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BAHIR DAR UNIVERSITY

COLLAGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF NUTRITION AND DIETETICS

VITAMIN D DEFICIENCY AND ITS ASSOCIATED FACTORS AMONG ADULTS PRESENTING WITH NON-SPECIFIC MUSCULOSKELETAL PAIN AND FATIGUE IN BAHIR DAR HOSPITALS, NORTH WEST ETHIOPIA, 2026.

BY MIKIYAS GIRMAW

A THESIS SUBMITTED TO DEPARTMENT OF NUTRITION AND DIETETICS, SCHOOL OF PUBLIC HEALTH, COLLEGE OF MEDICINE AND HEALTH SCIENCES, BAHIR DAR UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR MASTER'S DEGREE IN PUBLIC HEALTH NUTRITION.

JANUARY, 2026

BAHIR DAR UNIVERSITY,

ETHIOPIA

BAHIR DAR CITY UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF NUTRITION AND DIETETICS

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BY MIKIYAS GIRMAW (BSc); ADRESS: 0900186032/mikiyasgirmawu @gmail.com

ADVISORS

1. **MULAT TIRFIE (MSc, Assistant professor): 0912692308 /mulatbonny@gmail.com**
2. **GENET ENDALK (MSc, Lecturer**): **0931755827/**

JANUARY, 2026

BAHIR DAR UNIVERSITY,

ETHIOPIA

DECLARATION

This is to certify that the thesis entitled to assess vitamin D deficiency and its associated factors among adults presenting in adult outpatient OPD with nonspecific musculoskeletal pain and fatigue in Bahir Dar public and private hospitals, North west Ethiopia,2026, submitted in partial fulfillment of the requirements for masters of degree in public health nutrition, Bahir Dar university, is a record of original work carried out by me and has never been submitted to this or any other institution to obtain any other degree or certificates. The assistance and help I received during the course of this investigation have been duly acknowledged.

Name of candidate Mikiyas Girmaw

Date 02/04/2026

Place; Bahir Dar

Segnature 

APPROVAL OF THESIS

I hereby certify that I have supervised, read and evaluated this thesis titled to assess vitamin D Deficiency and its associated factors among adults presenting in adult outpatient OPD with Nonspecific musculoskeletal pain and fatigue in Bahir Dar public and private hospitals, North West Ethiopia, 2026, by Mikiyas Girmaw prepared under my guidance. I recommend the thesis be submitted for oral defense.

Advisors name- Muat Tirfie

Signature-

Date- 02 / 04 / 2026

Name- Genet Endalk

Signature-

Date- 27 / 07 / 2018

Board of examiners

External examiners	date	sebnature
Esmiel Ali	02/04/2026	for
Internal examiners	date	sebnature
Samuel Dabe	02/04/2026	
Chaire Person	date	Segnature
Mr. Omer Seid	03/04/2026	

Department of ... Distetics

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ABBREVIATIONS AND ACRONYMS

AED	Anti epileptic Drugs
AOR	Adjusted Odds Ratio
ART	Antiretroviral Therapy
AUDIT	Alcohol Use Disorders Identification Test
BMD	Bone Mineral Density
BMI	Body Mass Index
CI	Confidence Interval
CNMP	Chronic Non-Specific Musculoskeletal Pain
COR	Crude Odd Ratio
DDS	Dietary Diversity Score
DHS	Demographic and Health Survey
DM	Diabetes Mellitus
ETB	Ethiopian Birr
FAO	Food and Agriculture Organization
FHCSH	Felege Hiwot Comprehensive Specialized Hospital
GPAQ	Global Physical Activity Questionnaire
HSTP	Health Sector Transformation Plan
IFN-γ	Interferon gamma
IL	Interleukin (e.g., IL-12)
MET	Metabolic Equivalent of Task
MPH	Master of Public Health

MSc	Master of Science
NF-kB	Nuclear Factor kappa light chain enhancer of activated B cells
NNP	National Nutrition Program
NSMSP	Non-Specific Musculoskeletal Pain
OPD	Outpatient Department
25(OH)D	25-hydroxyvitamin D
PTH	Parathyroid Hormone
RA	Rheumatoid Arthritis
SPSS	Statistical Package for the Social Sciences
STATA	Data Analysis and Statistical Software
TB	Tuberculosis
TBSA	Total Body Surface Area
TGSH	Tibebe Gion Specialized Hospital
TLRs	Toll-Like Receptors
UNICEF	United Nations International Children's Emergency Fund
UVB	Ultraviolet B
VDI	Vitamin D insufficiency
VDR	Vitamin D Receptor
WHO	World health organization

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ABSTRACT

Background: Vitamin D deficiency is defined as a serum 25(OH) D level, below 20ng/ml and its leads to bone pain, muscle weakness, functional impairment and reduced quality of life. Musculoskeletal pain is the most common complaint among adults attending in out patient department. Despite vitamin D deficiency remains undetected and there is a scarcity of information among individuals with musculoskeletal discomfort especially in the study area as well as in Ethiopia. So this study will provide important evidence on the burden and risk factors of vitamin D deficiency among adults with non-specific musculoskeletal pain and fatigue in Bahir dar city.

Objective: The main objective is to assess the prevalence and associated factors of Vitamin D deficiency among adults presenting with non-specific musculoskeletal pain and fatigue in public and private hospitals in Bahir Dar, Northwest Ethiopia, 2025.

Methods and Materials: An institutional-based, cross-sectional study was conducted among 415 adults with non specific musculoskeletal pain and fatigue presenting from August 21 to September 16, 2025 in Bahir dar hospitas. Participants were selected consecutively as they attended the medical OPD. Data were collected using structured questionnaires and chart abstraction for serum 25(OH) D levels. Data were analyzed by SPSS with logistic regression models to identify associated factors. Variables with $p < 0.25$ in bivariate analysis were included in multivariable logistic regression, with significance at $p < 0.05$ and 95% confidence interval.

Result: Among 415 participants**,** the magnitude of vitamin D deficiency was 48.4%. In multivariable logistic regression analysis, vitamin D deficiency was significantly associated with older adult (AOR = 1.96; 95% CI: 1.02-3.76), morning sun exposure (AOR = 2.47; 95% CI: 1.35-4.52), overweight or obese (AOR = 2.28; 95% CI: 1.25-4.18) and the presence of comorbid conditions (AOR = 2.23; 95% CI: 1.14-4.38)

Conclusion: Vitamin D deficiency was high among adults presenting with non-specific musculoskeletal pain and fatigue. It was associated with older adults, morning sun exposure, overweight/obesity, and comorbidity. Health care professionals in outpatient departments should consider vitamin D deficiency as a potential cause in adults presenting with non-specific musculoskeletal pain.

Keywords: Vitamin D deficiency; Non-specific musculoskeletal pain and fatigue, Adults.

1. INTRODUCTION

1.1 BACKGROUND

Vitamin D (VD) is a fat-soluble vitamin that improves calcium/phosphate metabolism in our body (bone) and It act as a pro hormone within the human body that can be found in two forms Vitamin D3 (Cholecalciferol) and Vitamin D2 (Ergocalciferol) [1]. Vitamin D3 is produced in the skin in response to ultraviolet B (UVB) radiation or from the animal source diet. Vitamin D2 is found in some plants in the diet and is produced commercially by irradiation of yeast [2] . About 80% - 90% source of vitamin D is sunlight [3], and Vitamin D in a diet is essential when the UVB radiation is not sufficient [4].

Vitamin D's main function is to maintain serum calcium and phosphorus level by its action of osteoblasts and osteoclasts on the gut [5]. in addition to it, Vitamin D used for bone formation, maintenance, and re-modeling, as well as in muscle function, (Vitamin D effect on muscles strength, muscle bulk and neuromuscular performance) [6], modulates cell growth, neuromuscular and immune function, and reduces inflammation. Vitamin D has functions beyond healthy of bones, It also play an important role in optimizing neuromuscular functioning, reducing inflammation, and decreasing the risk of many chronic illnesses; these include a variety of cancers, autoimmune diseases, infectious diseases, and cardiovascular diseases and even possible effect on the reproductive health fertility [7].

The best indicator of an individual’s vitamin D status is 25-hydroxycholecalciferol [25(OH) D], which reflects both cutaneous synthesis and dietary consumption of the nutrient [8]. Many evidences cutoff consider if serum 25-(OH)D is between 20-30ng/ml it shows insufficient, if serum 25-(OH)D is below 20 ng/ml as deficiency, and some evidence suggests that values higher than 30 ng/ml may be associated with better health outcomes in the adult population, so our study will be conducted by based on this [9, 10].

Vitamin D deficiency can be a multiple cause, but low dietary intake of vitamin D source food and limited exposure to sunlight in among the major [11]. An individual who have dietary insufficiency, vegetarians and those who have malabsorption disease including (celiac disease, lactase deficiency, Crohn’s disease, parasitic infections and bacterial overgrowth) and those who

have problems on your anatomy of digestive system like:- gastrectomy and gastric bypass surgery, pancreatic disease, liver disease, renal disease [12]. The other significant cause of VDD is due to limited exposure to sunlight. Surprisingly study's in different high sunshine countries show that there is high prevalence of vitamin d deficiency, because even in sunny area, exposure to sunlight is affected by clothing style, use of sunscreen or umbrella during outdoor, more time spent indoors or time of exposed, skin color. Although chronic excessive sun exposure increases the risk of nonmelanoma skin cancer but avoidance of all direct sunlight increases the risk of vitamin D deficiency , So appropriate sun exposure (usually 30-60 min of exposure of the legs and arms or the arms, hands, and face, 2 or 3 times a week) and increased dietary and supplement intake of vitamin D are prudent steps to achieve vitamin D adequacy [13]. In addition, use of anti-epileptic drugs (phenytoin, carbamazepine), antineoplastic and antiretroviral medications (cyclophosphamide and ritonavir, respectively), and antibiotics and anti-inflammatory agents (rifampicin, dexamethasone, respectively), all of which leading to increased degradation of vitamin D, that can causes anticonvulsant induced osteomalacia and related disorders but that have ignored [6]

To manage Vitamin D deficiency, the study emphasizes the need for public health interventions such as food fortification, exposure to sunlight, dietary sources of fatty fish and cod liver oil, vitamin D supplements, and health education among high-risk populations. Biannual checks on serum 25-hydroxyvitamin D levels should reveal vitamin D deficiencies [14]. Prevention of VDD should be prioritized by policy makers as a global health agenda due to its broad impact on health. Globally, several strategies have been implemented in a bid to manage and prevent Vitamin D Deficiency due to its high prevalence and link with musculoskeletal as well as other ailments. The World Health Organization (WHO) has stressed the importance of micro-nutrient deficiencies and recommended the use of food fortification and public education campaigns to prevent VDD. Some countries, including the United States, Canada, and Finland, have enacted mandatory fortification of staple foods like milk, margarine, and cereals with vitamin D, which has resulted in an observable decrease in the prevalence of deficiency [15] .

But in low income country including Sub-Saharan Africa (Ethiopia), a few activities at the regional level include nutrition-sensitive interventions supported by organizations such as

UNICEF and the Micro-nutrient Initiative that promote maternal and child nutrition but do not address adult VDD. The lack of routine vitamin D screening and supplementation policy for at-risk adult populations [16]. There are limited national programs in Ethiopia that target Vitamin D deficiency specifically, though broader nutrition programs such as the National Nutrition Program (NNP II) and the Health Sector Transformation Plan (HSTP) involve supplementation of vitamins and minerals focus mainly on pregnant women and children under five years old but adults are neglicated [17]. There is Lack of guidelines or policy on adult vitamin D deficiency management and treatment. There are sixteen packages that are included in the health extension program (a widely advocated community health program in Ethiopia); unfortunately, adult vitamin D is not included in the list. And also Vitamin D deficiency is not also included under monthly reportable health problems and conditions by health centers and hospitals in their monthly Health Management Information System (HMIS) reporting format. Thise shows unlike other micronutrients' deficiencies, vitamin D deficiency especially among the adult population is a neglected area [18].

1.2 STATEMENTS OF THE PROBLEM

Vitamin D deficiency (VDD) has emerged as a major public health concern worldwide, with devastating health consequences [19]. Globally more than one billion people are deficient from this 50–90% of adults in the developing world were reported to have low levels of vitamin D [20, 21]. Various Global studies around vitamin D deficiency showed the rate of prevalence is from 20-90% in the world (20% in Australia and 90% in the Middle East) [14, 22-25].

In Africa, the prevalence of low 25(OH) D concentrations was higher than might have been expected considering the large amounts of sunshine on the continent, and challenges the misconception that vitamin D deficiency. The prevalence of vitamin D deficiency was 17-56% [26-28]. The study in Ethiopia shows that the prevalence of VDD in overall population was 56% [28], but one study in adult complain with nonspecific musculoskeletal pain and fatigue prevalence of VDD was 100% among 62 selected individual in yehulushet hospital in Addis Ababa[29].

Vitamin D deficiency manifests in various physical symptoms, including generalized body aches, paresthesia, neck and back pain, and fatigue. These symptoms can lead to significant psychosocial impacts, such as decreased quality of life, impaired daily functioning, decrease productivity, significant psychosocial burden and increased healthcare utilization [30]. Economically , the cost of untreated vitamin D deficiency is consider , excessive pain treatment and diagnostic testing, leading to costly health care, in developed nation annual cost from VDD related illness are estimated in the billions of dollar [7]. In American study both directly and indirectly annual cost of the condition reachs up to 50 million dollars, including healthcare expenditures and productivity losses [31]. but In poor resource setting like Ethiopia, such a burden is superimposed on already strained health care system and has indirect cost in the form of lost day of work and decrease economic output due to exhaustion and physical activity.

Vitamin D is critical for musculoskeletal health. Its deficiency is associated with non-specific musculoskeletal pain (NSMSP), proximal muscle weakness, fatigue, reduced physical performance and low back pain based on its role in mineral absorption and cellular activities, increasing pain sensitization, and exaggerated inflammation [31-34].

Vitamin D deficiency is associated with the marked suppression in intestinal Ca absorption and the impairment of Ca balance, which results in low bone mineral content and density. So, the skeletal consequences of 25(OH)D insufficiency include secondary hyperparathyroidism, increased bone turnover and bone loss, a decrease in bone marrow density (BMD) due to the increased bone restoration by PTH as well as a mineralization defect causing osteomalacia, and increased risk of low trauma fractures [35, 36]. Vitamin D deficiency is an important known responsible factor for development, progression and exacerbation of many musculoskeletal disease and correlated with many chronic conditions producing musculoskeletal pain like osteoarthritis, rheumatoid arthritis, arthralgia, osteoporosis, soft tissue rheumatism, and low backache or Chronic low back pain (CLBP) is a major health condition affecting adversely the quality of life of the patients [37]. The most common etiology of rickets in children and also causes and enhances osteoporosis in adults and provokes the painful bone disorder osteomalacia is due to vitamin D deficiency [35].

Vitamin D deficiency in adults can also cause a skeletal mineralization defect. As a result, patients with osteomalacia often complain of isolated or global bone discomfort along with aches

and pains in their joints and muscles [38-40]. These patient may be misdiagnosed with fibromyalgia, dysthymia, degenerative joint disease, arthritis, chronic fatigue syndrome and other diseases [30, 38]. Vitamin D insufficiency is associated with , muscle weakness, cardiovascular disease, respiratory infections, multiple sclerosis, rheumatoid arthritis, type 1 diabetes mellitus, mental illness like schizophrenia and a higher risk of disease like COVID-19 due to decreasing the immunity and also it is effect on fertility [41].

Vitamin D deficiency has been strongly associated with various health outcomes, including all-cause mortality [42]. it has been associated with increased risks of lethal cancers, cardiovascular disease, multiple sclerosis, rheumatoid arthritis, and type 1 diabetes mellitus [43]. several study showed a relevant and significant lower all-cause mortality of ~7% and cancer mortality of ~13% in patients who received vitamin D3 [44]. patients with hip fracture and vitamin D deficiency that have 24% higher odds of mortality and severely deficient the odd of mortality is double [45]. Various study shows vitamin D deficiency increased risk of all-cause mortality and also increase risk of fracture [45, 46].

Being pregnant, extremes of age, vegetarian, female sex, winter season, live in high altitude, dark skin pigmentation, malnutrition, lack of sun exposure, a covered clothing style, obesity ,drug users (antiepileptic), diseases causing malabsorption and others are among the risk group for vitamin D deficiency [47].

Although an interventions like food fortification with vitamin D, supplementation programs, and health promotion on safe sun exposure are advised by WHO everywhere to prevent its deficiency [48]. None of these prevention methods have ever been implemented throughout the whole nation of Ethiopia [17, 18]. Due to the absence of this implementation non-specific musculoskeletal pain and fatigue adults continue to suffer untreated and undiagnosed vitamin D deficiency, leading to chronic pain muscle weakness, fatigue, reduce quality of life and a potential associated complication like osteoporosis and increase fracture risk[21].

