treatment modality for diabetes of the study participants majority use OHA only 296 (72.9%) (Table 3).

Table 3**:** Other clinical Variables of T2DM outpatient in two referral Hospitals, Bahir Dar, northwest, Ethiopia from March-April 2021 (n=406).

Variables	Category	Frequency (%)
Treatment modality	Insulin	61 (15.0)
	OHA	296 (72.9)
	Both	49 (12.1%)
Comorbidity	No	189 (46.6)
	Yes	217 (53.4)
Comorbidity type	Hypertension	136 (63.0)
	CKD	31 (14.4)
	CVD	38 (17.6)
	Others	11 (5.1)

NB: *CKD; chronic liver disease) CVD; cardio vascular disease Other; including asthma, stroke.*

5.3. Behavioural related factors of the study subjects

As the result of behavioural variables of the participants showed that majority 392 (96.6%) of study participants were not current smokers.

According to the result of the study among 406 participants 20(4.9%) were chat chewers and among chewers 5 (25%) were chat dependents. Additionally, 125 (30.8%) of the study participants were current alcohol users among those users 10 (8%) were alcohol dependents. Beside of the result of physical activity habit of the respondent's majority 386 (95.1%) were doing physical exercise at least for 10 minutes. Among those majority 170(44.0%) were doing easy exercise (Table 4).

Table 4: Behavioural related characteristics of T2DM outpatients in two referral Hospitals Bahir Dar, northwest Ethiopia March-April 2021 (n=406).

Variables	Category	Frequency (%)
Smoking tobacco	No	392 (96.6)
	Yes	14 (3.4)
Tobacco abuse	No	12 (85.7)
	Yes	2 (14.3)
Khat chewing	No	386 (95.1)
	Yes	20 (4.9)
Khat abuse	No	15 (75.0)
	Yes	5 (25.0)
Drinking	No	281 (69.2)
	Yes	125 (30.8)
Alcohol abuse	No	115 (92.0)
	Yes	10 (8.0)
Physical exercise for 10 minutes	No	20 (4.9)
	Yes	386 (95.1)
Type of physical exercise	High	52 (13.5)
	Moderate	164 (42.5)
	low	170 (44.0)

5.4. cognitive status of the participants

Regard to the result of cognitive status of T2DM out patients, 112 (27.6%) had found cognitive impairment with [95% CI (23.2%,31.9%)]. Among cognitively impaired individuals 92 (22.66%), 19 (4.68%), and 1(0.25%) were mildly, moderately, and severely impaired, in the order accordingly (figure 6).

The median of total SMMSE score was 26.0 with interquartile range of 3 points, ranges from 9 to 30.

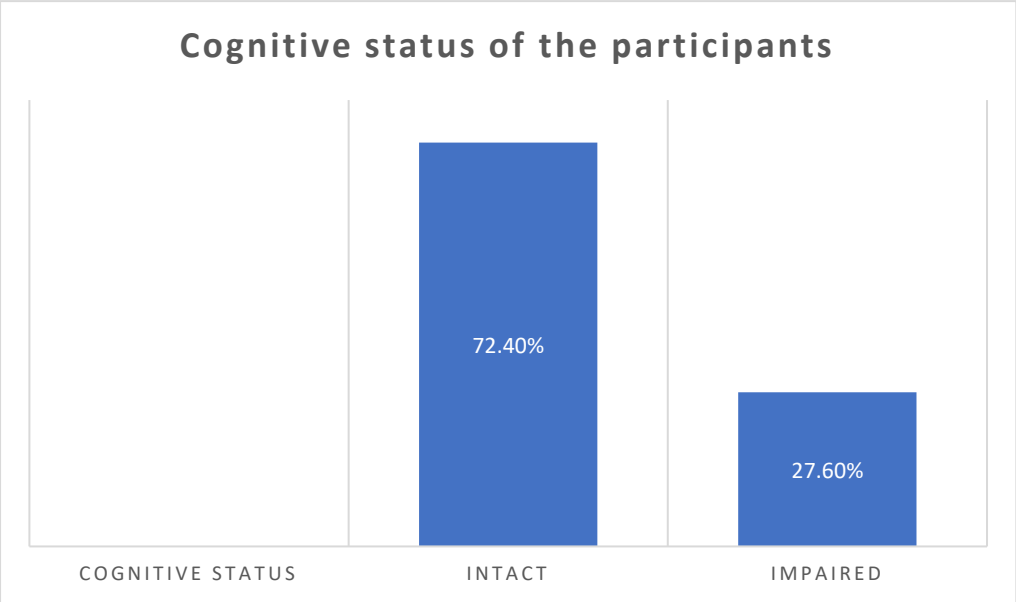

Figure 6: The cognitive status of T2DM out patients in two referral Hospitals, March-April 2021 (n=406).

5.5. Predictors of cognitive impairment among T2DM patients

As the result of the bivariate analyses showed sociodemographic factors such as age, sex, marital status, educational level, occupation, and place of residence were candidates for multivariant analysis of cognitive impairment.

The analysis of clinical related factors, showed that BMI, presence of comorbidity, duration of DM, and treatment modality for DM with behavioural factors like, current drinking, and type of physical activity were also candidates for the multivariant analysis.

Hosmer lame show (p=0.123), the model was fit for Hosmer Lame show goodness fit model. Multivariable logistic regression analysis was done for all explanatory variables having $p < 0.25$ in bivariate logistic regression analysis.

Then based on the analysis Age greater than 60 years, education level less than grade 8 and grade 9 to 12, being single, being farmer, presence of comorbidity, and doing moderate physical exercise were significantly associated with cognitive impairment of T2DM patients.

Therefore, those who were in the age group greater than 60 years were 4.6 times more likely to develop cognitive impairment than age group between 30-45 [AOR=4.6, 95% CI (1.03, 20.86)]. Concerning on marital status being single was 2.2 times increase the risk of cognitive impairment than married participants [AOR=2.2, 95% CI (1.6,9.4)]. As well, participants with education level less than grade 8 and those who complete their secondary education were 3.3 times and 2.8 times more likely to have cognitive impairment than those who complete their higher education [AOR=3.3, 95% CI (1.34, 8.01)] and [AOR=2.8, 95% CI (1.18, 6.54)] accordingly in the order.

Regard to occupation of the study subjects' farmers were 9.4 times more likely affected with cognitive impairment than government employers [AOR=9.4, 95% CI (2.14, 40.94)]. Concerning on the analysis of comorbidity with DM the respondents who had comorbidity were 3.5 times more likely to develop cognitive impairment than those who have comorbidity [AOR=3.5, 95% CI (1.7, 7.23)].

The result as well signifies that participants doing moderate physical exercise were 65% less likely to develop cognitive impairment than who did hard physical exercise [AOR=0.35, 95% CI (0.12,0.87)] see Table 5 below.

