ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES SCHOOL OF MEDICINE

DEPARTMENT OF INTERNAL MEDICINE

RESEARCH TITLE

NUTRITIONAL STATUS AND DIETARY PATTERNS OF TYPE 2 DIABETES PATIENTS SEEN IN TASH ENDOCRINE CLINIC DURING THE MONTH OF OCTOBER 2020

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ADDIS ABABA, ETHIOPIA

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A THESIS PROPOSAL SUBMITED TO THE DEPARTEMENT OF INTERNAL MEDICINE, ADDIS ABABA UNIVERISTY, COLLEGE OF MEDICINE AND HEALTH SCIENCE, IN PARTIAL FULFILEMENT OF THE REQUIREMENTS FOR THE SPECIALITY CERTEFICATE IN INTERNAL MEDICINE

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Full title of the research project	NUTRITIONAL STATUS AND DIETARY PATTERNS OF TYPE 2 DIABETES PATIENTS SEEN IN TASH ENDOCRINE CLINIC DURING THE MONTH OF OCTOBER 2020
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Project implementation area	Tikur Anbessa Speciliazed Hospital (TASH), Addis Ababa
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ABBREVIATIONS AND ACRONYMS

IDF:- international Diabetes federation

T2DM:- Type 2diabetes

T1DM:- Type 1diabetes

WHO: - World health organization

HDL: - high density lipoprotein

LDL: - low density lipoprotein

MNT: - medical nutrition therapy

TASH: - Tikur Anbessa Specialized Hospital

UKPDS: - The UK prospective diabetes study

FBS: - Fasting blood glucose

PGC: - practice guidelines nutritional care

BC: - basic nutritional care

RDN: - registered dietitian

AAU: - Addis Ababa University

SGA: - subjective global assessment

MNA: - mini nutritional assessment

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Abstract

Background

Diabetes mellitus can be associated with different ranges of malnutrition. Even in the obese patients who are labeled as such by calculating the BMI, can be undernourished when evaluated using another nutritional assessment tool.

Method

This is a prospective cross sectional study conducted in the endocrine clinic of TASH on type 2 diabetic patients who came for their follow up in the month of October. A structured questionnaire designed to assess their nutritional status and pattern was administered to the patients through a health professional

Result

A total of 109 patients were studied. Among the participants 69.6% of them had a BMI of 25 Kg/M^2 or more and out of these 21.3% of them were found to have moderate malnutrition when assessed using the subjective global assessment nutritional tool. The presence of GI symptoms (P=0.000, 95% CI (3.9-78.4) AOR=17.5) , presence of diabetic complications (P=0.031, 95% CI (1.2-19.7) AOR=4.8) and appetite loss (P=0.000, 95%CI (7.97-148) AOR=34.4) were found to be risk factors for moderate malnutrition/ SGA level B

Conclusion and recommendations

In diabetic patients nutritional assessment tools other than the BMI should be in place to detect under nutrition. The patients may also need to have frequent screening for appetite change and gastrointestinal symptoms. Screening for and managing diabetic complications would also contribute in prevention of under nutrition in diabetic patients. A locally customized and a variety of options of meal plans incorporating the available food item may aid in directing these patients toward the goal of medical nutritional therapy

1. Introduction

1.1. Background

The prevalence of diabetes is rising worldwide. In 2000 the global estimate of adults who have diabetes was around 151 million. In 2019 IDF has reported around 463 million people to be living with diabetes. It was estimated in 2010 that there will be around 438 million people diagnosed with diabetes in 2025. With 5 years still to go that projection has already been surpassed by 25 million. Out of the 463 million, 1.1 million are under the age of 20 mostly diagnosed with type 1 diabetes. Around 352 million people are of working age that is between 20 and 64. People older than 65 account for almost 28%.

The Middle East and North Africa has the highest prevalence of diabetes while the rest of Africa has the lowest. But the number of people with diabetes in the region is expected to increase in 143% by 2045. Low income countries have the highest proportion of undiagnosed diabetes. Access to health care and medication is also compromised in these countries

Countries with the largest numbers of adults with diabetes are China, India and USA. Egypt is ranked 9th in the 2019 IDF's report. The highest number of diabetes related deaths occur in the Western Pacific region and the South East Asia while the lowest number of deaths occur in south and central /America. 87% of all diabetes related deaths happen in low and middle income countries.

IDF estimates the annual global health expenditure on diabetes at USD 760 billion. It is projected that these direct costs will reach USD 825 billion by 2030 and USD 845 billion by 2045. The cost of treating complications account for over 50% of the direct health cost of diabetes. Premature death and other health complication are also associated with a negative economic impact(1)

The increased prevalence of diabetes is driven by multiple socioeconomic, environmental and genetic factors. The accretion of type 2 Diabetes maybe associated with growing urbanization and changing lifestyle habits with sedentary way of life,

increased consumption of processed food and higher calorie consumption. However levels of type 1 diabetes are also on the rise.