Ethiopia is one of the sunshine rich countries but vitamin D deficiency is most prevalent in high sunshine countries but personal lifestyle and cultural factors are important determinants for vitamin availability because of their influence on sun exposure and dietary intake. And also in Ethiopia vitamin D rich foods are rarely consumed and there is no fortification program[17, 49]. Vitamin D insufficiency is frequently unreported because of lack of knowledge about the scope of

the issue in a sunny nation like Ethiopia eve there is not guaidline or policy to prevent and manneg it. As we know vitamin D deficiency (VDD) is rapidly becoming a global public health problem, due to the fact that it has been associated with non-specific musculoskeletal pain (NSMSP) and fatigue that are common complaints among adults attending outpatient department [18].

Globally, about one in three adolescents and half of adults suffer from chronic musculoskeletal pain every year[50]. However, in the majority of facilities including the study setting, VDD remains largely under-diagnosed and untreated, and an aspect attributed in great part to a lack of proper awareness and absence of data concerning its prevalence among symptomatic patients and its complication. Due to this VDD couse multiple complications, yet no local and national guidelines cover screening and management of adults [18]. This study is necessary to generate local evidence to guide clinical decision-making and inform appropriate diagnostic and management strategies.

Due to financial constraints, it is not possible to conduct new lab tests for every participant in the study. Therefore, secondary data from hospital records, such as vitamin D test results in patients who underwent clinical assessment for musculoskeletal pain and fatigue, will be used in this study. And also, in our study setting there is limited data specific to the magnitude and associated factors of vitamin D deficiency among adults presented with non specific musculoskeletal pain and fatigue. Most existing studies often focus on general healthy population or nutritional deficiencies without considering the specific clinical signs and symptoms related to vitamin D deficiency in this population.

The Ethiopian Minister of Health identified vitamin D deficiency as an emerging public health problem and recommended other studies to be carried out in the area[51]. There is scarcity of data around the prevalence and determinants of VDD in Ethiopia as well as in Bahir Dar due to give less attention for vitamin D deficiency in high sunshine area, this is wrong because VDD is high even in countries with abundant sunshine. So, this study can inform the complication, its factors and its magnitude of vitamin D deficiency in adults presenting with non-specific musculoskeletal pain.

1.3 SIGNIFICANCE OF THE STUDY

The finding of this study will provide an important evidence on the burden and risk factors of vitamin D deficiency among adults with non-specific musculoskeletal pain and fatigue in Bahir dar city, and the results of this study can assist clinicians in making informed decisions about whether to consider vitamin D testing in the diagnostic work-up of adults with unexplained musculoskeletal pain and fatigue, particularly among high-risk groups identified in the study. By highlighting the extent of vitamin D deficiency in this patient population, the findings may contribute to improved recognition of vitamin D deficiency and help reduce misdiagnosis of conditions such as fibromyalgia or chronic fatigue syndromes.

The study findings can support health planners and policymakers in designing context-appropriate interventions, such as targeted health education on effective sun exposure, nutritional counseling, and vitamin D supplementation for susceptible adult groups. The identification of modifiable risk factors provides evidence that can inform preventive strategies aimed at reducing the burden of vitamin D deficiency in similar urban settings.

Finally, this study contributes to the limited body of evidence on vitamin D deficiency in Ethiopia, particularly among adults with non-specific musculoskeletal pain and fatigue. By addressing a clear local knowledge gap in Bahir Dar, the findings can serve as a foundation for future research, including intervention studies and broader population-based assessments of vitamin D status

2. LITERATURES REVIEW

2.1 MAGNITUDE OF VITAMIN D DEFICIENCY IN ADULTS

Globally Current knowledge from recent research indicates an extremely high prevalence of vitamin D deficiency among adults with musculoskeletal pain of non-specific origin. Vitamin D deficiency is common worldwide issue, with the prevalence estimated at 24%, 37%, in the United States and Canada, respectively [52, 53]. Several Global studies shows that, the vitamin D status in six different regions of the world Asia, Europe, Middle East and Africa, Latin America, North America and Oceania; and it was concluded that insufficiency for vitamin D is prevalent in worldwide. Varying with the location, more than 50% of the general population had a serum 25 (OH) total vitamin D level below 50nmol/L or 20ng/ml. Vitamin D deficiency among adults is a high prevalent in most developing nations like in China, Latin America, Mongolian, Middle East and in Sub-Saharan Africa, although most of the developing nations are get above sufficient sunlight to our body for production of vitamin D throughout the year[25]. The study in developed nation shows the prevalence of vitamin D deficiency is high but varies globally, with reported prevalence of 23–30% in the USA[54], 30–90% in the Middle East, 20% in Australia, and 56% in China[22-24]. Another Recent data have suggested that ~40% of Europeans are vitamin D deficient, and 13% are severely deficient [55].

The study in US all patients with persistent, nonspecific musculoskeletal pain are at high risk for the consequences of unrecognized and untreated severe hypovitaminosis D around 93% are deficiency [31]. According to the other study there was a high prevalence of low vitamin D status in the Southern Europe and the Eastern Mediterranean regions, despite abundant sunshine [56]. The study in Norway patients that complain headache found that 58% of the patients had low vitamin D levels[6]. 83% of patients from the Middle East, Africa, and South Asia had hypovitaminosis D, and 58% from Europe/America/SE Asia and 35% of ethnic Norwegians. This indicating that region of origin was also significantly associated with vitamin D status. Among these groups, women from the Middle East, Africa, and South Asia were affected, with 50% having levels below 25 nmol/L[6].

Studies from the Middle East around adults are scarcer but report higher prevalence, with the most recent studies in Qatar reporting vitamin D deficiency in more than 70% of symptomatic adults with musculoskeltal pain. Another study conducted in UAE Vitamin D levels among non-specific musculoskeletal pain found that 71.5% had below-normal levels, with 40.2% deficient and 31.3% insufficient. The findings highlight the high prevalence of Vitamin D deficiency among patients with unexplained musculoskeletal pain, especially in younger adults[57]. The study conducted in turkey adults is generalized musculoskeletal pain the prevalence of vitamin D deficiency was 73.9% [58]. The other study conducts in Indian complain with low back pain shows that 83%) of patients had below normal plasma vitamin D levels. Among these 66% were found to be deficient and 20% were insufficient levels of vitamin D [59]. Another study in north India adult that complain chronic low back pain found that 80.3% were vitamin D deficient, and those individuals had significantly higher pain severity, as measured by the Visual Analogue Scale (VAS). The study shows that is a statistically significant negative correlation between vitamin D levels and pain severity[60].

In developing countries, the prevalence of hypovitaminosis D varies widely by and within regions; prevalence ranges between 30-90%. A high prevalence of the disorder exists in China and Mongolia up to 50% are reported to have serum 25-hydroxyvitamin D levels <12.5 nmol/l. Despite high sunshine throughout the year, one-third to one-half of individuals living in Sub-Saharan Africa and the Middle East have serum 25-hydroxyvitamin D levels <25 nmol/l[47]. A recent studies reported that the overall prevalence of low vitamin D status in Africa was 34.2% [61]. Prevalence of Vitamin D deficiency (VDD) in those musculoskeletal pain populations is very high. the study conducted in Iran shows that among adults presenting with musculoskeletal pain 95.4% of patients with musculoskeletal pain had vitamin D deficiency.74.2% had severe deficiency (25(OH)D < 25 nmol/L) [62]. In Sub-Saharan Africa, is under-studied, but emerging research suggests that VDD is also highly prevalent, especially among urban populations and women of reproductive age. particularly where parts of the region have a high intensity of sunlight but prevalence of VDD is high around 30-50%, the prevalence is high in owing to indoor living, skin pigmentation that reduces dermal Vitamin D synthesis, and poor dietary supplement higher rates observed in urban areas due to limited sun exposure and poor dietary intake [27, 47, 61]. In Ethiopia study conducted in Addis Ababa

among nonspecific musculoskeletal pain and fatigue presenting patients, found that all patients(100%) had initial serum vitamin D levels < 20 ng/ml, among these 62.9% demonstrated severe deficiency (< 12 ng/ml). Thirty (48.4%) participants reported symptomatic improvement after treatment with standard doses of vitamin D and calcium[29]. But there is a lack of other data on VDD among adults presenting with NSMSP and fatigue, especially in Bahir Dar, indicating a significant knowledge gap. Promoting a vitamin D-rich diet, healthy body weight, and adequate sun exposure may help reduce this risk [63].

2.2 ASSOCIATED FACTORS OF VITAMIN D DEFICIENCY

Adults who were black, less educated, poor, obese, current smokers, physically inactive and infrequent milk consumers had a higher prevalence of VDD[52]. The study in Norway patients shows most significant association between headaches and low vitamin D level, with patients having hypovitaminosis D showing a 2.6 times higher odds of reporting headaches than those with normal levels [6]. According to different study Several factors contribute to VDD:

2.2.1 Socio-demographic Factors:

Older adult have reduced skin synthesis capacity and often limited sun exposure it shows risk for deficiency [64]. The concentration of the precursor of vitamin D3 in the skin, 7-dehydrocholesterol (7-DHC), declines approximately by 50% from age 20 to age 80 years[65]. the study conducted in Norway show as this “increase age is risk for VDD”[6]. but the study conducted in UAE shows that younger age group (20–39 years), indicating they were more likely to be deficient compared to older patients[57]. Sex is another factor, generally, in most study Females, particularly housewives with limited outdoor activity are at higher risk. The study shows that the risk of a low 25(OH) vitamin D level was 1.74 times higher in female patients than in males[58]. But the study in Indian lower back pain complain patient shows men were significantly more prone to have deficiency as compared to women[59]. But the other study in northern India shows that demographic variables such as age, gender and BMI were no significant association with vitamin D deficiency, But there is highly associated with pain severity [60]. But the study conducted in USA shows that Levels of vitamin D in men were as deficient as in women[31], But in UAE study shows that there was no significant association between Vitamin D levels and sex[57]. In Norway study shows that being women in Africa and middle east is risk for VDD[6]. Based on educational level the Indian study VDD did not find

any relationship with pain severity and educational level [59]. Lower education levels were associated with lower vitamin D status 18% of the participants with abnormal vitamin D were illiterate in Ismailia[66]. But in Tunisia study on educated women shows high magnitude of VDD [67]. Poverty limits access to nutritious foods and healthcare services, exacerbating VDD [68]. But the study conducted in Turkey show that there is no significant differences were found based on season or socioeconomic status (all participants were low/moderate income in turkey women [69]. The study at Uganda shows religion is one factor. Muslim women were 2.4 times more likely to have vitamin D deficiency compared to Christian adult women. Study in Ethiopia also shows that Age > 50 years, being housewife, use of medication, and higher serum parathyroid hormone are associated with severe vitamin D deficiency according to the study[29].

2.2.2 Sunlight Exposure, skin color, lifestyle factors and Seasonal Variation

Cultural practices, such as wearing concealing clothing, and indoor lifestyles reduce skin synthesis of vitamin D [70]. Turkey study based on their closing style, with covered clothing (67% of participants) had significantly lower vitamin D levels (12.96 ng/mL vs. 18.61 ng/mL in uncovered. but No significant differences were found based on season or socioeconomic status (all participants were low/moderate income in turkey women [69]. Outdoor activity less than an hour per day limited sun exposure significantly increased VDD risk[66, 71]. According to the study conducted in Ethiopia shows that being housewife is risk for VDD [29]. But the study in northern India shows that sun exposure is no significantly associated with vitamin D deficiency [60]. Skin color also affect the vitamin d status due to melanin reduces the skin's ability to synthesize vitamin D, putting darker-skinned populations at higher risk [72]. Vitamin D levels are lower during the rainy season due to reduced sunlight [6, 67, 73]. But in USA Season was not a significant factor in determining vitamin D serum levels [31]. patients that use umbrella or sunscreen during out door that have increased risk of VDD[74]. Similarily other studies on general outpatient populations with musculoskeletal complaints have observed that individuals with certain lifestyle factors, such as smoking, exhibited patterns of lower sunlight exposure and reduced physical activity, which are indirectly associated with lower serum vitamin D levels[53, 58]. Another study among patients with musculoskeletal disorders found that lifestyle factors including lower sun exposure and, by extension, reduced outdoor physical activity were linked to higher prevalence of vitamin D deficiency in Bangladesh[53].

2.2.3 Dietary habit and Medication Use

Low intake of vitamin D-rich foods contributes to deficiency. In USA Compared with frequent consumers, rare consumers of milk had 2·44 and 1·25 times higher prevalence of VDD and VDI, respectively. Current alcohol drinkers had 38 % lower prevalence of VDD than non-drinkers [31]. Daily dietary vitamin D intake in Tunisia was clearly lower than the recommended dose. Low intake of vitamin D-rich foods, such as fish, eggs, and fortified dairy products, is common in low-income settings[75]. But the study in northern India shows that the is no a significant different of vitamin D level between (vegetarian vs. non-vegetarian), and BMI were recorded but showed no significant association with vitamin D deficiency [60]. Use of anti-epileptic drugs has been linked to lower vitamin D levels due to interfere the vitamin D metabolism [29].

2.3.4 Obesity, weight gain or other comorbidity

In US obese adults showed 3·09 times higher prevalence of VDD and 1·80 times higher prevalence of VDI than non-obese adults. Physically inactive adults had 2·00 and 1·36 times higher prevalence of VDD and VDI than active peers [31]. The study conducted in Ethiopia , with a BMI ≥25 had a risk of being vitamin D deficient [63]. chronic kidney and liver disease and problem on PTH have affect the metabolism of vitamin D, so cause VDD [48]. Additionally, in a larger cohort of patients with wide-spread musculoskeletal pain, low vitamin D was common and was variably associated with chronic health conditions may interact with vitamin D status through reduced mobility and altered lifestyle patterns[58].

2.3 CONCEPTUAL FRAMEWORK OF VITAMIN D DEFICIENCY

This conceptual framework illustrates the determinate of VDD among adults with non-specific musculoskeletal pain and fatigue. It also integrates Socio-demographic characteristics, lifestyle and behavioral characteristics and dietary habits. It even adds biological and health related characteristics which either directly or indirectly can affect the level of vitamin D. By integration of these pieces, the model shows the path ways through which these variables can cause VDD, facilitating the identification of groups at risk and opportunities for intervention. This framework adopted from different literature's,[6, 29, 31, 48, 63, 66, 67, 69, 71-74]

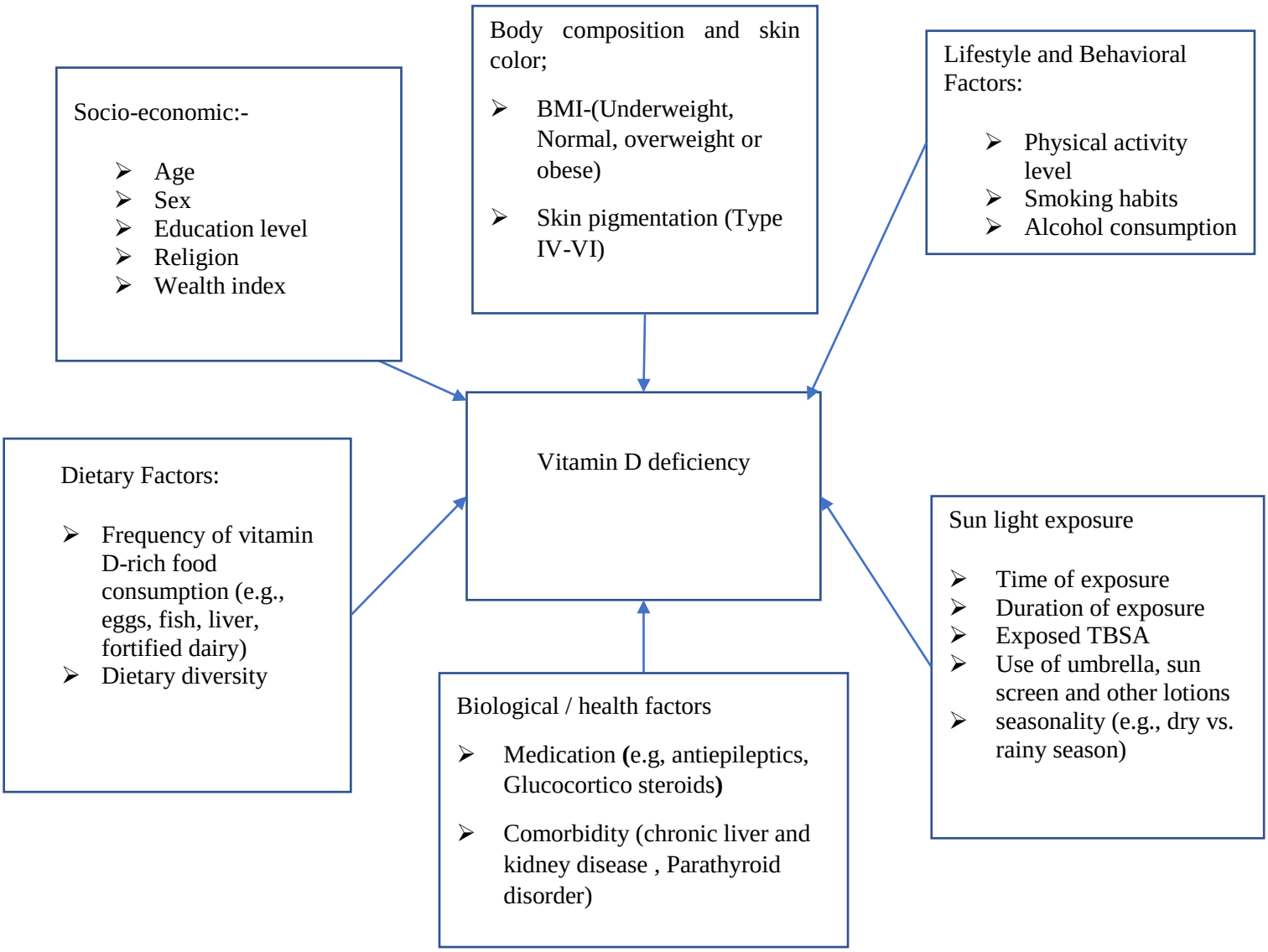

Figure 1 Conceptual freamwork of vitamin d deficiency

3. OBJECTIVES

3.1 GENERAL OBJECTIVE

To assess Vitamin D deficiency and its associated factors among adults presenting with non-specific musculoskeletal pain and fatigue in public and private hospitals in Bahir Dar city, northwest Ethiopia, in 2025.