Table 5: Predictors of cognitive impairment among T2DM out patients in two referral hospitals, March-April,2021.

Variables	Category	Cognitive impairment		COR (95% CI)	AOR (95% CI)
		No	Yes		
Age	30-45	70	7	1	1
	46-60	144	39	2.7 (1.15, 6.36)	2.6 (0.64, 11.0)
	>60	80	66	8.2 (3.55, 19.16)	4.6(1.03, 2.9) **
Sex	Male	163	48	1	1
	Female	131	64	1.7 (1.07, 2.57)	1.4 (0.66, 2.9)
Marital Status	Married	244	69	1	1
	Single	12	5	2.5 (1.8, 10.33)	2.2 (1.6, 9.4) **
	Divorce	20	11	1.9 (0.89, 4.26)	2.5 (0.95, 6.35)
	Widowed	18	27	5.3 (2.76, 10.2)	1.6 (0.68, 3.64)
Educational level	<grade 8	52	59	7.81(4.48,13.61)	3.3 (1.3, 8.0) **
	9-12 grade	63	27	2.95(1.60,5.43)	2.8 (1.18, 6.5) **
	College & above	179	26	1	1

Occupation	Government employee	128	11	1	1
	Merchant	64	23	4.2 (1.9, 9.95)	1.2 (0.43, 3.68)
	Farmer	12	14	13.6 (5.06, 36.42)	9.4 (2.1, 40.9) **
	House wife	24	25	12.1(5.3, 27.9)	2.1 (0.62, 7)
	Daily labourer	10	1	1.2 (0.14,9.95)	0.3 (0.02, 4.59)
	Others	56	38	7.9(3.76, 16.56)	1.6 (0.61, 4.42)
Residence	Urban	265	90	1	1
	Rural	29	22	0.45(0.24,0.82)	0.66 (0.26, 1.65)
BMI in kg/m^2	<18.5	4	1	1	1
	18.5-24.99	151	51	1.4 (0.15, 12.37)	2.2 (0.14, 36.23)
	≥25.00	139	60	1.7 (0.19, 15.17)	2.8 (0.16, 46.60)
Comorbidity	No	165	23	1	1
	Yes	129	89	5.02 (3.0, 8.39)	3.5 (1.7, 7.23) **
Duration of diabetes	1-5 years	71	16	1	1
	6-10 years	124	29	1.1 (0.53, 2.04)	1.0 (0.4, 2.74)
	>10	99(24.4%)	67	3.0 (1.61, 5.61)	1.0 (0.37, 2.6)

Treatment modality	Insulin	50	11	1	1
	OHA	207	89	1.9 (0.97, 3.93)	1.5 (0.53, 4.32)
	Both	37	12	1.5 (0.59, 3.71)	1.8 (0.48, 6.61)
Current Drinking	No	188	93	1	1
	Yes	106	19	2.7 (1.59,4.77)	2.23 (0.86,5.77)
Type of physical activity	High	40	12	1	1
	Moderate	143	21	0.26 (0.15,0.46)	0.35 (0.1, 0.9) ****
	Low	109	61	0.54(0.26,1.09)	1.0(0.34, 2.91)

*** Significantly associated variables in multivariant analysis*

6. Discussion

This study measured the cognitive status of adults with type 2 diabetes through the SMMSE and related variables.

In this study, prevalence of cognitive impairment was 27.6% with [95% CI (23.2%, 31.9%)]. This was in line with the result of the studies done in Addis Ababa, Ethiopia 25% (8) and in Poland 31.5% (24). On the other hand, this result was lower than the study conducted in Jimma, Ethiopia, which was 53.3% (7). This discrepancy might be due to educational, and physical ability modification of the study participants in which the study was not modified the SMMSE score by education and physical ability. Additionally, the result of this study was lower than the study done in Romania which was 75% (22). This discrepancy may be due to using different type of screening technique the study uses Montreal cognitive assessment tool (MoCA) and the referenced study had used large sample size. Although, the result of the study was higher than the study conducted in Egypt which was 22% (25). This was due to using different sample size, this study used large sample size.

In this study age was the independent predictor of cognitive impairment of the T2DM patients. The percentage of cognitive impairment increased on older age, this in line with the study conducted in Egypt (1), Mexico (27) and India (28). The possible mechanism may be due to as age increases the body cells including the brain cells will become degrade and decreased the individual's cognitive function (47, 48).

This study stated that being single was a risk factor for cognitive status. This agrees with the result of the study done in China (30). The potential reason may be due to after the age of adolescent individuals become self-governance and live out of family, so if they did not get married, they become expose to loneliness this led to depression and other mental disorders including cognitive impairment (49).

In addition to this educational background was associated with cognitive impairment, individuals with lower educational level had higher risk of cognitive impairment. This agrees with study conducted in Addis Ababa Ethiopia (8). And the other two cross sectional studies conducted in Poland and China also agrees with this finding (5, 24).

This is due to the fact that education increase the individuals thought function, and general mental functioning, so individuals with higher education level had lower prevalence of cognitive impairment (50).

In this study occupation was also a risk factor of CI. As it shows being a farmer was increasing the burden of CI. This finding similar with the result of the research conducted in Jimma Ethiopia in 2017 (7). This may be due to farmers spent more of their time on doing farm activities and not reading different books for developing their mental function and mostly farmers are more prone to work site injury (51).

The result of the study also showed that present of comorbidities was an independent risk factor for cognitive function of T2DM patient. This agrees with the studies done in different Asian countries in Japan, china, and Malaysia (35, 37, 38). In addition to this the studies done in Poland, Mexico, and USA support and discuss the finding of this result (24, 27, 36). The possible mechanism may be due to the patient with different diseases will face immunity deficiency, this affects the individual's neural function including his/her cognitive function by exposing those cells to diseases (52).

The study got the result of some individual behaviours, like doing physical activities were significantly associated with cognitive level of T2DM patients, which shows T2DM patients doing moderate physical activities were less likely suffer from cognitive impairment. This finding had agreed with the study conducted in China (37). The possible mechanisms may be due to: physical activity result in balanced body weight, which in turn increase burn out of excess accumulated fats and prevents arteriosclerosis and other vascular and brain cell diseases. On the other side it also improves normal circulatory and other metabolic functions that helps for individual's heathy cognitive activity (53).

7. Limitation of the study

The presence of purely physical problems and educational level could interfere with interpretation if not properly noted; for example, a patient may be physically unable to hear or read instructions properly, or might have a motor deficit that affects writing and drawing skills.

Lack of imaging data, confining the ability to link diabetic and its cause to neuropathology and cognitive deficit. Additionally, this leads the study unable to identify specific types of cognitive impairment.