3.2 SPECIFIC OBJECTIVES:

1) To determine Vitamin D deficiency among adult patients presenting with non-specific musculoskeletal pain and fatigue in in public and private hospitals in Bahir Dar city, 2025.
2) To identify factors associated with vitamin D deficiency among adult patients presenting with non-specific musculoskeletal pain and fatigue in in public and private hospitals in Bahir Dar city, 2025.

4. METHODS AND MATERIALS

4.1 STUDY SETTING

The study was conducted in Bahir Dar city, Amhara Regional State, North-West Ethiopia. Bahir Dar is the capital city of Amhara Regional State. The city was found at 1801 meters above sea level and 565 kilometers from Addis Ababa, which is the capital city of Ethiopia. The total population is about 500,000 based on 2016 Ethiopian population projection estimation. The city has three governmental and four private hospitals, Concerning the governmental health institutions, there are two specialized Hospitals (Felege Hiwot compressive specialized hospital and Tibebe Gion specialized hospital), one primary hospital (Adisalem primary hospital) and four private hospitals (Adinas, Afilas, Dream care and Gambi general hospitals)[76]. Our study was conducted in these hospitals from each hospital based on strata consecutively select study participates up to fill its quota. As shown in figure 2.

4.2 STUDY DESIGN AND PERIOD

An institutional based cross-sectional study design was conducted from August 21 to September 16, 2025

4.3 POPULATION

4.3.1 Source population;

All adults aged 18 years and above who seek medical care in Bahir Dar hospitals for idiopathic (unknown cause) non specific musculoskeletal pain and/or fatigue and are evaluated for Vitamin D status.

4.3.2 Study Population

Adults aged 18 years and above presenting with nonspecific musculoskeletal pain and/or fatigue in public and private hospitals in Bahir Dar, who undergo evaluation for Vitamin D status during the study period

4.4 ELIGIBILITY CRITERIA

4.4.1 Inclusion Criteria:

- Adults aged 18 years and older Presenting with non-specific musculoskeletal pain and/or fatigue with unknown cause that attending at all public or private hospitals in Bahir Dar during the study period.

4.4.2 Exclusion Criteria:

- Patients with known medical conditions that affect Vitamin D metabolism (e.g., chronic kidney disease, liver disease, malabsorption syndromes, parathyroid disorders)
- Pregnant or lactating women (due to altered Vitamin D metabolism).
- Patients with mental illness or cognitive impairment that limited reliable communication.
- Patients with incomplete clinical records or missing vitamin D test results

4.5 SAMPLE SIZE DETERMINATION

The sample size was determined by using a single population proportion formula assuming the proportion of 50% p = 0.5, 95% confidence level, and 5% margin of error. The formula is indicated as shown below:

$$n = \frac{Z^2 p(1-p)}{d^2}$$

Whee:

- Z = The Z- score corresponding to the 95% confidence level which is 1.96
- P= is the proportion of population 50%
- d= is the degree of precision of 5%

Therefore this gave a sample size of 384 and with non response rate of 10%; the final Sample size became 422.

4.6 SAMPLING TECHNIQUE

A multi-center consecutive sampling technique was used to select a total of 415 study participants from seven hospitals in Bahir Dar city, comprising three public and four private hospitals. There are seven hospitals in Bahir dar city [77]. Hospitals were considered as strata. The total sample size was proportionally allocated to each hospital based on the previous one-month patient flow of adults presenting with non-specific musculoskeletal pain and/or fatigue. Monthly NSMSP patient flow data were obtained from outpatient registration books of each hospital. Accordingly, the recorded patient flows were, (1323) for Tibebe Gion Specialized Hospital (TGSH), (1031) for Felege Hiwot Specialized and Comprehensive Hospital (FHSCH), (185) for dream care hospital, (956) for Adisalem primary hospital, (262) for Gambi teaching hospital, (324) for Afilas hospital and (409) for Adinas hospital. Based on these figures, proportional allocation was performed for each hospital (**Figure 2**). Finally, at each hospital, a consecutive sampling approach was used to select eligible patients sequentially, until the allocated quota was fulfilled.

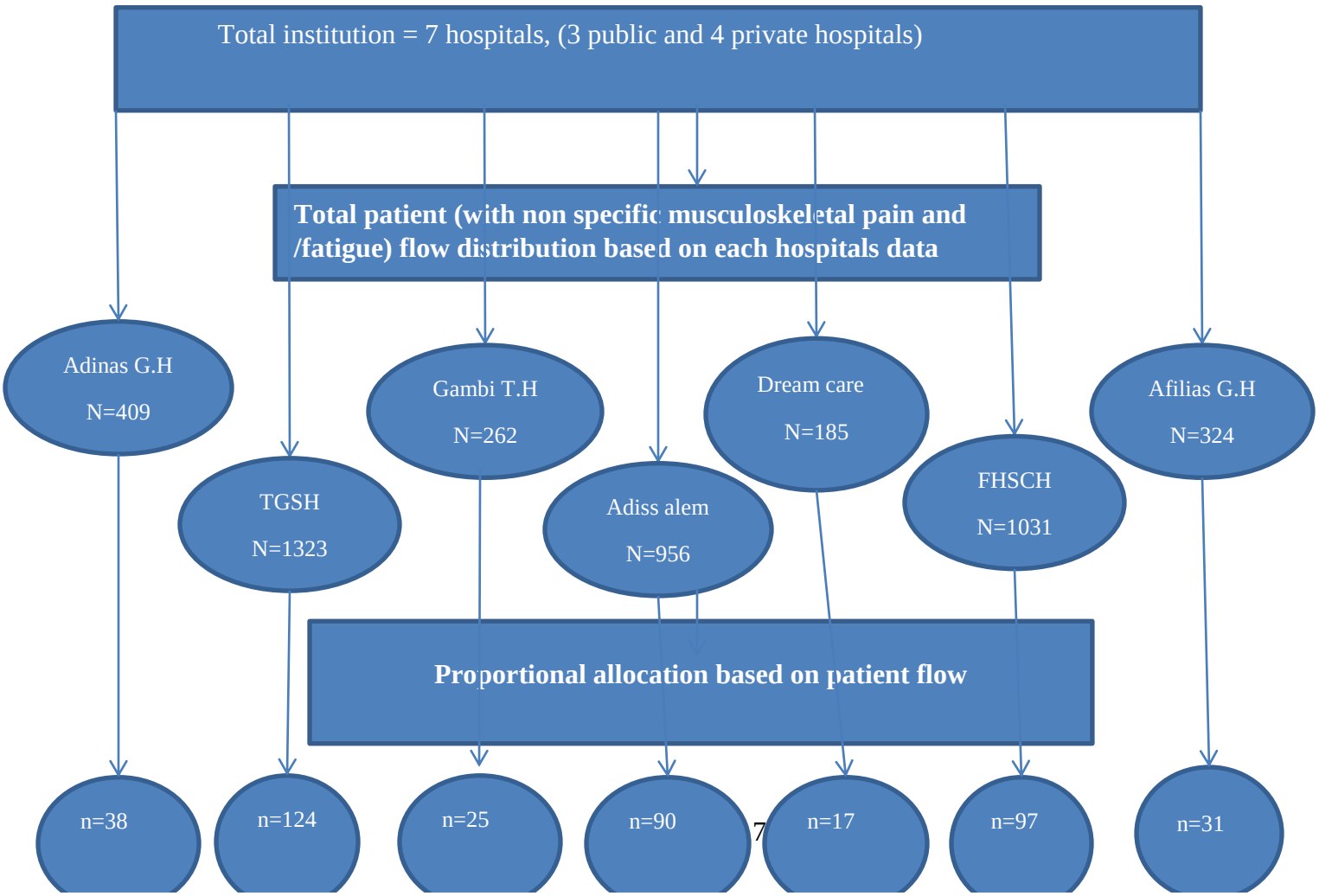

Figure 2 consecutive sampling technique for selecting study participants

4.7 STUDY VARIABLES

4.7.1 Dependent Variable

Vitamin D Deficiency (yes, no)

4.7.2 Independent Variables

- Socio-economic Factors: Age, Sex, religion, Education level, wealth index, Occupation and Residence (urban/rural)
- Body Composition and Skin Type: Body Mass Index (Underweight, Normal, overweight or obese), and Skin color classification (Type IV–VI)
- Dietary Intake: Frequency and quality of vitamin D-rich foods (milk, eggs, fish and fortified cereals) and Dietary diversity
- Sunlight Exposure and Lifestyle: Time of sunlight exposure (morning, mid-day, evening), Duration of sunlight exposure (<30 min, 30–60 min, >1 hour), Total body surface area (TBSA) exposed to sunlight and Use of sunscreen, lotions or umbrella,
- Biological/Health Conditions: chronic diseases, medication (e.g., antiepileptic, steroids),
- Lifestyle and Behavior: Smoking, alcohol consumption and physical activity.

4.8 OPERATIONAL DEFINITION

- Vitamin D level assessed by blood test If Serum 25-hydroxyvitamin D [25(OH)D] levels <20 ng/ml is deficiency, if Serum 25(OH)D levels is between 20-29.9 ng/ml, it can be Vitamin D Insufficiency but if Serum 25(OH)D levels is >=30ng/ml say sufficient [78].
- Non specific musculoskeletal pain: patients presented to the clinic with the main complaints of generalized body ache or localized body pain, lower back pain, neck pain, joint pain, shoulder pain and paresthesia with idiopathic (unknown) origin for more than 3 months [78, 79].
- Fatigue –: Is a subjective feeling of tiredness not relieved by rest, reported in the absence of other known medical conditions like heart failure [80].

- Body mass index (BMI. The World Health Organization (WHO) defines BMI categories as underweight, normal weight, overweight, and obese. BMI categorize as: - underweight: less than 18.5 kg/m2, normal weight: 18.5–24.9 kg/m2, or overweight: 25–29.9 kg/m2, Obese: above 30 kg/m2 [81].
- The Global Physical Activity Questionnaire (GPAC) classifies physical activity as low, moderate, or high based on weekly energy expenditure expressed as MET-minutes, as well as the frequency/duration of activity, in accordance with the WHO recommendations [82] .
- time of exposure ; Outdoor activities like walking or working outside (moth than 30 minutes) daily or most of the day in a week, mostly from 10:00AM to 3:00 PM is good and sufficiently exposed [63, 78].
- Alcohol Use Disorders Identification Test (AUDIT): is a 10-item WHO-developed screening tool for hazardous or harmful alcohol use, with scores ranging from 0–40; a total score of ≥8 indicates hazardous risk alcohol consumption or below 8 is as low risk, as used in this study [83].
- Smoking status: will be assessed using selected questions from the WHO Global Adult Tobacco Survey and classified as never smoker**,** former smoker**,** or current smoker[83]
- Exposed total body surface area: - Percentage of skin actually exposed to sunlight when outdoors, as estimated from clothing habit by visual Estimation. If exposed TBSA<15%: Face/hands only (e.g., full traditional dress + headscarf, or equivalent female Muslim dressing style, 15–20%: Face, hands, lower arms/feet (e.g., short sleeves/no socks, 21–30%: Arms/legs partially exposed (e.g., T-shirt + knee-length dresses or and >30%: High exposure (e.g., short sleeves + shorts). To reduce bias, use reference points (e.g., body part diagrams with % coverage). for analysis give ranks from lowest (<15%) to highest exposed (>30%)) [63].
- Sunlight exposure time in a day: 'Morning' The time period before 3:00 'Mid-day*'* the time period between 4:00 and 9:00; and 'Sunset/evening is the time period after 10:00[84].
- Wealth index**:** is a composite measure of household economic status, calculated using 15 standard indicators adapted from the Ethiopia DHS 2016 Equity-tool. Each item is coded as Yes = 1 and No = 0 for binary questions, while categorical items are assigned fixed scores (e.g., improved option = 1, other = 0). Principal Component Analysis (PCA) is used to generate separate urban and rural scores, which are then combined into a national score

(Nat-score) through a regression formula. Households are ranked by Nat-score and classified into five national wealth quintile: Quintile 1 (Poorest): 0–20%, Quintile 2 (Poorer): 20–40%, Quintile 3 (Middle): 40–60%, Quintile 4 (Richer): 60–80%, Quintile 5 (Richest): 80–100% [85].

- Frequency of umbrella use: Rarely Users Participants who reported less than 2 days per week use, sometime user; respondents who report 3-4 days per week and 'Regular Users'; Participants who reported consistent or frequent use of the specified item (mor than 5 days per week [84].

- Frequency of sunscreen user: - Rarely Users: using sunscreen less than 2 days per week; Sometimes Users: using it 3–4 days per week; and Regular Users: using it 5 or more days per week [84].

- Fitzpatrick classification: - Classified skin pigmentation that has six colors according to Fitzpatrick types. these are : very fair (skin color type I), fair (skin color type II), medium (skin color type III), olive or light brown (skin color type IV) , dark brown (skin color type V) and very dark brown or black (skin color type VI) [86]. because in our setup Ethiopia the skin type is predominantly Type IV, V, or V [63].

- Dietary Diversity Score (DDS): is the number of different food groups consumed by an individual over the previous 24 hours, assessed using a dietary diversity questionnaire based on FAO guidelines (FAO, 2011). DDS was categorized as adequate (≥5 food groups) or inadequate (<5 food groups)**,** reflecting minimum dietary diversity and nutrient adequacy [87].

- Frequency Dietary vitamin D intake: Participants were asked to report the frequency of consumption of common vitamin D rich food sources, including fish, fish oil, eggs, liver, mushrooms, fortified milk and milk products, and fortified cereals. The frequency of intake for each food item was categorized as daily (≥1 time/day)**,** weekly (1-6 times per week)**,** monthly (1-3 times per month), rarely (less than 1 time per month), or never, based on self-report [84].

4.9 Data collection tools and procedures

A pretested and standardized questionnaire was used to collect data for this study. Questionnaire development was carried out with a careful review of current literature, pertinent studies, and standard survey measures for vitamin D deficiency and non-specific musculoskeletal symptoms. The questionnaire consists of five main sections: Socioeconomic information, lifestyle and risk behavior (such as sun exposure, smoking, alcohol consumption, and physical activity), food habits (consumption of vitamin D sources), clinical symptoms, and biological/health variables. It was also contain chart abstraction forms to collect patients' serum 25(OH) D from clinical records.

The data collection was done on summer season by four data collectors who possess health-related backgrounds and are highly trained. They were receiving one-day training on the purpose of the study, informed consent protocols, interviewing, ethical concerns, and accurate recording of data. Consecutive participants were enrolled from medical OPD of Bahir Dar hospitals (both public and private). Data collectors were recruit eligible adults (≥18 years) with who have diagnosed with non-specific musculoskeletal pain and fatigue by their OPD doctors and have laboratory ordered and financial ability to done, the vitamin d status). All the participants were interviewed individually (interviewer-administered standardized questionnaire method) at the outpatient department after written informed consent provided about their willingness.

Height and weight was measured using standardized equipment (stadiometer and electronic scale) to calculate BMI. Skin color pigmentation was visually assessed using Fitzpatrick scale photographs Type IV (light brown), Type V (dark brown), and Type VI (very dark brown) based on the Fitzpatrick classification system which assesses melanin content and UV sensitivity By Visual Inspection. Trained data collectors observe participants in natural daylight and classify skin type based on standard descriptions or using reference photographs, then directly marked on the questionnaire as (Types IV-VI). Type IV, V, or V. because in our setup Bahir Dar the skin type is predominantly Type IV, V, or V [63],

Household wealth status was assessed using a standardized wealth index questionnaire adapted from the Demographic and Health Survey (DHS). The tool included asset ownership and housing characteristic variables relevant to both urban and rural settings, with separate items applied

accordingly. Data on durable goods, housing materials, water source, sanitation facilities, and access to utilities were collected. Principal component analysis (PCA) was used to derive a composite wealth index score. Participants were then categorized into wealth quintiles based on the PCA-generated scores.