8. Conclusions and Recommendations

8.1. Conclusion

In the study cognitive impairment was common in the study population, which accounts more than one fourth of the study population. Considering the factors that affect the respondents' cognitive status in this study, there was a significant difference on the cognitive status of the respondents among different groups of age, marital status, education level, occupation, presence of comorbidity, and doing physical activities.

8.2. Recommendation

Type 2 diabetes mellitus has an association with cognitive impairment which may be complicated along with the severity of the disease. This relationship yet again leads for further complication of the disease because of increased age, being single, low educational level, being farmer, presence of comorbidities, and don't do physical activities. At the same time, these related factors could be outcomes of impaired cognition. As a result, severity of diabetes and cognitive impairment worsen through time. Therefore, prevention and early detection is necessary. For that reason, this study recommends …….

The client

- ✓ Do regular physical exercise.
- ✓ Enhance their educational level

The health professionals

- ➢ Teach patients about use of doing physical activities, normal routine care of diabetes, preventive, early detection measures and regular follow up of cognitive function per the understanding capacity of the clients since low education level patients are at high risk.
- ➢ Perform cognition assessment for all T2DM patients together with their follow up.

Regional health bureau

- Design a strategy focused on early detection of cognitive impairment, through SMMSE or other tests and prevention on chronic diseases (diabetes) complication
- Generate accessible, affordable and available chronic illness (diabetes) care services, treatments, and education which also involves the cognitive status assessment for patients.

For Hospital administrators

- Design a training for healthcare providers on CI screening techniques and follow its application.

For researchers

- Future follow up studies are suggesting to better identify specific types of cognitive impairment and their respective risk factors of adults with type two diabetes by using advanced diagnostic techniques, like, MRI, CT.

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Referrance

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Annexes

Annex 1: Information and consent sheet

Information Sheet and Consent Form Prepared for type 2 diabetes patients who were going to participate in Research Project, A cross-sectional study on cognitive impairment and associated factors of adults with type 2 diabetes mellitus in Bahir Dar city referral hospitals, northwest Ethiopia in 2021.

Name of Principal investigator: Endalk Getasew

Name of the organization: Bahir Dar University, College of Medicine and Health Science, Department of Adult Health Nursing.

Name of the Sponsor: St. Peter Specialized hospital.

This information sheet and consent form is prepared to explain the study you are being asked to join. Please listen carefully and ask any questions about the study before you agree to join. You may ask questions at any time after joining the study. The investigator is final year MSc graduate student from the department of Adult Health nursing, College of medicine And Health Science, Bahir Dar University, and Two advisors from Bahir Dar University.

Purpose of Research Project

The purpose of this study is to assess the cognitive function of clients with type 2 diabetes and to identify the factors associated with it through mini mental state examination in FHCSH and Tibebe Gion comprehensive Specialized Hospital, northwest Ethiopia, 2021.

Procedure

To assess the prevalence and associated factors of cognitive impairment of the patient with type 2 diabetes who have follow up in Bahir Dar city referral hospitals, northwest Ethiopia, you are invited to take part in this project. If you are willing to participate in this research, you need to understand the procedures of standardised mini mental state examination form and confirm it verbally the agreement. Then after, you will be interviewed by the data collector to give your response. You do not need to tell your name to the data collectors and all your responses and the results obtained will be kept confidentially by using coding system whereby no one will have access to your response.

Risk/ Discomfort

By participating in this research project, you may feel that it has some discomfort especially on wasting time about 20 minutes. We hope you will participate in the study for the sake of the benefit of the research result. There is no risk in participating in this research project.

Benefits

If you participate in this research project, there may not be immediate benefit to you but your participation is likely to help the principal investigator in assessing what a significant association present between cognitive impairment and type 2 diabetes patients and factors associated to impaired cognition function in the socio-demography of the study area. Ultimately, this will help the investigator to identify the gap related to prevention, early detection and intervention going to be done by the authorized stake holder. Therefore, the future benefit of the study is towards promoting your health status.

Incentives

You will not be provided any incentives or payment to take part in this research.

Confidentiality

The information collected from this research project will be kept confidential and information about you that will be collected by this study will be stored in a file, without your name, but a code number will be assigned to it. And it will not be revealed to anyone except the principal investigator and will be kept locked with key.

Right to refuse or withdraw

You have full right to refuse from participating in this research. You can choose not to respond to some or all questions if you do not want to give your response. You have also the full right to withdraw from this study at any time you wish, without losing any of your right.

Persons to contact

If you have any question to ask, please contact

- Endalk Getasew
- Tel: +251-910-12-2781/+251-931-85-609
- Email: endiget2316@gmail.com

Annex 2: Questionnaire

Bahir Dar University

College of Medicine and Health Science

Department of Adult Health Nursing

The study was conducted by post graduate Adult health nursing (MSN) year II nursing student to assess the prevalence and associated factors of cognitive impairment among type 2 diabetes mellitus patients who have follow up in Bahir Dar city referral hospitals, Bahir Dar, northwest Ethiopia, 2020/21.

Instruction

Dear participants, the main aim of this study is to assess the prevalence and associated factors of cognitive impairment among type 2 diabetes mellitus patients. The results of the study will be used as base line information to design appropriate prevention, early detection, intervention strategies of diabetes clients with impaired function. The questionnaire contains closed ended questions and was provided in the form of interview which involves and carried out as the following.

The Standardised Mini-Mental Status Examination offers a quick and simple way to quantify cognitive function and screen for cognitive loss. It tests the individual's orientation, attention, calculation, recall, language and motor skills. Each section of the test involves a related series of questions or commands. The individual receives one point for each correct answer. To give the examination, the data collector and the participant seat in a quiet, well-lit room. Data collector should ask the participant to listen carefully and to answer each question as accurately as he/she can. If you are voluntary, please confirm it verbally so you are kindly requested to provide your genuine answers to the questions. If you have any question, don't hesitate to ask the data collector.

Thank you very much for your cooperation!!

Part I: Socio-Demographic characteristics

S,No	Variable	Response	Skip to
101	What is your age in years?	----------	
102	Sex of the patient	1. Male 2. Female	
103	What is the marital status of the patient?	1. Married 2. Single 3. Divorced 4. Widowed	
104	What is the current educational level of the patient?	1. $\leq grade\ 8$ 2. Grade 9-12 3. College and above	
105	What is the current occupation status of the patient?	1. Governmental employee 2. Merchant 3. Farmer 4. House wife 5. Daily labourer 6. Other (specify)	
106	What is the current residence of the patient?	1. Urban 2. Rural	

Part II: Questions to assess the Clinical characteristics of the patients			
201	Weight of the patient in Kg?	----------	
202	Height of the patient meter?	…….	
203	BMI of the patient in Kg/m^2?	----------	
204	FBS of the patients in mg/dl of blood?	----------	
205	How many years the patients live with diabetic?	-------	
206	Is there comorbidity	1. Yes 2. No	If no to 208
207	Type of comorbidity in the patient?	1. Hypertension 2. Chronic liver disease 3. Cardiovascular disease 4. Others (specify)	
208	What is the treatment option of the patient?	1. Insulin only 2. Oral hypoglycaemic agents only 3. Both	

Part III: questions to assess the behaviour of the patient

A) Questionnaires that screen for abuse or dependence of Tobacco in adults (CAGE assessment)

No	Questions	Response	Remark
301	Have you drink alcohol containing beverages?	1. Yes 2. No	If the response is "**No"** not ask the other questions, the screening is over.
302	Have you ever felt you out to **cut** down on your drinking?	1. Yes 2. No	
303	Have you ever had people **annoyed** you by criticizing your drinking?	1. Yes 2. No	
304	Have you ever felt bad or **guilty** about your drinking?	1. Yes 2. No	
305	Have you ever had a drink as an **eye opener** first think in the morning to steady your nerves?	1. Yes 2. No	

Scoring: Each question is scored 1 point.

A score of 1 raises suspicion of alcohol abuse.

A score of 2 or more indicates likelihood of alcohol abuse, i.e., alcohol use disorder.

B) Questionnaires that screen for abuse or dependence of Tobacco in adults (CAGE assessment)

No	Questions	Response	Remark
306	Have you smoke tobacco?	1. Yes 2. No	If the response is "**No"** not ask the other questions, the screening is over.

307	Have you ever felt you out to **cut** down on your smoking?	1. Yes 2. No	
308	Have you ever had people **annoyed** you by criticizing your smoking?	1. Yes 2. No	
309	Have you ever felt bad or **guilty** about your smoking?	1. Yes 2. No	
310	Have you ever had a smoke as an **eye opener** first think in the morning to steady your nerves?	1. Yes 2. No	

Scoring: Each question is scored 1 point.

A score of 1 raises suspicion of tobacco abuse.

A score of 2 or more indicates likelihood of tobacco abuse, i.e., tobacco use disorder

C) Questionnaires that screen for abuse or dependence of Khat in adults (CAGE assessment)

No	Questions	Response	Remark
311	Have you chewed khat?	1. Yes 2. No	If the response is "**No"** not ask the other questions, the screening is over.
312	Have you ever felt you out to **cut** down on your chewing?	1. Yes 2. No	
313	Have you ever had people **annoyed** you by criticizing your chewing?	1. Yes 2. No	
314	Have you ever felt bad or **guilty** about your chewing?	1. Yes 2. No	
315	Have you ever had a chew as an **eye opener** first think in the morning to steady your nerves?	1. Yes 2. No	

Scoring: Each question is scored 1 point.

D) Physical activity assessment by using international physical activity questionnaire (IPAQ)

I am going to ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.			
S.NO	Questions	Response	Skip
Now, think about all the vigorous activities which take hard physical effort that you did in the last 7 days. Vigorous activities make you breathe much harder than normal and may include heavy lifting, digging, aerobics, or fast bicycling. Think only about those physical activities that you did for at least 10 minutes at a time.			
316	During the last 7 days, on how many days did you do vigorous physical activities for at least 10 minutes at a time?	1. _____ Days per week 2. Don't Know/Not Sure	If respondent answers zero (No vigorous physical activities), refuses or does not know**, skip** to Question 318
317	How much time did you usually spend doing vigorous physical activities on one of those days for at least 10 minutes at a time?	1. __ __ Hours per day 2. __ __ Minutes per day 3. Don't Know/Not Sure	
Now think about activities which take moderate physical effort that you did in the last 7 days. Moderate physical activities make you breathe somewhat harder than normal and may include carrying light loads, bicycling at a regular pace, or doubles tennis. Do not include walking. Again, think about only those physical activities that you did for at least 10 minutes at a time.			
318	During the last 7 days, on how many days did you do moderate physical activities at least 10 minutes at a time?	1. ____ Days per week 2. Don't Know/Not Sure	If respondent answers zero (No moderate physical activities), refuses or does not know, **skip** to Question 320
319	How much time did you usually spend doing moderate physical activities on one of those days?	1. __ __ Hours per day 2. __ __ Minutes per day 3. Don't Know/Not Sure	
Now think about the time you spent walking in the last 7 days. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.			
320	During the last 7 days, on how many days did you walk for at least 10 minutes at a time?	1. ____ Days per week 2. Don't Know/Not Sure	If respondent answers zero, or does not know, **skip** to Question 322

321	How much time did you usually spend walking on one of those days?	1. __ __ Hours per day 2. __ __ Minutes per day 3. Don't Know/Not Sure	
Now think about the time you spent sitting on week days during the last 7 days. Include time spent at work, at home, while doing course work, and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television.			
322	During the last 7 days, how much time did you usually spend sitting on a week day?	1. -----Hours per weekday 2. __ Minutes per weekday 3. Don't Know/Not Sure	

Part IV: Standardized Mini mental state examination For cognition Assessment

Say: I am going to ask you some questions and give you some problems to solve. Please try to answer as best you can.

1. Orientation to Time	**correct**	**Incorrect**
what is today's date?		
What is the month?		
What is the year?		
What is the day of the week today?		
What season is it?		

Total: ____

2. Orientation to Place

Whose home is this?		
What room is this?		
What city are we in?		
What county are we in?		
What state/region are we in?		

Total: ____

3. Immediate Recall

Ask if you may test his/her memory. Then say ―ball‖, ―flag‖, ―tree‖ clearly and slowly, about 1 second for each. After you have said all 3 words, ask him/her to repeat them – the first repetition determines the score (0-3):

Ball ☐ ☐

Flag ☐ ☐

Tree ☐ ☐

Total _____

4. Attention

Ask the individual to begin with 100 and count backwards by 7. Stop after 5 subtractions. Score the correct subtractions.

93 ☐ ☐

86 ☐ ☐

79 ☐ ☐

72 ☐ ☐

65 ☐ ☐

Total: _____

Alternative back spell of the word **"WORLD":** **D** **L** **R** **O** **W**

☐ ☐ ☐ ☐ ☐

One point for each correct spell.

5. Delayed Verbal Recall

Ask the individual to recall the 3 words you previously asked him/her to remember.

Ball ☐ ☐

Flag ☐ ☐

Tree ☐ ☐

Total: _____

6. Naming

Show the individual a wristwatch and ask him/her what it is. Repeat for pencil.

Watch		
Pencil		

Total: _____

7. Repetition

Ask the individual to repeat the following:

―No if, ands, or buts''		

Total: _____

8. 3 -Stage Command

Give the individual a plain piece of paper and say, ―Take the paper in your hand, fold it in half, and put it on the floor.