Sun exposure was assessed with self-reported duration/timing and estimated exposed body surface area to clothing). Information was collected by asking Participants, when they are most often outside (Time of the day) during: - morning (7:00–9:00 AM), mid-day (10:00 AM–3:00 PM) (when UVB intensity is highest), or evening (4:00–6:00 PM). And also, interviewers ask about the length of mean daily exposure by minute or houre. For analysis it will classify Time of day, (morning/mid-day/evening) and duration (<30 min/30–60 min/>1 hr.). The estimated TBSA exposed to sun light was assessed by visual inspection and self-report of dressing style after that to reduce bias, use body part diagrams with % coverage. For analysis give ranks from lowest (<15%) to highest exposed (>30%).

Sun-protective behaviors were assessed by using a self-reported questionnaire. For umbrella use and sunscreen use, participants were first asked whether they used the item to protect themselves from sunlight (Yes/No), and these variables were analyzed as dichotomous measures of adoption. Participants who reported "Yes" were then asked about the frequency of use, categorized as always, sometimes, or rarely, and analyzed separately to describe the intensity of sun-protective behavior. Lotion use was assessed only as a Yes/No variable. For participants who were unfamiliar with sunscreen or lotion, images were shown to illustrate the items and ensure comprehension.

Dietary practices Frequency of intake of important Vitamin D/calcium-containing foods (fish, eggs, fortified milk, cereals). By asking study participants predefined frequency options, (Fish/egg consumption: Daily (≥1 time/day), weekly (1-6 days per week), sometimes (1-3 times per month), rarely (less than one per month), and never. Finally for analysis Food frequencies as ordinal (never → daily) [78]. Dietary diversity was measured using a 24-hour dietary recall based on FAO guidelines (FAO, 2011). Participants were report all foods and beverages consumed during the previous day, and each food was classified into one of the ten FAO-defined food groups for adults. Each food group consumed was scored 1, and the DDS was calculated as the sum of 0-10 food groups consumed**.** Foods such as oils, sweets, condiments, and beverages

will be recorded but not included in the score. For analysis, DDS was categorized as adequate (≥5 food groups) or inadequate (<5 food groups) [87].

Alcohol consumption was assessed using the Alcohol Use Disorders Identification Test (AUDIT), a 10-item self-report instrument developed by the WHO to screen for hazardous or harmful alcohol use. Each item was scored to yield a total score ranging from 0–40, with higher scores indicating greater risk. In this study, participants with a total score of ≥8 were classified as engaging in risky alcohol consumption, while those with lower scores was considered low-risk or non-hazardous drinkers. This tool provides a standardized method to quantify alcohol use severity and identify individuals at risk of alcohol-related harm [83].

Physical activity level was assessed by Global Physical Activity Questionnaire (GPAC), a 16-item self-report instrument developed by the WHO to screen for low, moderate and high physical activity. Vigorous activity is valued at 8 METs per minute, and moderate activity, such as walking/bicycling for transport, is valued at 4 METs per minute; thus, MET minutes per week are calculated by multiplying minutes by these MET values and summing across domains. Individuals reaching a total of at least 3000 MET-min/week, or ≥ 1500 MET-min/week from vigorous activity on ≥3 days are classified as "High". Those getting at least 600 MET-min/week but below the high threshold, or meeting the time/day moderate criteria, are "Moderate". Participants not meeting these criteria are classified as "Low" physical activity. This categorizes physical activity volume according to WHO thresholds of insufficient, adequate, and high activity levels used in population surveillance.

Smoking status was assessed using questions from the WHO Global Adult Tobacco Survey. Participants are classified based on self-reported tobacco use as never smokers (never used any tobacco product), former smokers (previously smoked but not currently), and current smokers (currently smokes any tobacco product, daily or less than daily)[83].

And confidentiality was maintained in the process, by (Without disclosing their names, without using the information beyond its intended purpose, and without passing their data it on to another person). In addition, Laboratory tests of serum 25-hydroxyvitamin D [25(OH) D] levels from medical chart who have already been tested was used for their clinical assessment. The process was strictly monitored by the principal investigator by reading through the filled forms each day for completeness and accuracy.

4.10 Data quality control

To ensure data accuracy and reliability, multiple quality control measures was implemented throughout the study. The questionnaire was written in English, and then translated into the local language (Amharic) then back to English to ensure consistency. A total of 5% (21) of patients from other health facility (Eyasta clinic) was conducted piloting test to check the questionnaire's clarity, completeness, and contextual appropriateness of the questionnaire. Based on the pretest finding ambiguous and unclear questions were revised accordingly. Data collectors were received one-day training on study objectives, interview techniques, and anthropometric measurements (Anthropometric measurements were conducted following standardized procedures. Weight was measured using a calibrated digital weighing scale with participants wearing light clothing and no shoes, while height was measured using a portable stadiometer with participants standing upright, barefoot, and with heels together. Body Mass Index (BMI) was calculated as weight in kilograms divided by height in meters squared (kg/m^2) and classified according to WHO criteria). All measurements were taken three times, and the average was recorded as the final measurement. Dietary intake was assessed using a semi-quantitative food frequency questionnaire. To improve recall accuracy and minimize misclassification visual aids (food images and household utensils) were used to help participants recognize food items and recall the frequency of fish and egg consumption, rather than to quantify portion size, and ethical considerations. For assessment of sun-protective behaviors visual aids were used to help participants recognize and differentiate sunscreen and skin lotion products, particularly when participants were unfamiliar with product names. To minimize observer variability in visual assessments such as Total Body Surface Area (TBSA) and Fitzpatrick skin type, data collectors received standardized training using reference image. Data collectors were blinded to participants' serum vitamin D status during interviews and physical assessments to reduce observer bias. The principal investigator closely supervised the data collection process, and completed questionnaires were checked daily for completeness and consistency. After data collection, the dataset was cleaned by identifying and correcting errors, inconsistencies, and missing values. Data entry was performed using EpiData version 3.1 with validation checks. Data analysis was conducted using SPSS version 27**,** and any outliers or anomalies were examined and addressed appropriately**.**

4.11 Data processing and analysis

The collected data was thoroughly screened for completeness and consistence, entered into Epi-data version 3.1. The data was coded, cleaned, and entered into SPSS version 27, for analysis, double entry of data and cross-checking to confirm no errors and consistency. Outliers and missing values was managed with most care before analysis to avoid biasing results. Frequency was used to provide a description of participants' socio demographic and clinical characteristics. For identifying factors associated with vitamin D deficiency (the single dependent variable), bivariate binary logistic regression was conducted. Then if variables with a p-value <0.25 in the bivariate analysis was included in a multivariate binary logistic regression model to control for potential confounders. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) was reported to assess the strength and direction of associations, and statistical significance was considered at a p-value <0.05.

4.12 ETHICAL CONSIDERATION

Ethical clearance was obtained from the Institutional Review Board of Bahir Dar University, College of Medicine and Health Sciences. Permission letters was sought from the management bodies of the participating hospitals. Written consent was obtained from each study participant before conducting measurements and interviews, and the confidentiality of the data was ensured (Without disclosing their names, without using the information beyond its intended purpose, and without passing their data it on to another person). Participants were informed of their right to refuse or withdraw from the study at any time without any consequences. The information provided by each respondent was kept strictly confidential

5. RESULTS

5.1 Socio-demographic Characteristics of the Study Participants

This study included 415 adult with Non-specific musculoskeletal pain and fatigue with a 98% of response rate. 39.8% of the participant was complete degree or diploma. Most of the respondents (36.6%) were under the age of 40-59. More than half of respondents (58.6%) are female. Around 26.5% of the participants were homemaker. 33.3% belonged to the middle quintile wealth index

Table1

Table 2: Socio-demographic and economic characteristics of adults presenting with non-specific musculoskeletal pain and fatigue at public and private hospitals in Bahir Dar, Northwest Ethiopia, 2025

Variables		**Frequency**	**Percent**
Age (year)	Young adult 18-40	167	40.2
	Middle aged adult (40-59)	152	36.6
	Older adult (60 and above)	96	23.1
Sex	Male	172	41.4
	Female	243	58.6
Residence	Urban	313	75.4
	Rural	102	24.6
Educational level	Unable to read and write	71	17.1

	Able to read/write (no formal)	41	9.9
	Primary school	62	14.9
	Secondary school	76	18.3
	Diploma or degree	165	39.8
Occupation	farmer	78	18.8
	non-government worker	42	10.1
	government worker	78	18.8
	merchants	42	10.1
	homemaker	110	26.5
	student	32	7.7
	retired	16	3.9
	Unemployed	17	4.1
marital status	married	322	77.6
	divorced	13	3.1

	widowed	11	2.7
	single	69	16.6
Wealth index	poorest	78	18.8
	poorer	82	19.8
	middle quantile	138	33.3
	Richer	49	11.8
	Richest	68	16.4
Religion	Orthodox	405	97.6
	Muslim	9	2.2
	Protestant	1	0.2

5.2 Dietary Intake of the study participants.

The majority of the participants were inadequate dietary diversity score (81.7%). almost half of the participants (50.6%) rarely consumed fish, and most of them (97.8%) have never taken fish oil supplements. Most people consumed eggs, as 46.7% reported eating eggs on a monthly basis, while 23.6% daily **Table2**.

Table 3: Dietary Intake of adults presenting with non-specific musculoskeletal pain and fatigue at public and private hospitals in Bahir Dar, Northwest Ethiopia, 2025

Variable	**Frequency**	**Percent (%)**

Fish consumption	Never	183	44.1
	Rarely	210	50.6
	Monthly	20	4.8
	Weekly	2	0.5
Fish oil consumption	Never	406	97.8
	Rarely	9	2.2
Egg consumption	Rarely	3	0.7
	Monthly	194	46.7
	Weekly	120	28.9
	Daily	98	23.6
Dietary diversity score	Inadequate	339	81.7
	Adequate	76	18.3
Liver consumption	Never	113	27.2
	Rarely	293	70.6
	Monthly	9	2.2
Mushroom consumption	Never	393	94.7
	Rarely	22	5.3
Fortified milk and milk product with vitamin D consumption	Never	411	99
	Rarely	4	1
Fortified cereals with vitamin D consumption	Never	414	99.8
	Rarely	1	0.2

5.3 Sunlight exposure, lifestyle characteristics, skin color and BMI of the study participants at Bihar dar city in Northwest Ethiopia, December 2025.

Most participants, 64.8% were says that exposed to sunlight mainly at the morning. Only 5.5% of participants were sunscreen user from this, the majority applying it sometimes (52.2%). On the other hand, 58.8% of participants were body lotion users, and most of the umbrella users were sometimes (44.9%) and regular users were (19.0%). **Table 3**.

Table 4: Sunlight exposure, lifestyle characteristics , skin color and BMI of adults presenting with non-specific musculoskeletal pain and fatigue at public and private hospitals in Bahir Dar, Northwest Ethiopia, 2025

Variable		**Frequancy**	**Percent (%)**
Day time of sun exposure	Midday	132	31.8
	Morning	269	64.8
	Evening	14	3.4
Duration of sun exposure	<30minutes	96	22.7
	30-1 hour	189	44.8
	>1 hour	130	30.8
TBSA exposed	<15% TBSA	38	9.2
	16%-20% TBSA	121	29.2
	21%-30% TBSA	224	54
	>31% TBSA	32	7.7
Lotion user	No	171	41.2
	Yes	244	58.8
Sunscreen user	No	392	94.5

	Yes	23	5.5
Umbrella user	No	141	34
	Yes	274	66
Skin color	Type IV	81	19.5
	Type V	322	77.6
	Type VI	12	2.9
Physical exercise	Low	206	49.6
	Moderate	177	42.7
	High	32	7.7
Alcohol drinker	Non risky	377	90.8
	Hazardious	38	9.2
Smoker	No	411	99.0
	Yes	4	1.0
Body mass index (kg/m2)	Normal BMI	313	75.4
	Underweight	18	4.3
	Overweight	79	19.0
	Obese	5	1.2

5.3 Clinical and medical history of the study participants

The symptoms reported in the majority of subjects were pain in muscles or joints was found in 96.1%. 6.3% of participants had use medication including chronic disease medication (like anti

HTN, anti TB, ART, DM drugs and others). 17.1% had comorbid systemic diseases (From this hypertension, diabetes mellitus,heart failer and HIV/AIDS most commonly reported included, and others like TB, goiter and others had also reported by respondents) **Table 4**.

Table 5: The clinical and medical history of adults presenting with non-specific musculoskeletal pain and / fatigue at public and private hospitals in Bahir Dar, Northwest Ethiopia, 2025.

Variable		**Frequency**	**Percent (%)**
experienced muscle or joint pain	No	16	3.9
	Yes	399	96.1
experienced Generalized fatigue	No	72	17.3
	Yes	343	82.7
experienced Bone pain or weakness	No	21	5.1
	Yes	394	94.9
experienced Paresthesia (tingling	No	113	27.2
	Yes	302	72.8
current on medication	No	389	93.7
	Yes	26	6.3
Collateral disease	No	344	82.9
	Yes	71	17.1
VDD history	No	407	98.1
	Yes	8	1.9

5.4 Serum vitamin D level of Adults with nonspecificic musculoskeletal pain and fatigue in Bahir Dar hospitals.

Based on this study finding nearly half of the participants around 48.4% (95% CI: 43.6%–53.2%) were vitamin D deficient (serum 25-hydroxyvitamin D <20 ng/ml) among adults patient presenting with non-specific musculoskeletal pain and or fatigue **Table 5**.

Table 6: Vitamin D status of adults presenting with non-specific musculoskeletal pain and/fatigue at public and private hospitals in Bahir Dar, Northwest Ethiopia, 2025.

Variable		Frequency	Percent (%)
Vitamin D level	Deficient	201	48.4
	Non-deficient	214	51.6

As shown in **Figure 3**, Only 18.1% of respondents were sufficient vitamin D level..

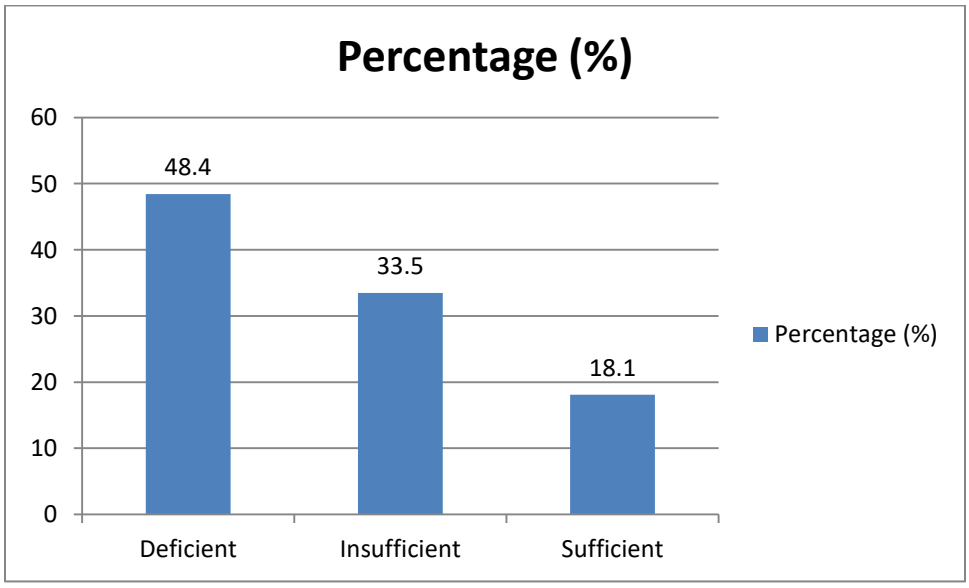

Figure 3, Percentage distribution of vitamin D status among adults attending public and private hospitals in Bahir Dar, Northwest Ethiopia, 2025

5.5 Factors associated with vitamin D deficiency

Bi-variable logistic regression was used to evaluate each candidate variable, and those with a p-value of less than 0.25 were taken into consideration for the multi-variable logistic regression

analysis. Age, sex, wealth index, physical activity level, time of exposure to sunlight, use of sunscreen, use of umbrella, medication user, comorbidity, alcohol consumption, occupation, BMI, duration of sunlight exposure, exposed TBSA and liver consumption are fitted to Multivariable logistic regression.

After adjusting for potential confounders, several factors remained independently associated with vitamin D deficiency. Individuals who had older (60 years and above) had about nearly 2 times higher odds of vitamin D deficiency compared with those under 40 years (AOR = 1.96 ; 95% CI: 1.02-3.76). In relation to time of sun exposure, participants who were mainly exposed during the morning hours had about more than two times increased odds of vitamin D deficiency compared with those exposed at midday (AOR = 2.47; 95% CI: 1.35-4.52). Participants with comorbid medical conditions had more than twice the odds of vitamin D deficiency compared with those without comorbidity (AOR = 2.23; 95% CI: 1.14-4.38). And also individuals who were overnurished had more than two times higher odds of vitamin D deficiency compared with those with normal BMI (AOR = 2.28; 95% CI: 1.25-4.18) **Table 7**.

Table 8: Multi variable Logistic Regression Analysis of Factors Associated With Vitamin D deficiency Among Adult presenting with non specific musculoskeletal pain and / fatigue in Public and private Hospitals of Bahir Dar city, 2025

Variable		Deficient (%)	Non-deficient (%)	COR (95% CI)	AOR	95% CI	p-value
AGE(year)	Young adult (18-39)	75(44.9)	92 (55.1)	Ref.			
	Middle aged adult (40-59)	64 (42.1)	88 (57.9)	.89(.57-1.39)	.64	.36-1.13	.120

	Older adult (>=60)	62 (64.6)	34 (35.4)	2.24(1.33-3.75)	1.96	1.02-3.76	**.043**
Sex	Male	71 (41.3)	101 (58.7)	Ref.			
	Female	130 (53.5)	113 (46.5)	1.64(1.10-2.42)	.68	.25-1.82	.441
Wealth Index	Rich	63 (53.8)	54 (46.2)	Ref.			
	poor	70 (43.8)	90 (56.2)	.67(.41-1.08)	1.15	.58-2.27	.697
	Middle class	68 (49.3)	70 (50.7)	.83(.51-1.36)	.86	.49-1.52	.600
Level of Physical Activity	High activity	8 (25.0)	24 (75.0)	Ref.			
	Low activity	122 (59.2)	84 (40.8)	4.36(1.87-10.16)	2.70	.84-8.73	.097
	Moderate activity	71 (40.1)	106 (59.9)	2.01(.86-4.72)	1.51	.54-4.22	.433
Time of exposure	Midday	48 (36.4)	84 (63.6)	Ref.			
	Morning	151 (56.1)	118 (43.9)	2.24(1.46-3.44)	2.47	1.35-4.52	**.003**
	Evening	2 (14.3)	12 (85.7)	.29(.06-1.36)	.28	.05-1.54	.143
Sunscreen use	No	187 (47.7)	205 (52.3)	Ref.			
	Yes	14 (60.9)	9 (39.1)	1.71(.72-4.03)	1.94	.65-5.80	.235

Umbrella use	No	55 (39.0)	86 (61.0)	Ref.			
	Yes	146 (53.3)	128 (46.7)	1.78(1.18-2.70)	1.42	.56-3.59	.461
Medication currently	no	183 (47.0)	206 (53.0)	Ref.			
	yes	18 (69.2)	8 (30.8)	.03(1.08-5.96)	1.21	.40-3.62	.733
Comorbidity	No	156 (45.5)	187 (54.5)	Ref.			
	yes	45 (63.4)	26 (36.6)	2.03(1.20-3.44)	2.23	1.14-4.38	**.020**
Alcohol consumption level	Non-hazardous	187 (49.6)	190 (50.4)	Ref.			
	Hazardous	14 (36.8)	24 (63.2)	.593(.30-1.18)	1.16	.49-2.74	.744
Employment status	Farmer	32 (41.0)	46 (59.0)	Ref.			
	Non government worker	24 (57.1)	18 (42.9)	1.92(.90-4.10)	1.38	.46-4.14	.564
	Government worker	33 (42.3)	45 (57.7)	1.05(.56-1.99)	.64	.21-1.92	.422
	Marchant	12 (28.6)	30 (71.4)	.58(.27-1.29)	.51	.17-1.50	.220

	Homemaker	67 (60.9)	43 (39.1)	2.24(1.24-4.05)	1.13	.45-2.86	.797
	Others	33 (50.8)	32 (49.2)	1.48(.76-2.88)	.66	.234-1.85	.428
BMI (kg/m2)	Normal	137 (43.8)	176 (56.2)	Ref.			
	Underweight	10 (55.6)	8 (44.4)	1.61(.62-4.18)	1.20	.37-3.92	.766
	Overnurished	54 (64.3)	30 (35.7)	2.31(1.40-3.81)	2.28	1.25-4.18	**.007**
Duration of exposure	>1 hour per day	52 (40.0)	78 (60.0)	Ref.			
	<30 minute per day	55 (57.3)	41 (42.7)	2.01(1.18-3.44)	1.06	.44-2.54	.902
	30-60 minute per day	94 (49.7)	95 (50.3)	1.48(.94-2.33)	.81	.40-1.65	.565
Exposed TBSA	>30%TBSA	9 (28.1)	23 (71.9)	Ref.			
	<15% TBSA	18 (47.4)	20 (52.6)	2.30(.85-6.25)	1.11	.32-3.90	.866
	15-20% TBSA	71 (58.7)	50 (41.3)	3.63(1.55-8.50)	1.93	.67-5.57	.222
	21-30% TBSA	103 (46.0)	121 (54.0)	2.18(.96-4.91)	1.41	.51-3.88	.509
Liver	Ever	138 (45.7)	164 (54.3)	Ref.			

consumption	Never	63 (55.8)	50 (44.2)	1.497(.97-2.31)	1.32	.77-2.29	.316

Note: BMI= body mass index, COR = Crude Odds Ratio; AOR = Adjusted Odds Ratio; CI = Confidence Interval; Ref. = Reference category and Variables with p < *0.05 were considered statistically significant.* Other= students, retireds, and unemployed, *overnurished = overweight or obese*

6. DISCUSSION

The aim of this study was to assess vitamin D deficiency and identify factors associated with vitamin D status among adults aged 18 years and above presenting with non-specific musculoskeletal pain and/or fatigue in public and private hospitals of Bahir Dar, Northwest Ethiopia, in 2025. According to this study, vitamin D deficiency among adults was 48.4% (95% CI: 43.6%-53.2%) who visited public and private hospitals in Bahir Dar with non-specific musculoskeletal pain and fatigue. This finding shows that vitamin D deficiency is a major public health problem among symptomatic adults, even in settings with adequate sunlight.

The prevalence of 48.4% in the present study is in line with the worldwide estimates. In UAE Vitamin D levels among non-specific musculoskeletal pain found that 40.2% deficient and 31.3% insufficient. In China and Mongolia up to 50% are reported to have serum 25-hydroxyvitamin D levels were deficient. This similarity suggests that despite abundant sunlight, vitamin D deficiency remains common.

But this research reports the investigated rate, which is lower than that observed in Addis Ababa. In Addis Ababa, a study revealed that commonly nonspecific musculoskeletal pain and fatigue were associated with 100% vitamin D deficiency[29]. This discrepancy may be explained by differences in sample size, study setting, and participant characteristics. The Addis Ababa study included only 62 selected symptomatic patients, which may have overestimated the magnitude due to small sample size and possible selection bias. In contrast, the present study included 415 participants from multiple public and private hospitals, which may provide a more representative estimate. Furthermore, differences in altitude, urban lifestyle patterns, sun exposure behavior, and laboratory methods used for serum 25(OH)D measurement could also contribute to the variation. Addis Ababa is a highly urbanized city where indoor lifestyle and limited sun exposure may be more common compared to Bahir Dar [29].

The prevalence recorded in this research is much less than numerous international studies that have been carried out among patients suffering from musculoskeletal pain. For example, various studies performed in Iran (95.4%), Turkey (73.9%), UAE (71.5%), India (80–83%), and the United States (93%) have demonstrated significantly higher prevalence of vitamin D deficiency among adults with non-specific musculoskeletal pain. This variation may be explained by

differences in study design, population characteristics, environmental exposure, and healthcare context. Many of the cited international studies included patients who were referred specifically for severe or chronic musculoskeletal symptoms, which may have increased the likelihood of detecting vitamin D deficiency. In contrast, the present study included a broader outpatient population with varying levels of symptom severity, potentially resulting in a lower observed prevalence. Cultural clothing practices and sun-avoidance behaviors are more pronounced in Middle Eastern countries such as Iran and the UAE, where conservative dressing styles substantially limit skin exposure to ultraviolet B radiation despite abundant sunshine. In the current study, although sunscreen and umbrella use were reported, the overall total body surface area exposed to sunlight was relatively moderate among participants, which may have contributed to comparatively lower deficiency rates. Additionally, dietary patterns and national fortification policies vary across countries. While some Western nations have implemented vitamin D fortification programs, lifestyle factors such as indoor occupations and sedentary behavior may still reduce effective sun exposure. Geographic and climatic differences, including seasonal timing of data collection, may also influence serum 25(OH)D concentrations. Furthermore, variations in laboratory measurement techniques and cut-off values used to define vitamin D deficiency across studies may contribute to discrepancies in reported prevalence [26-28,[31, 54, 55]. However, the prevalence in this study remains high and is consistent with evidence showing that vitamin D insufficiency and deficiency are common even in regions with abundant sunshine.

In this study, participants aged 60 years and above (being older adult) had nearly two times higher odds of vitamin D deficiency compared with those less than 40 years old (AOR = 1.96 ; 95% CI: 1.02-3.76). This finding is consistent with studies in Norway and other countery showing that increasing age is a risk factor for vitamin D deficiency due to reduced skin synthesis capacity and limited sun exposure [6, 64, 65]. The decline in the concentration of 7-dehydrocholesterol in the skin with advancing age reduces the ability to synthesize vitamin D, making older adults particularly vulnerable. However, some studies, such as those conducted in the UAE, reported higher deficiency among younger adults [57]. These differences may be related to context-specific lifestyle factors, including indoor living and occupational patterns. In

the current study setting, older adults may have less outdoor activity and higher burden of chronic illness, contributing to low vitamin D levels.

Concerning the period of sun exposure, this study shows that individuals who were predominantly exposed to the sun during the morning hours had more than twice higher odds of vitamin D deficiency than those who were exposed at midday (AOR = 2.47; 95% CI: 1.35-4.52). This result is in line with the studies conducted in European counters , which concluded that the sun exposure in the middle of the day is the best for the synthesis of vitamin D[66, 71]. It can be explained by the differences in the daily outdoor activities and the intensity of the sun that were reported in the previous studies. And also the study conducted in America and India shows that evening exposure to sunlight is risk for vitamin D deficiency [60, 74].

Overnurished individuals were more than twice as likely to be deficient in vitamin D compared to those with normal body mass index (AOR = 2.28; 95% CI: 1.25-4.18). In US overweight obese adults showed 3·09 times higher prevalence of VDD and 1·80 times higher prevalence of VDI than non-obese adults [31]. The same pattern was found in the study done in Ethiopia , with a BMI ≥25 had a risk of being vitamin D deficient [63], which were referred to in the review, thereby implying that the increased body fat could be the reason for the decreased bio-availability of vitamin D. Similarly, research in other clinical populations has demonstrated that individuals with excess body weight often show lower circulating vitamin D concentrations, which is biologically explained by sequestration of vitamin D in adipose tissue, reducing its availability in the circulation[53].

Additionally those participants who suffered from medical commodities were, moreover, more likely to be vitamin D deficient than the ones without any comorbidity (AOR = 2.23; 95% CI: 1.14-4.38). A similar pattern exists in the reported findings of studies conducted in the Middle East and Asia, where chronic diseases such as diabetes, cardiovascular disorders, Anemia and renal disease have been linked to vitamin D deficiencies[48, 58]. Some of the reasons suggested are limited mobility, longer stays indoors, chronic inflammation, and different vitamin D metabolism due to disease processes or medication for a long time[48, 58].

7. Strengths and limitations

This study has several important strengths. It included a relatively large sample size (415 participants), which increases the statistical power and precision of the estimates. The study was conducted across multiple public and private hospitals in Bahir Dar, improving the representativeness of adults presenting with non-specific musculoskeletal pain in the study area. Moreover, the study involved the use of serum vitamin D measurements confirmed by the laboratory, which enhances the accuracy of the results.

However, there are some limitations. Some information, such as dietary intake and socioeconomic data, relied on self-report, which may introduce recall or reporting bias. On the other hand, the study was a facility-based one and concentrated on patients with symptoms, hence its results might not be applicable to the general population. However, the findings are still very important for clinical settings, where patients with musculoskeletal complaints are a common occurrence**.**

8. CONCLUSION

Based on international public health classification, vitamin D deficiency among adults presenting with non-specific musculoskeletal pain and fatigue in Bahir Dar hospitals was high and represents a public health concern in this population. Based on the finding, vitamin D deficiency shows the highest odd of individuals those who had age of 60 years old and above, morning sun exposure, being overnurished and individuals who had comorbid medical condition. These findings highlight the need for increased clinical attention to vitamin D status among adults presenting with non-specific musculoskeletal pain and fatigue. Routine screening, targeted health

education on effective sun exposure, and nutritional counseling should be considered, particularly for high-risk groups identified in this study

9. RECOMMENDATIONS

Based on the findings of this study, several practical measures are recommended to address the vitamin d deficiency among adults. Routine assessment of vitamin D status should be considered for patients attending outpatient departments with musculoskeletal complaints, particularly for those aged 60 years and above, individuals with comorbid medical conditions, and patients who are overweight or obese, as these groups were identified as having significantly higher odds of vitamin D deficiency.

Health professionals should provide focused counseling on effective sun exposure practices. In particular, patients should be advised to obtain adequate sun exposure during midday hours rather than relying solely on morning exposure, as ineffective timing of sun exposure was independently associated with vitamin D deficiency in this study. Such counseling should be incorporated into routine patient education provided at hospital outpatient departments.

In addition, management of adults with musculoskeletal pain should include attention to body weight and coexisting medical conditions. Counseling on healthy weight maintenance and appropriate follow-up of patients with chronic illnesses may contribute to improved vitamin D status and overall musculoskeletal health.

And also additional community-based and longitudinal research is essential to clarify the extent of vitamin D deficiency in the general population and long-term health outcomes as well as effective intervention strategies to be explored.

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11. APPENDICES

11.1 Information Sheet

My name is Mikiyas Girmaw; Currently I am a graduate student at Bahir dar University, College of Medicine & Health Sciences, Department of nutrition and dietetics. Now I am interesting to conduct a study on the title: The prevalence and associated factors of Vitamin D deficiency among adults presenting with non-specific musculoskeletal pain and fatigue in public and private hospitals in Bahir Dar city, Northwest Ethiopia, in 2025.

Research Project: - vitamin D status among adults presenting with non-specific musculos5eletal pain and fatigue in Bahir Dar city, Ethiopia.

Name of Principal Investigator: Mikiyas Girmaw Aniteneh

The investigator is (Mph nutrition) student from Bahir Dar University

Purpose: To assess vitamin D deficiency among adults presenting with non-specific musculoskeletal pain and fatigue in hospitals, Bahir Dar, Ethiopia.

Procedures: you are kindly invited to take part in our research because we believe you can provide the necessary information for the research. Participation in the study is on voluntary basis. If you are willing to participate in our research, you need to understand and sign the consent form. Then, you will be asked to give your response by the data collectors. All the responses given by the participants and the results obtained will be kept anonymous and confidential. No one outside the research team will have access to your responses.

By participating in this study, you may feel that it has some discomfort especially on wasting your time (about 10－ 20minutes) but if someone compares its Potential benefits it contributes to this study, giving this minute to fill the questioner means nothing. So, you can be sure that there is no risk in participating in this research project. If you participate in this study, you may not get direct benefit, but your participation is likely to help me in assessing vitamin D deficiency among adults presenting with non-specific musculoskeletal pain and fatigue in Bahir Dar city, Ethiopia.

The information that we will collect from this research project will be kept confidential. Information about you that will be collected from the study will be stored in a file, which will not have your name on it, and it will not be revealed to anyone except the principal investigator.

You have the full right to refuse to participate in this research (you can choose not to respond to some or all of the questions) if you do not wish to participate; and this will not affect you. You have also the full right to withdraw from this study at any time.

People to contact for further information: If you have any questions, you can contact the principal investigator in the following address:

Name: Mikiyas Girmawu Aniteneh

Tel: +251900186032

Email: mikiyasgirmawu@gmail.com

Contact information for complaint: If you have any concern that the research team is conducting their activities unethically or inappropriately, please contact Bahir Dar University with the following address:

Tel:

Email:

If you agree to participate in this study, I appreciate your truthfulness. And after having this consent form, please put a sign below to show if you are willing to participate (No need to write your name).

Are you willing to participate in this study?

Yes []

No []

11.2 CONSENT FORM

You are invited to participate in a research study that aims to assess the magnitude and associated factors of vitamin D deficiency among adults presenting with non-specific musculoskeletal pain in medical outpatient department at selected hospitals in Bahir Dar. If you agree to participate, you will be asked to answer a questionnaire regarding your VDD status, and dietary intake. Your weight and height will also be measured for BMI calculation. This process will take approximately 15–**30 minutes**. There are no significant risks involved, and while you may not receive a direct benefit, your participation will help improve the identification and management of VDD in future patients. All information collected will remain confidential, coded, and used only for research purposes. No identifying details will be shared in any reports or publications.

Participation is entirely voluntary, and you have the right to refuse or withdraw at any time without consequences for your medical care. By signing below, you confirm that you have read and understood the study details and voluntarily agree to participate.