Takes		
Folds		
Puts		

Total: _____

9. Reading

Hold up the card reading: ''**CLOSE YOUR EYES''** so the individual can see it clearly. Ask him/her to read it and do what it says. Score correctly only if the individual actually closes his/her eyes.

Total: _____

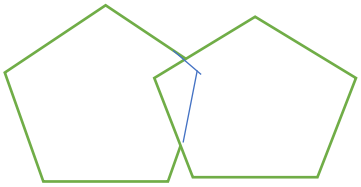
10. Writing

Give the individual a piece of paper and ask him/her to write a sentence. It is to be written spontaneously. It must contain a subject and verb and be sensible.

Total: _____

11. Copying

Give the individual a piece of paper and ask him/her to copy a design of two intersecting shapes. One point is awarded for correctly copying the shapes. All angles on both figures must be present, and the figures must have one overlapping angle



Total:_____

Total score (30): _____

Annex 3: patient information and consent form (Amharic version)

በባህር-ዳር ዩንቨርሲቲ
የህክምና ጤና ሳይንስ ኮሌጅ
የአዋቂዎች ነርሲግ ት/ት ክፍል

ክፍል I: የተሳታፊዎች የመረጃ እና የስምምነት መሙያ ፎርም

ይህ ቅፅ የተዘጋጀው በነርሲንግ ትምህርት ክፍል የሁለተኛ ዲግሪ የመጨረሻ ዓመት የአዋቂ ጤና ነርስ ተማሪ ሲሆን የጥናቱ **ር ዕ ስ ም፡** - ” በሆስፒታሉ በስኳር ህክምና ማዕከል ውስጥ ህክምናቸውን በሚከታተሉ የአይነት ሁለት ስኳር በሽታ ህሙማን የአእምሮ ሁነትን (መረጃን) ንዑስ የአእምሮአዊ ሁነት መለኪያ መጠይቅን በመጠቀም መገምገምና ይህን

ተፈጥሮአዊ ሁነት ሊያዛቡ የሚችሉ ምክንያቶችን መመዘን ነው።

በዚህ ጥናት ውስጥ እንዲሳተፉ ተጋብዘ ዋል፡ ፡ መሳተፍ ከወመወሰንዎ በፊት ግን ጥናቱ ምን እንደሚያጠና እና ምን እን ደሚያስፈልግ መረዳት ያስፈልገዎታል፡ ፡ ቀጣዩን ክፍል በፅሞና በማንበብ በጥናቱ ውስጥ መሳተፍ ወይም አለመሳ ተፋችሁን መወሰን ትችላላችሁ፡ ፡

የጥናቱ ዓላማ

ኢትዮጲያና እንደ ኢትዮጲያ ያሉ ታዳጊ ሀገሮች ስፍር ቁጥር ከሌላቸው ተላላፊ በሽታዎች ጫና ውስጥ ሳይወጡ የእድሜና የሃብት ባለፀጋ በሽታዎች በመባል በስፋት በሀገሮች ይታወቁ የነበሩት እንደ ካንሠር ፣ የልብና የደም ቧንቧ እን ዲሁም የጥናቱ ዋነኛ አጀንዳ የሆነው ስኳር በአሁኑ ጊዜ በሃገራችን እና በማደግ ላይ በሚገኙ ሃገሮች የግንባር ቀደምትነትን ስፍራ የያዘ በሚያሰኝ ሁኔታ በመስፋፋት ላይ ይገኛል፡ ፡ በመሆኑም የዚህ ጥናት ዋና ዓላማ የአይነት ሁለት ስኳር በሽታ ህመምን የአእምሮ ሁነትን ወይም መረጃን ንዑስ የአእምሮአዊ ሁነት መለኪያ መጠይቅን በመጠቀም መገምገምና ይህን ተፈጥሮአዊ ሁነት ሊያዛቡ የሚችሉ ምክንያቶችን መመዘን ነ ው።

ሊኖሩ የሚችሉ አደጋዎችና ጉዳቶች

በጥናቱ ውስጥ በመሳተፍ ወርቃማ የሆነ ጊዜዎን መጠይቁን በሚሞሉበት ወይም በሚጠየቁበት ጊዜ ከማጥፋትዎ በቀር (20ደቂቃ) ምንም አይነት ጉዳት የለውም ፤ በሆሲፒታሉ ውስጥ ከሚሰጠው አገልግሎት ጋር በአንዳችም መንገድ አይገናኝ ም፡ ፡

ከጥቱ የሚያገኙት ጥቅም

በጥናቱ ውስጥ በመሳተፍዎ በቀጥታ አሁን የሚያገኙት ጥቅም ባይኖርም ፤ ጥናቱ የአይነት ሁለት ሰኳር በሽታ ህሙማን የአእምሮ ሁነትን ወይም ደረጃን ንዑስ የአእምሮአዊ ሁነት መለኪያ መጠይቅን በመጠቀም ገምግሞ ይህን ተፈጥሮአዊ ሁነት ሊያዛቡ የሚችሉ ምክንያቶችን መዝኖ ቅድመ ምርመራ, ቅድመ መከላከል እና ፈጣን ህክምናን እንዲተገበርና ጤና ዎን በመጠበቅና ብሎም ለማሻሻል ከሚኖረው ከፍተኛ ሚና ከሚያገኙት የአእምሮ እና የመንፈስ እርካታ ውጪ ሊከ ፈለዎት የሚችል ዋጋ አይኖርም፡ ፡

ምስጢር ጠባቂነት

የሚሰጡት መረጃ ምስጢራዊነቱ በሚገባ የሚጠበቅና ለማንም ይፋ የማይደረግ መሆኑን ስም አልባ በሆነ የመጠይቅ ቅፅ መሞላቱ ከምንም በላይ ማስረጃ ይሆኖታል፡ ፡

የመቃወም ወይም ከጥናቱ የመውጣት መብት

በጥናቱ ውስጥ ለመሳተፍ መቃወምም ሆነ በማነኛውም ጊዜና ሰዓት ከጥናቱ ራስዎን በማስወጣትዎ መብትዎን ከማክበር ውጪ ምንም አይነት የሚጓደልብዎት የሆሲፒታል አገልግሎት ሊኖር አይችልም፡ ፡

ትእዛዝ

በጥናቱ ለመሳተፍ ፍቃደኛ ከሆኑ የሚከተሉትን መጠይቅ ይጠየቃሉ፡ ፡ ይህ መጠይቅ የተለያዩ የአእምሮ ሁነቶችን ትክክለኛነት ለመገምገም የሚያስችሉ የጥያቄ ክፍሎችን የያዘ ሲሆን በእነዚህ ክፍሎችም ውስጥ የሚዛመደና ተከታታይ የሆኑ ጥያቄዎችንና ትእዛዛትን ይዟል።