Signature: _____
Date: //____

Interviewer's Name: _____
Signature: _____

11.3 Questionnaires

Section 1: Socio-demographic and Economic Information

Code	Variable	Questions	Response Options	Remarks
1	Age	How old are you?	___ years	
2	Sex	What is your sex?	1=Male 2=Female	
3	Educational Level	What is your highest level of education?	1=Unable to read/write 2=Able to read/write (no formal) 3=Primary incomplete 4=Primary completed 5=Secondary completed 6=University/college completed	
4	Religion	What is your religion?	1=Orthodox Christian 2=Muslim	

			3=Protestant 4=Catholic 5=Traditional/Other (specify)	
5	Residence	Where is your residence?	1=Urban 2=Rural	
6	Employment Status	What is your current employment status?	1=Unemployed 2=Farmer 3=Trader/Business 4=Government employee 5=non-government employee 6=Student 7=Housewife 8= retired 9=Other	
7	Marital Status	What is your marital status?	1=Single 2=Married 3=Divorced/Separated 4=Widowed	

Wealth Index for urban

Code No-	Wealth index variables in the family	Options	See EDHS 2016 tool
8	Do you have an electric supply?	1. Yes 2. No	
9	Do you have a smartphone?	1. Yes 2. No	
10	Do you have a television?	1. Yes 2. No	
11	Do you have a refrigerator?	1. Yes 2. No	
12	Do you have an electric pan?	1. Yes	

		2. No	
13	Do you have a table?	1. Yes 2. No	
14	Do you have a sofa?	1. Yes 2. No	
15	Do you have a separate bedroom?	1. Yes 2. No	
16	Do you have a car?	1. Yes 2. No	
17	Do you have a bicycle?	1. Yes 2. No	
18	Do you have a motorbike?	1. Yes 2. No	
19	Do you have gari?	1. Yes 2. No	
20	Where do you get drinking water?	1. Piped water 2. Groundwater 3. Spring water 4. Both piped and ground water	
21	Do you have a toilet?	1. Yes 2. No	
22	If yes to Q 14 What type of toilet do you have the most?	1. Ventilated pit latrine 2. Traditional pit latrine	
23	What is the source of energy that you usually use for cooking?	1. Electric 2. Wood/charcoal	

		3. Both	
24	What is the floor of the house made of?	1. Mud 2. Cement 3. Ceramic 4. Other Specify-----	
25	What is the wall of your house made of?	1. Mud 2. Cement 3. block 4. Other specify----------	
26	What is the roof of your house made of?	1. Iron 2. Plastic 3.grass 4.Other specify_____	
27	Do you have a laundry machine?	1. Yes 2. No	
28	Do you have a computer?	1. Yes 2. No	

Wealth Index for rural

	Question (Yes/No)	**Response Options**
29	Does your household have electricity?	1. Yes 2. No
30	Does your household own a radio?	1. Yes 2. No

	Question (Yes/No)	Response Options
31	Does your household own a television?	1. Yes 2. No
32	Does your household own a refrigerator?	1. Yes 2. No
33	Does your household have an electric cooking device (e.g., electric mitad)?	1. Yes 2. No
34	Does your household own a table?	1. Yes352. No
35	Does your household own chairs?	1. Yes 2. No
36	Does your household have a bed with a mattress?	1. Yes 2. No
37	Does any household member have a bank account?	1. Yes 2. No
38	Does your household have a telephone or mobile phone?	1. Yes 2. No
39	Does your household own livestock (e.g., cattle, goats)?	1. Yes 2. No
40	Does your household own agricultural land?	1. Yes 2. No
41	Does your household have a bicycle?	1. Yes

	Question (Yes/No)	Response Options
		2. No
42	Does your household own a motorcycle or car?	1. Yes 2. No
43	Is the main source of drinking water from an improved source (e.g., piped, protected well)?	1. Yes 2. No
44	Does your household have an improved toilet facility?	1. Yes 2. No
45	Is the main floor material made of finished materials (not earth/sand)?	1. Yes 2. No
46	Are the exterior walls made of durable materials (mud)?	1. Yes 2. No
47	Is the roof made of metal/corrugated iron?	1. Yes 2. No
48	Does your household use a cooking fuel source other than wood (e.g., charcoal, gas)?	1. Yes 2. No

Section 2: Dietary & Nutritional Factors

Dietary Intake of calcium and Vitamin D Rich Foods

Code	Questions	Response Options	Remarks
49	How often do you consume fish?	1. Daily 2. Weekly	

		3. Monthly 4. Rarely 5. Never	
50	How often do you consume fish oil?	1. Daily 2. Weekly 3. Monthly 4. Rarely 5. Never	
51	How often do you consume eggs?	1. Daily 2. Weekly 3. Monthly 4. Rarely 5. Never	
52	How often do you consume liver?	1. Daily 2. Weekly 3. Monthly 4. Rarly 5. Never	
53	How often do you consume mushroom?	1. Daily 2. Weekly 3. Monthly 4. Rarely 5. Never	
54	How often do you consume fortified milk and milk product with vitamin D?	1. Daily 2. Weekly 3. Monthly 4. Rarely	

		5. Never	
55	How often do you consume fortified cereals with vitamin D?	1. Daily 2. Weekly 3. Monthly 4. Rarely 5. Never	
56	Do you consume other fortified foods with vitamin D?	1. Daily 2. Weekly 3. Monthly 4. Rarely 5. Neve	

Dietary diversity

57. Please describe the foods (meals and snacks) that you ate or drank yesterday during the day and night, whether at home or outside the home?

Breakfast	Snack	Lunch	Snack	Dinner	Snack

Code	Questions	Response Options	Remarks
58	Cereal consumed?	1=Yes 0=No	
59	Vitamin A-rich vegetables/tubers consumed?	1=Yes 0=No	
60	White tubers/roots	1=Yes	

	consumed?	0=No	
61	Dark green leafy vegetables consumed?	1=Yes 0=No	
62	Other vegetables consumed?	1=Yes 0=No	
63	Vitamin A-rich fruits consumed?	1=Yes 0=No	
64	Other fruits consumed?	1=Yes 0=No	
65	Organ meat consumed?	1=Yes 0=No	
66	Flesh meats consumed?	1=Yes 0=No	
67	Eggs consumed?	1=Yes 0=No	
68	Fish consumed?	1=Yes 0=No	
69	Legumes/nuts/seeds consumed?	1=Yes 0=No	
70	Milk/milk products consumed?	1=Yes 0=No	
71	Oils/fats consumed?	1=Yes 0=No	
72	Red palm products consumed?	1=Yes 0=No	
73	Sweets consumed?	1=Yes 0=No	
74	Spices/condiments/beverages consumed?	1=Yes 0=No	

Section 3: Sunlight Exposure questionnaire

Code	Questions	Response Options	Remarks
74	On average, how many hours do you spend outdoors in direct sunlight per day?"	1. Less than 30 minutes 2. 30 minutes to 1 hour 3. More than 1 hours	

75	Do you use sunscreen lotion when exposed to sunlight?	1. Yes 2. No	
76	If the above answere is yes how often do you use umbrella?	1. Always 2. Sometimes 3. Rarely	
77	Do you use an umbrella to shield yourself from sunlight?	1. Yes 2. No	
78	If the above answere is yes how often do you use umbrella?	1. always 2. Sometimes 3. Rarely	
79	At what time of day do you usually spend time in direct sunlight?	1. Morning (6 AM – 10 AM) 2. Midday (10 AM – 2 PM) 3. Afternoon (2 PM – 5 PM) 4. Evening (after 5 PM)	
80	When you are outdoors, how much of your body is usually exposed to sunlight?"	1. Face only. 2.Hands and face only 3.Arms, hand and face 4.Most of the body exposed (arm face leg)	

Section 4: questionary towards Lifestyle Factors

Physical activity level questionnaire

Code No_	**Question**	**Response**	
81	Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like *[carrying or lifting heavy loads, digging or construction work*] for at least 10 minutes continuously?	Yes	1
		No	2 *If No, go to* Q73
82	In a typical week, on how many days do you do vigorous-intensity activities as part of your work?	Number of days	⌊__⌋
83	How much time do you spend doing vigorous-intensity activities at work on a typical day?	Hours: minutes	hrs. mins
84	Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking *[or carrying light loads*] for at least 10 minutes continuously?	Yes	1
		No	2 *If No, go to* Q76
85	In a typical week, on how many days do you do moderate-intensity activities as part of your work?	Number of days	
86	How much time do you spend doing moderate-intensity activities at work on a typical day?	Hours: minutes	hrs. mins
87	Do you walk or use a bicycle (*pedal cycle*) for at least 10 minutes continuously to get to and from places?	Yes	1
		No	2 *If No, go to* Q79
88	In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?	Number of days	
89	How much time do you spend walking or bicycling	Hours:	hrs.

	for travel on a typical day?	minutes	mins
90	Do you do any vigorous-intensity sports, fitness or recreational (*leisure*) activities that cause large increases in breathing or heart rate like [*running or football,]* for at least 10 minutes continuously?	Yes	1
		No	2 *If No, go to* Q82
91	In a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational (*leisure*) activities?	Number of days	
92	How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?	Hours: minutes	Hrs. mins
93	Do you do any moderate-intensity sports, fitness or recreational *(leisure*) activities that causes a small increase in breathing or heart rate such as brisk walking, (*cycling, swimming, volleyball*) for at least 10 minutes continuously?	Yes	1
		No	2 *If No, go to* Q85
94	In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational (*leisure*) activities?	Number of days	
95	How much time do you spend doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day?	Hours: minutes	Hrs. mins
96	How much time do you usually spend sitting or reclining on a typical day?	Hours: minutes	hrs. min s

Alcohol consumption questionnaire

Code	Questions	Response Options	Remarks
97	How often do you have a drink containing alcohol such as beer, Wine, Tej, Tella, Areki?	0=Never. 1=Monthly or less; 2=2–4 times/month; 3=2–3 times/week; 4=4 or more times/week **Skip all if this**	

		answer is never	
98	How many alcohol containing drinks do you have on a typical day when drinking?	0=1–2. 1=3–4. 2=5–6. 3=7–9. 4=10 or more	
99	How often do you have six or more drinks on one occasion?	0=Never. 1=Less than monthly; 2=Monthly; 3=Weekly; 4=Daily/almost daily	
100	How often in the last year have you been unable to stop drinking once you started?	0=Never. 1=Less than monthly; 2=Monthly; 3=Weekly; 4=Daily/almost daily	
101	How often in the last year have you failed to do what was normally expected because of drinking?	0=Never. 1=Less than monthly; 2=Monthly; 3=Weekly; 4=Daily/almost daily	
102	How often in the last year have you needed a first drink in the morning after a heavy session?	0=Never. 1=Less than monthly; 2=Monthly; 3=Weekly; 4=Daily/almost daily	
103	How often in the last year have you felt guilt or remorse after drinking?	0=Never. 1=Less than monthly; 2=Monthly; 3=Weekly; 4=Daily/almost daily	
104	How often in the last year have you been unable to remember what happened the night before due to drinking?	0=Never. 1=Less than monthly; 2=Monthly; 3=Weekly; 4=Daily/almost daily	
105	Have you or someone else been injured as a result of your drinking?	0=No. 2=Yes, but not in the last	

		year. 4=Yes, during the last year	
106	Has a relative/friend/doctor/health worker been concerned about your drinking or suggested you cut down?	0=No. 2=Yes, but not in the last year. 4=Yes, during the last year	

Smoking questionnaires

Code	Questions	Response Options	Remarks
107	Do you currently smoke any tobacco products, such as cigarettes, cigars, or pipes?	1 = Yes 2 = No	If "No" → Skip to Q101
108	Do you currently smoke tobacco on a daily basis, less than daily, or not at all?	1 = Daily 2 = Less than daily 3 = Not at all	—
`109	On average, how many manufactured cigarettes do you smoke per day? (If less than daily, ask: On days you smoke, how many do you usually smoke?)	Numeric (0–99)	—
110	How old were you when you first started smoking tobacco regularly (daily)?	1=Numeric (years) 2 = Don't know	—
111	Have you tried to stop smoking completely during the past 12 months?	1 = Yes 2 = No	—
112	Have you ever smoked tobacco (even if you do not smoke now)?	1 = Yes 2 = No	If "No" → Skip to end of smoking section
113	How long has it been since you stopped smoking regularly?	Record years / months / weeks	—
114	Do you currently use any smokeless tobacco products (e.g., chewing tobacco,	1 = Yes	—

	snuff, betel)? *(Optional)*	2 = No	
115	In the past 30 days, how many days did you smoke any tobacco product? *(Optional)*	Numeric (0–30)	—

Section 5: their experienced Symptoms questionnaire

code	Questions	Response Options	Remark
116	Do you experienced muscle or joint pain?	1. Yes 2. no	
117	Do you experienced Generalized fatigue?	1. Yes 2. no	
118	Do you experienced Bone pain or weakness?	1. yes 2. no	
119	Do you experienced Paresthesia (tingling)?	1. Yes 2. no	

Section 6: Biological and Health Factors questionnaires

code	Questions	Response Options	Remark
120	Are you currently on any of the following medications?	1. No 2. Yes	if yes please specify:_____
121	Do you have any known chronic diseases (kidney, liver, thyroid, etc.)?	1. Yes 2. no	if yes please specify:_____
122	Have you been diagnosed with VDD before?	1. Yes 2. no	

Section 7: Body Composition and Skin Type

code	Questions	Response Options	Remark
123	Height (cm)		_____
124	Weight (kg)		_____
125	Type of Skin Color	1. Type IV (Light brown) 2. Type V (Dark brown) 3. Type VI (Very dark brown	

Section 8: Laboratory Investigation

code	Questions	Response Options	Remark
126	Serum Vitamin D level (25(OH)D)		_____ng/ml

12. አባሪዎች

12.1 የመረጃ ወረቀት

ሚኪያስ ግርማው እባላለሁ በአሁኑ ሰአት በባህር ዳር ዩኒቨርሲቲ የመድሀኒት እና ጤና ሳይንስ ኮሌጅ የስነ ምግብ እና አመጋገብ ትምህርት ክፍል ተመራቂ ተማሪ ነኝ። አሁን በርዕሱ ላይ ጥናት በማካሄድ ላይ ነኝ፡ በ2025 በባህር ዳር ከተማ ሰሜን ምዕራብ ኢትዮጵያ ውስጥ በመንግስት እና በግል ሆስፒታሎች ላይ ልዩ ያልሆነ የጡንቻ ህመም እና ድካም የሚያሳዩ አዋቂዎች የቫይታሚን ዲ እጥረት ስርጭት እና ተያያዥ ምክንያቶች።

የምርምር ፕሮጀክት፡ - በባህር ዳር ከተማ ምክንያታቸው ያልታወቁ የጡንቻ ሕመም እና ድካም በሚታይባቸው ጎልማሶች ላይ የቫይታሚን ዲ ደረጃን ማወቅ።

የዋና መርማሪ ስም፡ ሚኪያስ ግርማው አንተነህ

መርማሪው የባህር ዳር ዩኒቨርሲቲ (Mph nutrition) ተማሪ ነው።

ዓላማበባህር ዳር ከተማ በሆስፒታሎች ልዩ ያልሆነ የጡንቻ ህመም እና ድካም የሚያሳዩ አዋቂዎች የቫይታሚን ዲ እጥረትን ለመገምገም።

ሂደቶች: ለምርምሩ አስፈላጊውን መረጃ መስጠት ትችላላችሁ ብለን ስለምናምን በጥናታችን እንድትሳተፉ በአክብሮት ተጋብዘዋል። በጥናቱ ውስጥ መሳተፍ በፈቃደኝነት ላይ የተመሰረተ ነው. በጥናታችን ውስጥ ለመሳተፍ ፍቃደኛ ከሆኑ፣

የፈቃድ ቅጹን መረዳት እና መፈረም አለብዎት። ከዚያ፣ ምላሽዎን በመረጃ ሰብሳቢዎች እንዲሰጡ ይጠየቃሉ። በተሳታፊዎች የተሰጡ ሁሉም ምላሾች እና የተገኙ ውጤቶች በማይታወቁ እና በሚስጥር ይያዛሉ. ማንም ከምርምር ቡድን ውጭ የእርስዎን ምላሾች ማግኘት አይችልም።

በዚህ ጥናት ውስጥ በመሳተፍ በተለይም ጊዜዎን በማባከን (10 - 20 ደቂቃ አካባቢ) አንዳንድ ምቾት እንደሚሰማዎት ሊሰማዎት ይችላል ነገር ግን አንድ ሰው ሊገኙ የሚችሉትን ጥቅሞቹን ካነጻጸረ ለዚህ ጥናት አስተዋፅዖ ያደርጋል፣ ጠያቂውን ለመሙላት ይህን ደቂቃ መስጠት ምንም ማለት አይደለም። ስለዚህ, በዚህ የምርምር ፕሮጀክት ውስጥ ለመሳተፍ ምንም አይነት አደጋ እንደሌለ እርግጠኛ መሆን ይችላሉ. በዚህ ጥናት ላይ ከተሳተፉ ቀጥተኛ ጥቅማጥቅሞችን ላያገኙ ይችላሉ ነገር ግን የእርስዎ ተሳትፎ በባህር ዳር ከተማ ኢትዮጵያ ልዩ ባልሆነ የጡንቻ ህመም እና ድካም ውስጥ ባሉ አዋቂዎች ላይ የቫይታሚን ዲ እጥረትን ለመገምገም ሊረዳኝ ይችላል ።

ከዚህ የምርምር ፕሮጀክት የምንሰበስበው መረጃ በሚስጥር ይጠበቃል። ከጥናቱ የሚሰበሰብ ስለእርስዎ መረጃ በፋይል ውስጥ ይከማቻል, ስምዎ በእሱ ላይ አይኖረውም, እና ከዋናው መርማሪ በስተቀር ለማንም አይገለጽም.