በመጠይቁ ሂደት ውስጥ ያልገባዎትና መጠየቅ የሚፈልጉት ማንኛውም ነገር ካለ በማንኛውም ሰዓት መጠየቅ የሚችሉ መሆኑን አሳውቃለሁ።

መጠይቁን ለማካሄድ መረጃውን የሚሰበስበው ሰውና በጥናቱ ላይ የሚሳተፈው ሰው ፀጥታና በቂ ብርሃን ባለበት ቦታ መቀመጥ ያለባቸው ሲሆን መጠይቁን ከመጀመሩ በፊት መረጃ ሰጭውን በደንብ እንዲያዳምጡና ለጥያቄዎቹ ትክክለኛ መልስ እንዲሰጡ ማሳሰብ ይኖርበዎታል።

ይህ ከላይ የተፃፈውን በማንበብ ወይም መረጃ ሰብሳቢው የሚያነብለዎትን በማዳመጥ በጥናቱ ላይ ለመሳተፍ ፍላጎትዎን በቃል እንዲያረጋግጡልኝ እጠይቃለሁ።

በዚህ ጥናት መሳተፍም ሆነ አለመሳተፍ በእርስዎ ልባዊ ፈቃድ የሚወሰን ነው። ስለሆነም በቅድሚያ ለፈቃደኝነትዎ እያመሰገንኩ ለማቀርብለዎ ጥያቄዎች ተገቢውንና ትክክለኛውን መልስ በመስጠት እንዲተባበሩኝ በትህትና እጠይቃለ ሁ።

ማግኘት ካስፈለገዎ

ማንኛውም ዓይነት ጥያቄ ካለዎት እና አስቸኳይ በሆነ ሁኔታ ማግኘት ከፈለጉ ጥናቱን የሚያካሂደው

እንዳልክ ጌታሰው

መገ ኛ ፡ - ስ. ቁ. 251-910-12-27-81/+251-931-85-6095.

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Annex 4: Questionnaire (Amharic version)

ክፍል I ፤ማህበራዊ እና ዲሞግራፊያዊ ሁኔታ፡

ተ.ቁ	መለኪያዎች	ማብረ መልሰ	ይዘለል
101	እድሜዎት በአመት ስንት ነው	----------	
102	ፆታ	1. ወንድ 2. ሴት	
103	የጋብቻ ሁኔታ	1. ያገባ 2. ያለገባ 3. ያፈታ/ች 4. የሞተባት/ችበት	
104	የትምህርት ደረጃ	1. ከ8ኛ ክፍል በታች 2. ከ9-12ኛ ክፍል 3. ኮሌጅና ከዚያ በላይ	
105	ስራዎ ምንድን ነው	1. የመንግስት ሰራተኛ 2. ነጋዴ 3. ገበሬ 4. የቤት እመቤት 5. የቀን ሰራተኛ 6. ሌላካለ ይገለፅ	
106	አሁን የሚኖሩበት ቦታ	1. ከተማ 2. ገጠር	

ክፍል II፡-የጤንነት ሁኔታን በተመለከተ

ተ.ቁ	*መለኪያዎች*	*ግብረ-መልስ*	*ይዘለል*
201	*ቁመት በሜትር*		
202	*ክብደት በኪ.ግ.*		
203	*የሰውነት ክብደት ጠቋሚ በኪ.ግ/ሜ^2 ሰንት ነው*	----------	
204	*የጸም ሰዓት የደምየሰኳር መጠን በሚግ/ዴሊ ሰንት ነው*	----------	
205	*በስኳር ከተያዙ ሰንት አመት ሆነዎት*	----------	
206	*ከስኳር በሽታ ተጨማሪ በሽታ አለበዎት*	*1. አዎ* *2. የለብኝም*	*የለብኝም ከሆነ ወደ 208 ይሂዱ*
207	*ምን አይነት በሽታ ነዉ ያለበዎት*	*1. የደምግፊት* *2. የኩላሊት ህመም* *3. የልብና የደምስር ህመም* *4. ሌላ ካለ ይገለጽ*	
208	*ምን አይነት የስኳር መድህኒት ነው የሚጠቀሙት*	*1. እንሱሊን* *2. በአፍ የሚዎሰድ እንክብሎች* *3. ሁለቱንም*	

ክፍል III: <u>ባህሪን የሚለኩ መጠይቆች</u>

የአልኮል ሱሰኝነትን የሚለኩ መጠይቆች(የ CAGE መለኪያዎች)

ተ.ቁ	መጠይቆች	ምላሽ	ምርመራ
301	አልኮል ይጠጣሉ ?	1. አዎ 2. የለም	መልሰዎ **የለም** ከሆነ ሌሎች ጥያቄያዎችን አይጠይቁ
302	አልኮል መጠጣት **መቀነስ** / **ማቆም** እንዳለበዎት ተሰምቶዎት ያዉቃል ?	1. አዎ 2. የለም	
303	አልኮል በመዉሰደዎት ሰዎች ሲገስጸዎት **ይናደዳሉ**?	1. አዎ 2. የለም	
304	አልኮል በመዉሰደዎ **የጥፋተኝነት ስሜት** ተሰምቶዎት ያዉቃል?	1. አዎ 2. የለም	
305	ስሜትዎን **ለማማረጋጋት/ለመንቃት** አልኮል ወስደዉ ያዉቃሉ?	1. አዎ 2. የለም	

እያንዳንዱ መጠይቅ ከአንድ ዉጤት አለዉ፤ ተሳታፊዉ ሁለት እና ከዚያ በላይ ዉጤት ካለዉ የአልኮል ሱሰኛ እንደሆነ ያሳያል።

የሲጋራ ሱሰኝነትን የሚለኩ መጠይቆች(የ CAGE መለኪያዎች)

ተ.ቁ	መጠይቆች	ምላሽ	ምርመራ
306	ሲጋራ አጭሰዉ ያጨሳሉ?	1. አዎ 2. የለም	መልሰዎ **የለም** ከሆነ ሌሎች ጥያቄያዎችን አይጠይቁ
307	ሲጋራ ማጨስ **መቀነስ / ማቆም** እንዳለበዎት ተሰምቶዎት ያዉቃል ?	1. አዎ 2. የለም	
308	ሲጋራ በመዉሰደዎት ሰዎች ሲገስጸዎት **ይናደዳሉ**?	1. አዎ 2. የለም	
309	ሲጋራ በመዉሰደዎ **የጥፋተኝነት ስሜት** ተሰምቶዎት ያዉቃል?	1. አዎ 2. የለም	
310	ስሜትዎን **ለማረጋጋት/ለመንቃት** ሲጋራ ወስደዉ ያዉቃሉ?	1. አዎ 2. የለም	

እያንዳንዱ መጠይቅ ከአንድ ዉጤት አለዉ፤ ተሳታፊዉ ሁለት እና ከዚያ በላይ ዉጤት ካለዉ የሲጋራ ሱሰኛ እንደሆነ ያሳያል።

የጫት ሱሰኝነትን የሚለኩ መጠይቆች(የ CAGE መለኪያዎች)

ተ.ቁ	መጠይቆች	ምላሽ	ምርመራ
311	ጫት ይቅማሉ ?	1. አዎ 2. የለም	መልሰዎ **የለም** ከሆነ ሌሎች ጥያቄያዎችን አይጠይቁ።
312	ጫት መቃም **መቀነስ / ማቆም** እንዳለበዎት ተሰምቶዎት ያዉቃል ?	1. አዎ 2. የለም	
313	ጫት በመዉሰደዎት ሰዎች ሲገስጸዎት **ይናደዳሉ**?	1. አዎ 2. የለም	
314	ጫት በመዉሰደዎ **የጥፋተኝነት ስሜት** ተሰምቶዎት ያዉቃል?	1. አዎ 2. የለም	
315	ስሜትዎን **ለማማረጋጋት/ለመንቃት** ጫት ወስደዉ ያዉቃሉ?	1. አዎ 2. የለም	

እያንዳንዱ መጠይቅ ከአንድ ዉጤት አለዉ፤ ተሳታፊዉ ሁለት እና ከዚያ በላይ ዉጤት ካለዉ የጫት ሱሰኛ እንደሆነ ያሳያል።

አካላዊ እንቅስቃሴን የተመለከቱ መጠይቆች (IPAQ)

በመቀጠል ስለሚያደርጉዋቸው የተለያዩ አካላዊ እንቅስቃሴዎች እጠይቆታለሁ፡፡ እባክዎን ራስዎን አካላዊ እንቅስቃሴ የሚያደርግ ሰው አድርገው ባይቆጥሩም ሁሉንም ተግባራት በመመልከት ጥያቄዎቹን ይመልሱ፡፡ እነዚህም በት/ቤት፣ በቤት ውስጥ ስራዎች ወይም ከቦታ ወደ ቦታ ለመሄድ የሚያደርጉአቸውን መደበኛ እንቅስቃሴዎች እና በዕረፍት ጊዜዎ ውስጥ ለመዝናኛ ወይም ለስፖርት የሚሰሯቸውን እንቅስቃሴዎች ያጠቃልላሉ፡፡			
ተ.ቁ	**ጥያቄዎች**	**መልስ**	**ወደ ሚቀጥለው ጥያቄ ይለፉ**
ባለፉት 7 ቀናት ያከናወኗቸውን ከባድ አካላዊ ጥረት ስለሚጠይቁ ጠንካራ እንቅስቃሴዎች ሁሉ ያስቡ ፡፡ ጠንከር ያሉ እንቅስቃሴዎች ከተለመደው በጣም በከባድ ሁኔታ እንዲተነፍሱ ያደርጉዎታል፡፡ እንዲሁም ከባድ እቃ ማንሳትን እና መሰከም ፣ መቆፈርን ፣ ኤሮቢክስን ወይም በፍጥነት ብስክሌት መንዳት የመሳሰሉትን ያካትታሉ ፡፡ ታዲያ በአንድ ጊዜ ለ 10 ደቂቃ ስላከናወኗቸው አካላዊ እንቅስቃሴዎች ብቻ ያስቡ ፡፡			
316	በአለፉት 7 ቀናት ውስጥ ለስንት ቀናት ቢያንስ ለ 10 ደቂቃ ያህል ጠንካራ አካላዊ እንቅስቃሴዎችን አደረጉ?	1. በሳምንት _____ ቀናት 2. ምንም ጠንካራ አካላዊ እንቅስቃሴዎችን አላደረኩም	መልሱ ዜሮ፣አላውቅም / እርግጠኛ አይደለም, ፈቃደኛ ያልሆነ ከሆነ ወደ ጥያቄ ቁጥር318 ይሂዱ
317	በእነዚያ ቀናት በአንዱ ቢያንስ ለ 10 ደቂቃዎች ያህል በአንድ ጊዜ ጠንካራ አካላዊ እንቅስቃሴዎችን በማድረግ ምን ያህል ጊዜ አሳልፈዋል?	1. በቀን -------- ሰዓታት 2. በቀን -------- ደቂቃ 3. አላውቅም / እርግጠኛ አይደለሁም	
ባለፉት 7 ቀናት በእግር መጓዝን ሳያካትቱ በአንድ ጊዜ ቢያንስ ለ 10 ደቂቃዎች ያከናወኗቸውን መጠነኛ አካላዊ ጥረት ስለሚወስዱ እንቅስቃሴዎች አሁን ያስቡ ፡፡ መጠነኛ አካላዊ እንቅስቃሴዎች ቀላል ሸክሞችን መሸከም ፣ በመደበኛ ፍጥነት ብስክሌት መንዳት ወይም ቴኒስ መጫዎት የመሳሰሉት ሲሆኑ ከተለመደው በተወሰነ ደረጃ በከባድ እንዲተነፍሱ ያደርጉዎታል ፡፡			
318	በአለፉት 7 ቀናት ውስጥ ለስንት ቀናት ቢያንስ ለ 10 ደቂቃ ያህል መጠነኛ አካላዊ እንቅስቃሴዎች አደረጉ?	1. በሳምንት _____ ቀናት 2. ምንም መጠነኛ አካላዊ እንቅስቃሴዎች አላደረኩም	መልሱ ዜሮ፣አላውቅም / እርግጠኛ አይደለም, ፈቃደኛ ያልሆነ ከሆነ ወደ ጥያቄ ቁጥር 319 ይሂዱ
319	በእነዚያ ቀናት በአንዱ ላይ መጠነኛ አካላዊ እንቅስቃሴዎችን በማድረግ ምን ያህል ሰአት አሳልፈዋል?	1. በቀን -------- ሰዓታት 2. በቀን -------- ደቂቃ 3. አላውቅም / እርግጠኛ አይደለሁም	
አሁን ባለፉት 7 ቀናት ውስጥ በእግር በመራመድ ያሳለፉትን ጊዜ ያስቡ ፡፡ ይህ በሥራ፣ በቤት ውስጥ ፣ ከቦታ ወደ ቦታ ለመጓጓዝን ፣ ለመዝናናት ፣ ለስፖርት ፣ ለአካል ብቃት እንቅስቃሴ ወይም ለመዝናናት ብቻ ሊያደርጉዋቸው የሚችሉትን ማንኛውንም የእግር ጉዞዎች ያጠቃልላል ፡፡			
320	በአለፉት 7 ቀናት ውስጥ ለስንት ቀናት ቢያንስ የ10 ደቂቃ የእግር ጉዞ አደረጉ?	1. በሳምንት _____ ቀናት 2. ምንም የእግር ጉዞ አላደረኩም	መልሱ ዜሮ፣አላውቅም / እርግጠኛ አይደለም, ፈቃደኛ ያልሆነ ከሆነ ወደ ጥያቄ ቁጥር 322 ይሂዱ
321	በእነዚያ ቀናት በአንዱ ላይ የእግር ጉዞ በማድረግ ምን ያህል ሰአት አሳልፈዋል?	1. በቀን -------- ሰዓታት 2. በቀን -------- ደቂቃ 3. አላውቅም / እርግጠኛ አይደለሁም	
አሁን ባለፉት 7 የስራ ቀናት ውስጥ ቁጭ ብለው ያሳለፉትን ጊዜ ያስቡ ፡፡ በሥራ ፣ በቤት ውስጥ ፣ በትምህርት እና በእረፍት ያሳለፉትን ጊዜን ያጠቃልላል፡፡ ፡፡ ይህ ጓደኞችን ለመጎብኘት ፣ በማንበብ ወይም በመቀመጥ ወይም ቴሌቪዥን ለመመልከት፣ በመተኛት ያሳለፉትን ጊዜም ሊያካትት ይችላል ፡፡			