በዚህ ጥናት ውስጥ ለመሳተፍ ፈቃደኛ አለመሆን ሙሉ መብት አልዎት (ለአንዳንዶቹ ወይም ለሁሉም ጥያቄዎች ምላሽ ላለመስጠት መምረጥ ይችላሉ) መሳተፍ ካልፈለጉ; እና ይህ እርስዎን አይነካዎትም. እንዲሁም በማንኛውም ጊዜ ከዚህ ጥናት የመውጣት ሙሉ መብት አልዎት።

ለበለጠ መረጃ የሚያገኟቸው ሰዎች፡ ማንኛውም አይነት ጥያቄ ካለዎት ዋናውን መርማሪ በሚከተለው አድራሻ ማነጋገር ይችላሉ።

ስም፡ ሚኪያስ ግርማው አንተነህ

ስልክ፡ +251900186032

ኢሜል፡ mikiyasgirmawu@gmail.com

ለቅሬታ መረጃ፡- የጥናት ቡድኑ ስራውን በሥነ ምግባር የጎደለው ወይም አግባብነት በጎደለው መንገድ እያከናወነ ነው የሚል ስጋት ካሎት ባህር ዳር ዩኒቨርሲቲን በሚከተለው አድራሻ ያግኙ።

ስልክ፡-

ኢሜይል፡-

በዚህ ጥናት ላይ ለመሳተፍ ከተስማሙ፣ እውነትነትዎን አደንቃለሁ። እና ይህን የስምምነት ቅጽ ከያዙ በኋላ፣ ለመሳተፍ ፈቃደኛ መሆንዎን ለማሳየት እባክዎ ከዚህ በታች ምልክት ያድርጉ (ስምዎን መጻፍ አያስፈልግም)።

በዚህ ጥናት ለመሳተፍ ፈቃደኛ ነህ?

አዎ []

አይ []

12.2 የፍቃድ ቅጽ

በባህር ዳር ከተማ በተመረጡ ሆስፒታሎች የተመላላሽ ታካሚ ኦፒዲ ላይ ልዩ ያልሆነ የጡንቻ ሕመም ያለባቸው ጎልማሶች የቫይታሚን ዲ እጥረት ምን ያህል እና ተያያዥ ምክንያቶችን ለመገምገም ያለመ የምርምር ጥናት እንዲሳተፉ ተጋብዘዋል። ለመሳተፍ ከተስማሙ፣ የእርስዎን የቪዲዲ ሁኔታ እና የአመጋገብ አወሳሰድን በተመለከተ መጠይቁን እንዲመልሱ ይጠየቃሉ። ክብደትዎ እና ቁመትዎ ለBMI ስሌት ይለካሉ። ይህ ሂደት በግምት 15 ይወስዳል- **30 ደቂቃዎች**. ምንም ጉልህ አደጋዎች የሉም፣ እና ቀጥተኛ ጥቅማጥቅሞችን ላያገኙ ይችላሉ፣ የእርስዎ ተሳትፎ ለወደፊት ታካሚዎች የቪዲዲ መለየት እና አያያዝን ለማሻሻል ይረዳል። ሁሉም የተሰበሰበው መረጃ ሚስጥራዊ፣ ኮድ የተደረገ እና ለምርምር ዓላማዎች ብቻ ጥቅም ላይ የሚውል ይሆናል። በማናቸውም ሪፖርቶች ወይም ህትመቶች ውስጥ ምንም መለያ ዝርዝሮች አይጋሩም።

ተሳትፎው ሙሉ በሙሉ በፈቃደኝነት ነው፣ እና በማንኛውም ጊዜ ለህክምና እንክብካቤዎ መዘዝ ሳይኖር እምቢ ማለት ወይም የማቋረጥ መብት አለዎት። ከታች በመፈረም የጥናት ዝርዝሮችን እንዳነበቡ እና እንደተረዱ እና ለመሳተፍ በፈቃደኝነት መስማማትዎን ያረጋግጣሉ።

ፊርማ፡ _____
ቀን፡- //_____

የጠያቂው ስም፡- _____
ፊርማ፡ _____

12.3 መጠይቆች

ክፍል 1: ማህበረ-ሕዝብ እና ኢኮኖሚያዊ መረጃ

ኮድ	ተለዋዋጭ	ጥያቄዎች	የምላሽ አማራጮች	አስተያየቶች
1	ዕድሜ	ስንት አመት ነው፤	__ ዓመታት	
2	ጾታ	የእርስዎ ጾታ ምንድን ነው?	1= ወንድ 2=ሴት	
3	የትምህርት ደረጃ	ከፍተኛ የትምህርት ደረጃዎ የቱ ነው?	1= ማንበብ/መፃፍ የማይችል 2= ማንበብ/መፃፍ የሚችል (መደበኛ ያልሆነ) 3=የመጀመሪያ ደረጃ ያላጠናቀቀ 4=የመጀመሪያ ደረጃ ያጠናቀቀ 5=ሁለተኛ ደረጃ ያጠናቀቀ 6=ዩንቨርስቲ/ኮሌጅ የጨረሰ።	
4	ሃይማኖት	ሃይማኖትህ ምንድን ነው?	1=አርቶዶክስ ክርስቲያን 2=ሙስሊም 3=ፕሮቴስታንት 4=ካቶሊክ 5=ባህላዊ/ሌላ (ይጥቀሱ)	
5	መኖሪያ	መኖሪያህ የት ነው?	1= የከተማ 2=ገጠር	
6	የቅጥር ሁኔታ	አሁን ያለህበት የስራ ሁኔታ ምንድን ነው?	1=ስራ አጥ 2=ገበሬ 3=ነጋዴ/ንግድ 4=የመንግስት ሰራተኛ 5=መንግስታዊ ያልሆነ ሰራተኛ 6=ተማሪ 7=የቤት እመቤት 8=ሌላ	
7	የጋብቻ ሁኔታ	የጋብቻ ሁኔታዎ ምንድን ነው?	1= ያላገባ 2=ያገባ 3=የተፋታ/የተለያየ 4=ባል የሞተባት/ሚስት የሞተችበት	

የሀብት መረጃ ጠቋሚ

ኮድ ቁጥር-	በቤተሰብ ውስጥ የሃብት መረጃ መጠይቆች	አማራጮች	የ EDHS 2016 መሣሪያን ይመልከቱ
8	የኤሌክትሪክ አቅርቦት አለህ?	1. አዎ 2. አይ	
9	ስማርትፎን አለህ?	1. አዎ 2. አይ	
10	ቴሌቪዥን አለህ?	1. አዎ 2. አይ	
11	ማቀዝቀዣ(ፍሪጅ) አለህ?	1. አዎ 2. አይ	
12	የኤሌክትሪክ መጥበሻ አለህ?	1. አዎ 2. አይ	
13	ጠረጴዛ አለህ?	1. አዎ 2. አይ	
14	ሶፋ አለህ?	1. አዎ 2. አይ	
15	የተለየ መኝታ ክፍል አለህ?	1. አዎ 2. አይ	
16	መኪና አለህ?	1. አዎ 2. አይ	
17	ብስክሌት አለህ?	1. አዎ 2. አይ	
18	ሞተር ሳይክል አለህ?	1. አዎ 2. አይ	

19	ጋሪ አለህ?	1. አዎ 2. አይ	
20	የመጠጥ ውሃ ከየት ታገኛለህ?	1. የቧንቧ ውሃ 2. የከርሰ ምድር ውሃ 3. የምንጭ ውሃ 4. ሁለቱም የቧንቧ እና የከርሰ ምድር ውሃ	
21	ሽንት ቤት አለህ?	1. አዎ 2. አይ	
22	ለ ጥያቄ ቁጥር 21 መልሶ አዎ ከሆነ የምትጠቀሙት መጸዳጃ ቤት ምን አይነት ነው?	1. የአየር ማስገቢያ ያለዉ የጉድጓድ መጸዳጃ ቤት 2. ባህላዊ ጉድጓድ መጸዳጃ ቤት	
23	ብዙውን ጊዜ ምግብ ለማብሰል የሚጠቀሙበት የኃይል ምንጭ ምንድነው?	1. ኤሌክትሪክ 2. እንጨት / ከሰል 3. ሁለቱም	
24	የቤትዎ ወለል ከምን የተሠራ ነው?	1. ጭቃ 2. ሲሚንቶ 3. ሴራሚክ 4. ሌላ ይግለጹ-----	
25	የቤትዎ ግድግዳ ከምን ነው የተሰራው?	1. ጭቃ 2. ሲሚንቶ 3. ብሎኬት 4. ሌላ ይግለጹ --------	
26	የቤትዎ ጣሪያ ከምን የተሠራ ነው?	1. ብረት 2. ፕላስቲክ 3. ሌላ ይግለጹ_____	
27	የልብስ ማጠቢያ ማሽን አለህ?	1. አዎ 2. አይ	
28	ኮምፒውተር አለህ?	1. አዎ	

		2. አይ	

ቁጥር	ጥያቄ (አዎንታዊ/አይደለም)	መልስ አማራጮች
29	ቤትዎ ኤሌክትሪክ አለው?	1. አዎ 2. አይደለም
30	ቤትዎ ራዲዮ አለው?	1. አዎ 2. አይደለም
31	ቤትዎ ቲቪ አለው?	1. አዎ 2. አይደለም
32	ቤትዎ ሪፍሪጀሬተር አለው?	1. አዎ 2. አይደለም
33	ቤተሰብዎ የኤሌክትሪክ ማብሰያ መሳሪያ አለው (ለምሳሌ የኤሌክትሪክ ሚታድ)?	1. አዎ 2. አይደለም
34	ቤትዎ ጠረጴዛ አለ?	1. አዎ 2. አይደለም
35	ቤተሰብዎ የራሱ ወንበሮች አሉት?	1. አዎ 2. አይደለም
36	ቤተሰብዎ ፍራሽ ያለው አልጋ አለው?	1. አዎ 2. አይደለም
37	ቤት አባል ባንክ መለያ አለው?	1. አዎ 2. አይደለም
38	ቤትዎ ስልክ (ተንቀሳቃሽ ወይም ቋሚ) አለ?	1. አዎ 2. አይደለም

ቁጥር	ጥያቄ (አዎንታዊ/አይደለም)	መልስ አማራጮች
39	ቤትዎ እንስሳት (በግ/ፈረስ/ላም etc.) አለ?	አዎ / አይደለም
40	ቤትዎ እርሻ መሬት አለው?	1. አዎ 2. አይደለም
41	ቤትዎ ብስክሌት አለ?	1. አዎ 2. አይደለም
42	ቤትዎ ሞተር/መኪና አለ?	1. አዎ 2. አይደለም
43	ዋናው የመጠጥ ውሃ ምንጭ ከተሻሻለ ምንጭ (ለምሳሌ፣ ከቧንቧ የተገጠመለት፣ የተጠበቀ ጉድጓድ) ነው?	1. አዎ 2. አይደለም
44	ቤተሰብዎ የተሻሻለ የመጸዳጃ ቤት አለው?	1. አዎ 2. አይደለም
45	ዋናው የወለል ቁሳቁስ ከተጠናቀቁ ቁሳቁሶች የተሠራ ነው (ከምድር/አሸዋ አይደለም)	1. አዎ 2. አይደለም
46	የውጪው ግድግዳ ከጠንካራ ቁሳቁሶች (ጭቃ) የተሰራ ነው?	1. አዎ 2. አይደለም
47	ጣሪያው ከብረት/ከቆርቆሮ የተሰራ ነው?	1. አዎ 2. አይደለም
48	ቤተሰብዎ ከእንጨት ውጪ (ለምሳሌ ከሰል፣ ጋዝ) የማብሰያ ነዳጅ ምንጭ ይጠቀማል?	1. አዎ 2. አይደለም

ክፍል 2፡ በአመጋገብ እና በስርዐተ ምግብ ምክንያቶች

የካልሲየም እና የቫይታሚን ዲ የበለጸጉ ምግቦች አመጋገብ ሁኔታ ለማዎቅ

ኮድ	ጥያቄዎች	የምላሽ አማራጮች	አስተያየቶች
49	የዓሳ ስጋ ምን ያህል ጊዜ ትበላለህ/ሽ?	1. በየቀኑ 2. በየሳምንቱ 3. በየወሩ	

		4. አልፎ አልፎ 5. በጭራሽ	
50	የዓሳ ዘይት ምን ያህል ጊዜ ትጠቀማለህ/ሽ?	1. በየቀኑ 2. በየሳምንቱ 3. በየወሩ 4. አልፎ አልፎ 5. በጭራሽ	
51	እንቁላል ምን ያህል ጊዜ ትበላለህ/ሽ?	1. በየቀኑ 2. በየሳምንቱ 3. በየወሩ 4. አልፎ አልፎ 5. በጭራሽ	
52	ጉበት ምን ያህል ጊዜ ትበላለህ/ሽ?	1. በየቀኑ 2. በየሳምንቱ 3. በየወሩ 4. አልፎ አልፎ 5. በጭራሽ	
53	ምን ያህል ጊዜ እንጉዳይን ይበላሉ?	1. በየቀኑ 2. በየሳምንቱ 3. በየወሩ 4. አልፎ አልፎ 5. በጭራሽ	
54	በቫይታሚን ዲ የተጠናከረ / የበለፀገ ወተት እና የወተት ተዋጽኦን ምን ያህል ጊዜ ይበላሉ?	1. በየቀኑ 2. በየሳምንቱ 3. በየወሩ 4. አልፎ አልፎ 5. በጭራሽ	

55	በቫይታሚን ዲ የተጠናከረ/ የበለፀገ የእህል አይነት ምን ያህል ጊዜ ይበላሉ?	1. በየቀኑ 2. በየሳምንቱ 3. በየወሩ 4. አልፎ አልፎ 5. በጭራሽ	
56	ሌሎች በቫይታሚን ዲ የበለፀጉ ምግቦችን ይጠቀማሉ?	1. አዎ 2. አይ አዎ ከሆነ እባክዎን ይግለጹ _____ እና በየስንት ጊዜ ይበላሉ? 1. በየቀኑ 2. በየሳምንቱ 3. ወርሃዊ 4. አልፎ አልፎ 5. በጭራሽ	

የአመጋገብ ስብጥርን ለማወቅ

57. እባኮትን ትላንትና ቀንና ማታ የበሉትን ወይም የጠጡትን ሁሉንም ምግብ (ምግቦች እና መክሰስ) በቤትም ሆነ ከቤት ውጭ የተመገቡትን ይግለፁ?