322	በአለፉት 7 ቀናት ውስጥ ምን ያህል ሰአት ቁጭ በማለት አሳልፈዋል?	4. በቀን -------- ሰዓታት 5. በቀን -------- ደቂቃ 6. አላውቅም / እርግጠኛ አይደለሁም	

ክፍል IV፡ የአእምሮ ስራን ሁኔታን በተመለከተ

1. ጊዜን በተመለከተ

	ትክክል	ስህተት
ዛሬ ቀኑ ስንት ነው ?		
ወሩ ማን ነው?		
አመቱ ማን ነው ?		
የዛሬው እለት ማን ነው ?		
ወቅቱ ምንድን ነው?		

ጠቅላላ _____

2. ቦታን በተመከተ

ያለንበት ቤት የማን ነው?		
ያለንበት ቤት የምን ክፍል ነው?		
አሁን የምንገኝበት ከተማ ማን ነው?		
አሁን በየትኛው ሃገር ነው የምንኖረው?		
በየትኛው ክልል ነው አሁን የምንገኘ ው		

ጠቅላላ _____

3. በፍጥነት ማስታወስን በተመለከተ

በመጀመሪያ ማስታወስን በተመለከተ መረጃ ሰጭውን መጠየቅ እንደምትችሉ ጠይቅ ከዚያም የሚቀጥሉትን ቃላት በግልጽና በዝግታ (አንድ ሴኮንድ ለእያንዳንዱ ቃል) ኳስ ፣ ሰንደቅ አላማ ፣ ዛፍ የሚሉ ቃላቶችን ከተናገርክ በኋላ መልሱን እንዲደግማቸው ጠይቅ ። የመጀመሪያው ድግግሞሽ ውጤቱን ይወስነዋል፡ ፡

ኳስ		
ሰንደቅ አላማ		
ዛፍ		

ጠቅላላ _____

4. ትኩረትን በተመለከተ

ግለሰቡን/ቧን ከ100 ወደ ኋላ ሰባትን እንዲቀንስ ጠይቅ ። አምስተኛው ስሌት ላይ ያቆማል።

93

86

79

72

65

ጠቅላላ____

እንደ አማራጭ **አ ለ ማ ች ን** የሚለዉን ወደኻላ ያነብቡ **ን ች ማ ለ አ**

5.ከቆይታ በኋላ ያለ የማስታወስ ብቃትን በተመለከተ

ግለሰቡን/ቧን ቅድም የደጋገሟቸውን ቃላት እንዲያስታውሱ ጠይቅ

ካስ

ስንደቅ አላማ

ዛፍ

ጠቅላላ _____

6.በስም መለየትን በተመለከተ

ለግለሰቡ የእጅ ሰአት አሳይተህ ምንድን ነው ብለህ ጠይቅ ። ለእርሳሱም በተመሳሳይ ሁኔታ ድገም

ሰዓት

እርሳስ

ጠቅላላ _____

7. ድግግሞሽን በተመለከተ

ግለሰቡን የሚቀጥሉትን ሀረጋት እንዲደጋግመው ጠይቅ ። "አይሆንም/እና/ ነገር ግን"

ጠቅላላ _____

8. ባለ ሶስት ደረጃ ትዕዛዝ

ወረቀት ስጠው/ስጣት ከዚያም ትዕዛዝ ስጥ፡ ፡ —ወረቀቱን በእጅ ውሰድ ፤

ለሁለት እጠፈው እና ወለል ላይ/ጠረጴዛ ላይ አስቀምጠው። ‖

መውሰድ

ማጠፍ

ማስቀመጥ

ጠቅላላ _____

9. ማንበብን በተመለከተ

በካርድ ላይ የሚነበብ ነገር ጻፍ "**አይንህን ጨፍን**" ከዚያም ግለሰቡን ወይም ግለሰቧን አንብቦ ያነበበውን እንዲተገብር አሳስበው። ሙሉ ውጤቱን የሚያገኘው/ የምታገኘው በትክክል የተጻፈውን ከተገበረ ነው።

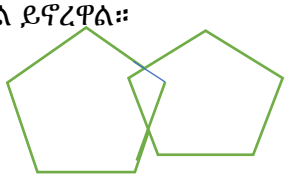
ጠቅላላ_____

10. ጽህፈትን በተመለከተ

ለግለሰቡ/ቧ ወረቀት እና እስክብሪቶ ስጠው/ጣት ከዚያም ሰዋሰዋዊ ስርዓቱን ያሟላ ዓረፍተ ነገር እንዲጽፍ/ትፅፍ ጠይቀው/ቃት። ዓ/ነገሩን መፃፍ ያለባቸው በራሳቸው ምርጫና ፍላጎት በፍጥነት መሆን ይኖርበታል፡፡

ጠቅላላ_____

11. ለግለሰቡ/ቧ ወረቀት እና እርሳስ/እስክርቢቶ ስጠውና ሁለት እርስ በራሳቸው የሚያቋርጡ ጎነ አምስት ስእሎች እንድትሰራ/ዲሰራ ጠይቅ። የሁለቱም ስእሎች ሁሉም አንግሎች መኖር አለባቸው። ስእሉ አንዱ በአንዱ ላይ የሚያልፍ አንግል ይኖረዋል።



ጠቅላላ _____

አጠቃላይ ድምር ከ30_____