ቁርስ	መክሰስ	ምሳ	መክሰስ	እራት	መክሰስ

ኮድ	ጥያቄዎች	የምላሽ አማራጮች	አስተያየቶች

58	የእህል ዘሮችን በልቷል/ታለች?	1=አዎ 0=አይ	
59	በቫይታሚን ኤ የበለጸጉ አትክልቶችን በልተዋል?	1=አዎ 0=አይ	
60	ስራቸዉ የሚበሉ አትክልቶችን ይመገባሉ ለምሳሌ ቀይ ስር ፣ድንች ?	1=አዎ 0=አይ	
61	ጥቁር አረንጓዴ ቅጠላማ አትክልቶችን ይበላሉ?	1=አዎ 0=አይ	
62	ሌሎች አትክልቶችን ይበላሉ?	1=አዎ 0=አይ	
63	በቫይታሚን ኤ የበለጸጉ ፍራፍሬዎችን ይበላሉ?	1=አዎ 0=አይ	
64	ሌሎች ፍራፍሬዎችን ይበላሉ?	1=አዎ 0=አይ	
65	የእንስሳትን የኦርጋን ስጋ ይበላሉ?	1=አዎ 0=አይ	
66	ሥጋ ይበላሉ?	1=አዎ 0=አይ	
67	እንቁላል ይበላሉ?	1=አዎ 0=አይ	
68	ዓሳ ይበላሉ?	1=አዎ 0=አይ	
69	ጥራጥሬዎችን/ለውዝን/ፍሬዎችን ይበላሉ?	1=አዎ 0=አይ	
70	ወተት/የወተት ተዋጽኦዎችን ይበላሉ?	1=አዎ 0=አይ	
71	ዘይትን/ቅባትን ይበላሉ?	1=አዎ 0=አይ	
72	ቀይ የዘንባባ ምርቶች (ዘይት) ይበላሉ ?	1=አዎ 0=አይ	
73	ጣፋጮችን ይበላሉ?	1=አዎ 0=አይ	
74	ቅመማ ቅመም/ማጣፈጫዎችን/ይጠቀማሉ?	1=አዎ 0=አይ	

ክፍል 3፡ የፀሐይ ብርሃን ተጋላጭነትን ለማወቅ መጠይቅ

ኮድ	ጥያቄዎች	የምላሽ አማራጮች	አስተያየቶች
75	በአማካይ በቀን ስንት ሰዓት ከቤት ውጭ በቀጥታ የፀሐይ ብርሃን ታሳልፋለህ?	1. ከ30 ደቂቃ ባነሰ ጊዜ 2. ከ30 ደቂቃ እስከ 1 ሰዓት 3. ከ1 ሰዓት በላይ	

76	ለፀሐይ ብርሃን ሲጋለጡ የፀሐይ መከላከያ ሎሽን ይጠቀማሉ?	1. አዎ፣ ሁልጊዜ 2. አንዳንድ ጊዜ 3. አልፎ አልፎ 4. በጭራሽ	
77	እራስዎን ከፀሐይ ብርሃን ለመጠበቅ ጃንጥላ ይጠቀማሉ?	1. አዎ፣ ሁልጊዜ 2. አንዳንድ ጊዜ 3. አልፎ አልፎ 4. በጭራሽ	
78	ብዙውን ጊዜ በቀጥታ የፀሐይ ብርሃን ውስጥ የሚያሳልፉት በየትኛው የቀን ሰዓት ነው?	1. ጥዋት (ከጠዋቱ 6 ሰዓት - 10 ሰዓት) 2. እኩለ ቀን (ከጠዋቱ 10 ሰዓት - 2 ሰዓት) 3. ከሰዓት (ከሰዓት 2 ሰዓት - 5 ሰዓት) 4. ምሽት (ከሰዓት 5 ሰዓት በኋላ)	
79	ከቤት ውጭ ሲሆኑ፣ ሰውነትዎ ምን ያህል ለፀሐይ ብርሃን የተጋለጠ ነው?	1. ፊት ብቻ። 2. እጅና ፊት ብቻ 3. ክንዶች፣ እጅና ፊት 4. አብዛኛው የሰውነት ክፍል ተጋልጧል (የክንድ ፊት እግር)	

ክፍል 4፡ ስለ የአኗኗር ዘይቤዎች መጠይቅ

የአካል ብቃት እንቅስቃሴ ደረጃ መጠይቅ

ኮድ ቁጥር_	ጥያቄ	ምላሽ	
80	ስራዎ ከፍተኛ የአተነፋፈስ ወይም የልብ ምት መጨመርን የሚያስከትል ኃይለኛ-የጥንካሬ እንቅስቃሴን ያካትታል? *[መሸከም ወይም ማንሳት ከባድ ሸክሞች, መቆፈር ወይም የግንባታ ስራ]* ቢያንስ ለ ነ0 ደቂቃዎች ያለማቋረጥ?	አዎ	1
		አይ	2 *ኣይ ከሆነ ወደ ይሂዱ* Q73
81	በተደጋጋሚ በሳምንት ዉስጥ ለስንት ቀናት ያክል እንደስራዎ አካል አድርገዉ ከባድ ከባድ እንቅስቃሴዎችን ወይም ስራወችን ይሰራሉ?	የቀናት ብዛት	⌊__⌋
82	በሥራ ቦታዎ ብርታትን የሚጠዪቁ ከባድ እንቅስቃሴዎችን ለማድረግ ምን ያህል ጊዜ ትጠቀማለህ/ሽ?	ሰዓታት: ደቂቃዎች	ሰኣታት ደቂቃ
83	ስራዎ አነስተኛ የአተነፋፈስ መጨመርን ወይም እንደ ፈጣን መራመድ ያሉ የልብ ምትን የሚያስከትል መጠነኛ አስቸጋሪ የሆነ እንቅስቃሴን ያካትታል? *ወይም ቀላል ሸክሞችን መሸከም*] ቢያንስ ለ ነ0 ደቂቃዎች ያለማቋረጥ?	አዎ	1
		አይ	2 *ኣይ ከሆነ ወደ ይሂዱ* Q76
84	በተለመደው ሳምንት ውስጥ፣ ለስንት ቀናት ያህል መጠነኛ አስቸጋሪ የሆኑ እንቅስቃሴዎችን እንደ የስራዎ አካል አድርገዉ ይሰራሉ?	የቀናት ብዛት	
85	በተለመደው ቀን በሥራ ቦታ መጠነኛ አስቸጋሪ የሆኑ እንቅስቃሴዎችን ለማድረግ ምን ያህል ጊዜ ትጠቀማለህ/ሽ?	ሰዓታት: ደቂቃዎች	ሰኣታት ደቂቃ
86	ወደ ስራ ቦታዎች ለመድረስ እና ለመመለስ ቢያንስ ለ ነ0 ደቂቃዎች ያለማቋረጥ በእግር ጉዞ ያደርጋሉ ወይም ብስክሌት ይጠቀማሉ?	አዎ	1
		አይ	2 *ኣይ ከሆነ ወደ ይሂዱ* Q79
87	በተለመደው ሳምንት ውስጥ፣ ወደ ስራ ቦታ ለመድረስ እና ለመመለስ ያለማቋረጥ ቢያንስ ለ10 ደቂቃ ለስንት ቀናት በእግር ወይም በብስክሌት ይጓዛሉ?	የቀናት ብዛት	
88	በተለመደው ቀን በእግር ወይም በብስክሌት በመጓዙ ምን ያህል ስዓት ያሳልፋሉ?	ሰዓታት: ደቂቃዎች	ሰኣታት ደቂቃ
89	ማንኛውንም ከባድ እና አስቸጋሪ የሆኑ ስፖርቶችን፣ የአካል ብቃት ወይም መዝናኛዎችን ታደርጋለህ (*ዮትርፍ ጊዜ ማሳለፊያ* ከፍተኛ የአተነፋፈስ ወይም የልብ ምት እንዲጨምር የሚያደርጉ እንቅስቃሴዎችን እንደራጫ *ወይም እግር ኳስ መጫወት፣*] ቢያንስ ለ ነ0 ደቂቃዎች ያለማቋረጥ?	አዎ	1
		አይ	2 *ኣይ ከሆነ ወደ ይሂዱ* ጥ 82

90	በተለመደው ሳምንት ውስጥ፣ ለስንት ቀናት ያህል ከባድ እና አስቸጋሪ የሆኑ ስፖርቶችን፣ የአካል ብቃት ወይም የመዝናኛ (የሚያካሂዱ) *የትርፍ ጊዜ ማሳለፊያ*) እንቅስቃሴዎች ታደርጋለህ/ሽ?	የቀናት ብዛት	
91	በተለመደው ቀን ከባድ እና አስቸጋሪ የሆኑ ስፖርቶችን፣ የአካል ብቃት ወይም የመዝናኛ እንቅስቃሴዎችን ለምን ያህል ሰዓት ትሰራለህ?	ሰዓታት: ደቂቃዎች	ህ. ደቂቃ
92	ማንኛውንም መጠነኛ-አስቸጋሪ የሆኑ ስፖርቶችን፣ የአካል ብቃት እንቅስቃሴ፣ ወይም መዝናኛ ታደርጋለህ *(መዝናኛ)* ትንሽ የትንፋሽ መጨመር ወይም የልብ ምት የሚጨምሩ እንደ ፈጣን መራመድ ያሉ እንቅስቃሴዎች, (*ብስክሌት, ዋና, መረብ ኳስ*) ቢያንስ ለ ነ0 ደቂቃዎች ያለማቋረጥ ትሰራለህ/ሽ?	አዎ	1
	አይ	2 *አይ ከሆነ ወደ ይሂዱ* Q85
93	በተለመደው ሳምንት ውስጥ፣ ለስንት ቀናት ያህል መጠነኛ-አስቸጋሪ የሆኑ ስፖርቶችን፣ የአካል ብቃት እንቅስቃሴዎችን ወይም የመዝናኛ (*የትርፍ ጊዜ ማሳለፊያ*) እንቅስቃሴዎችን ትሰራለህ/ሽ?	የቀናት ብዛት	
94	መጠነኛ-አስቸጋሪ የሆኑ ስፖርቶችን፣ የአካል ብቃት እንቅስቃሴዎችን ወይም የመዝናኛ እንቅስቃሴዎችን ለመስራት ምን ያህል ሰዓት ቲጠቀማለህ?	ሰዓታት: ደቂቃዎች	ህ. ደቂቃ
95	በተለመደው ቀን ዉስጥ ለምን ያህል ሰዓት በመቀመጥ ወይም በመተኛት(ጋደም በማለት) ያሳልፋሉ?	ሰዓታት: ደቂቃዎች	ሰኣታት ደቂቃ s

የአልኮል አጠቃቀም/ ፍጆታ መጠይቅ

ኮድ	ጥያቄዎች	የምላሽ አማራጮች	አስተያየቶች
96	እንደ ቢራ፣ ወይን፣ ኡዞ፣ጠጅ፣ ጠላ፣ አረቂ ያሉ አልኮል የያዙ መጠጦችን ምን ያህል ጊዜ ይጠጣሉ?	0= በጭራሽ። ነ=ወርሃዊ ወይም ያነሰ; 2 = 2-4 ጊዜ / በወር; 3 = 2-3 ጊዜ / በሳምንት; 4=4 ወይም ከዚያ በላይ ጊዜ/ሳምንት **ይህ መልስ በጭራሽ ካልሆነ ሁሉንም ዝለል**	
97	በአንድ ቀን በሚጠጡበት ጊዜ ምን ያህል አልኮል የያዙ መጠጦችን ይጠቀማሉ/ይጨርሳሉ?	0=1–2 ነ=3–4። 2=5–6 3=7–9	

		4=10 ወይም ከዚያ በላይ	
98	በአንድ ጊዜ ለምን ያህል ጊዜ ስድስት ወይም ከዚያ በላይ የሆኑ መጠጦችን ይጠጣሉ?	0= በጭራሽ። 1=ከወርሃዊ ያነሰ; 2=ወርሃዊ; 3=ሳምንት; 4=በየቀኑ/በየቀኑ ማለት ይቻላል።	
99	ባለፈው አመት ምን ያህል ጊዜ መጠጣት ከጀመሩ በኋላ መጠጣት ማቆም አልቻሉም?	0= በጭራሽ። 1=ከወርሃዊ ያነሰ; 2=ወርሃዊ; 3=ሳምንት; 4=በየቀኑ/በየቀኑ ማለት ይቻላል።	
100	ባለፈው አመት ምን ያህል ጊዜ በመጠጣትዎ ምክንያት በተለምዶ የሚጠበቀውን ነገር ሳያደርጉ ቀሩ?	0= በጭራሽ። 1=ከወርሃዊ ያነሰ; 2=ወርሃዊ; 3=ሳምንት; 4=በየቀኑ/በየቀኑ ማለት ይቻላል።	
101	ባለፈው አመት ምን ያህል ጊዜ ከከባድ /ከአስቸጋሪ ሁኔታ በኋላ በጥዋቱ መጠጥ ለመጀመር የመጠጥ ፍላጎት አሳይተዋል?	0= በጭራሽ። 1=ከወርሃዊ ያነሰ; 2=ወርሃዊ; 3=ሳምንት; 4=በየቀኑ/በየቀኑ ማለት ይቻላል።	
102	ባለፈው አመት ምን ያህል ጊዜ ከጠጡ በኋላ የጥፋተኝነት ስሜት ወይም ፀፀት ተሰምቷችኋል?	0= በጭራሽ። 1=ከወርሃዊ ያነሰ; 2=ወርሃዊ; 3=ሳምንት; 4=በየቀኑ/በየቀኑ ማለት ይቻላል።	
103	ባለፈው አመት ምን ያህል ጊዜ ከመጠጥዎ በፊት በነበረው ምሽት ምን እንደተፈጠረ ማስታወስ አልቻሉም?	0= በጭራሽ። 1=ከወርሃዊ ያነሰ; 2=ወርሃዊ; 3=ሳምንት; 4=በየቀኑ/በየቀኑ ማለት ይቻላል።	
104	በመጠጥዎ ምክንያት እርስዎ ወይም ሌላ ሰው ተጎድተዋል?	0=አይ. 2=አዎ ግን ባለፈው አመት አይደለም። 4=አዎ ባለፈው አመት	
105	አንድ ዘመድ/ጓደኛ/ዶክተር/የጤና ሰራተኛ ስለ መጠጥህ/ሽ አሳስቦት ነበር ወይስ እንድትቀንስ ሀሳብ አቅርበዉላችሁ ያዉቃሉ?	0=አይ. 2=አዎ ግን ባለፈው አመት አይደለም። 4=አዎ ባለፈው አመት	

የማጨስ መጠይቆች

ኮድ	ጥያቄዎች	የምላሽ አማራጮች	አስተያየቶች
106	በአሁኑ ጊዜ እንደ ሲጋራ፣ ሲጋራ ወይም ቧንቧ ያሉ የትምባሆ ምርቶችን ያጨሳሉ?	1 = አዎ 2 = ቁ	“አይ” ከሆነ → ወደ Q101 ዝለል
107	በአሁኑ ጊዜ ትምባሆ ምታጨሰዉ በየቀኑ ነው ወይስ ከቀን ያነሰ ታጨሳለህ ወይስ በጭራሽ አተጨስም?	1 = በየቀኑ 2 = ከቀን ቀን ያነሰ 3 = በፍጹም	-
108	በአማካይ በቀን ስንት ሲጋራዎችን ያጨሳሉ?	ቁጥር (0–99)	-
109	ትንባሆ በመደበኛነት (በየቀኑ) ማጨስ ስትጀምር ስንት አመትህ ነበር?	1=ቁጥር (ዓመታት) 2 = አያውቅም	-
110	ባለፉት 12 ወራት ውስጥ ማጨስዎን ሙሉ በሙሉ ለማቆም ሞክረዋል?	1 = አዎ 2 = ቁ	-
111	ትንባሆ አጨስህ ታውቃለህ (አሁን ባታጨስም እንኳ)?	1 = አዎ 2 = ቁ	"አይ" ከሆነ → ወደ ማጨስ ክፍል መጪረሻ ይዝለሉ
112	አዘውትረህ ማጨስ ካቆምክ ምን ያህል ጊዜ አልፏል?	ዓመታት / ወራት / ሳምንታት ይመዝግቡ	-
113	በአሁኑ ጊዜ ምንም ዓይነት ጭስ የሌላቸው የትምባሆ ምርቶችን (ለምሳሌ, ትንባሆ ማኘክ, ስናፍ, ቤቴል) ይጠቀማሉ?	1 = አዎ 2 = ቁ	-
114	ባለፉት 30 ቀናት ውስጥ የትኛውንም የትምባሆ ምርት ለስንት ቀናት አጨሱ?	ቁጥር (0–30)	-

ክፍል 5: በተዳጋጋሚ የሚያስተዉሏቸዉ ምልክቶች

ኮድ	ጥያቄዎች	የምላሽ አማራጮች	አስተያየት
115	የጡንቻ ወይም የመገጣጠሚያ ህመም አጋጥሞዎታል?	1. አዎ 2. አይ	
116	አጠቃላይ ድካም አጋጥሞዎታል?	1. አዎ 2. አይ	
117	የአጥንት ህመም ወይም ድክመት አጋጥሞዎታል?	1. አዎ 2. አይ	

118	የጡንቻ መደንዘዝ ፣ የመዉጋት ስሜት አጋጥሞዎታል?	1. አዎ 2. አይ	

ክፍል 6: ባዮሎጂካል እና የጤና ሁኔታዎች መጠይቅ

ኮድ	ጥያቄዎች	የምላሽ አማራጮች	አስተያየት
119	በአሁኑ ጊዜ ከሚከተሉት መድሃኒቶች በአንዱ ላይ ነዎት?	1. በጭራሽ 2. ፀረ-የሚጥል መድኃኒቶች 3. Glucocorticoids 4. ሌሎች፡ ይግለጹ_____	
120	የሚታወቁ ሥር የሰደዱ በሽታዎች (ኩላሊት፣ ጉበት፣ ካንሰር፣ ወዘተ) አለብዎት?	1. አዎ 2. አይ	አዎ ከሆነ እባክዎን ይግለጹ:_____
121	ከዚህ በፊት የቪታሚን ዲ እጥረት አለብዎት ተብለው ያውቃሉ?	1. አዎ 2. አይ	

ክፍል 7: የሰውነት ቅንብር እና የቆዳ አይነት

ኮድ	ጥያቄዎች	የምላሽ አማራጮች	አስተያየት
122	ቁመት (ሴሜ)		_____
123	ክብደት (ኪግ)		_____
124	የቆዳ ቀለም አይነት	1. IV ዓይነት (ቀላል ቡናማ) 2. ዓይነት V (ጥቁር ቡናማ)	

		3. ዓይነት VI (በጣም ጥቁር ቡናማ	

ክፍል 8፡ የላብራቶሪ ምርመራ

ኮድ	ጥያቄዎች	የምላሽ አማራጮች	አስተያየት
125	በደም ዉስጥ የቫይታሚን ዲ መጠን (25(OH)D)	1. እጥረት (<20 ng/ml 2. በቂ ያልሆነ (20-29.99 ng/ml) 3. በቂነት (>=30 ng/ml)	