WHO and IDF has classified diabetes into categories. Type 1 and type 2 diabetes being the major ones.T2DM accounts for 90-95% of diabetes. (2). It is most common in adults but an increasing number of children and young adults are also affecting due to an increasing trend of obesity in the younger population.

Many factors increase the risk of developing T2DM including age, obesity, unhealthy lifestyle and prior GDM. It is also associated with strong familial genetic predisposition. It is often accompanied by other conditions such as hypertension, high LDL and low HDL. The major attributed mechanisms are said to be a combination of varying degree of insulin resistance and relative insulin deficiency.

The pathogenesis of T2DM makes medical nutritional therapy one of the most important modality of treatment. Strong evidences support the efficacy and cost effectiveness of nutrition therapy as a component of diabetic care. (3) Nutrition counseling that works toward improving or maintaining glycemic targets, achieving weight management goals, and improving cardiovascular risk factors (e.g., blood pressure, lipids, etc.) within individualized treatment goals is recommended for all adults with diabetes and pre diabetes. MNT is also shown to have an impact on HgbA1c decreasing it by up to 2% within 3 to 6 month(3)

Multiple studies have attempted to identify the optimal combination of macronutrients such as carbohydrates, proteins and fats to incorporate in eating plans of diabetic patients but there is no ideal mix of these macronutrients that fit to all category patients. Therefore it needs to be individualized according to the patients' profiles. It has been observed that people with diabetes, on average, eat about the same proportions of macronutrients as the general public: ;45% of their calories from carbohydrate ;36– 40% of calories from fat, and the remainder (16–18%) from protein. Regardless of the macronutrient mix, total energy intake should be appropriate to attain weight management goals.(3)

It should be noted that MNT is currently one of the main modality of treatment in combination with pharmacologic agents and has resulted in statistically and clinically relevant outcome improvements

1.2. Statement of the problem

T2DM is a prevalent disease causing wide spread impact worldwide. Nutritional interventions play a major role in preventing delaying and halting the progression of the disease and its complications. Hence MNT has been incorporated in the standard care of diabetic patients.

The aim of the MTN is to attain considerable amount of weight loss which can translate into beneficial clinical outcomes. The benefit of MNT has been demonstrated in multiple studies. It was demonstrate that it has an effect on weight and calorie intake reduction. One of the many evidences for this conclusion was done by the UKPDS group to see response of FBS to diet therapy in newly diagnosed T2DM patients. More than 3000 patients were included in the study. The reduction in FBS was greater in those presenting with a high initial FBS and in those who lost more weight(4) . In 1998 a randomized control trial conducted by Marion J Franz et al assessed the effect of MNT by dieticians on medical and clinical outcomes for adults with non insulin dependent diabetes mellitus and to compare MNT administered according to practice guidelines nutrition care(PGC) and MNT administered with basic nutrition care (BC). At 6 months both approaches resulted in significant improvements in blood glucose control as indicated by FBS and HbA1c level. Regarding FBS the PGC approach was superior than the BC especially for patients with diabetes longer than 6 months (5) . Nutritional interventions were also studied on T1DM patients. In a study done by Karmeen Hulkarni et al, patients with T1DM were enrolled and followed for 3 months period with dietary interventions. In the study MNT achieved improvement in HgbA1c (6) Another study done in this area is the one done by Lee Jeongsook et al in 2005 which included around 79 overweight and obese

women who underwent MNT 5 times for 12 weeks by a dietitian. The treatment resulted in reduced body weight, plasma lipid cholesterol and leptin(7)

Essential components of MNT are assessment, nutrition diagnosis and interventions and monitoring with ongoing follow up and support . Ideally this should be done in collaboration with a registered dietitian (RDN)(3)

It has been shown that finding a diet plan that fit for all is unrealistic. Numerous studies have attempted to identify optimal mix of macronutrients for the eating plans of people with diabetes but an ideal mix hasn't really been found. Therefore the plan should be customized to the patient according to the associated factors such as metabolic goals, physical activity, food preference and availability. This makes knowing the nutritional profiles and characters of the patients we are dealing with imperative in designing a customized MNT

Although T2DM is most often associated with obesity in different studies, some studies have identified under nutrition among these patients. The study done in Gaza strip Palestine assessing malnutrition and their association with diabetes complications found that 31.5% of the studied patients were undernourished.(8) Another study in Turkey found that 9-11% of patients with T2DM in the outpatient follow up program were undernourished using different nutritional assessment tools. (9)

Living in a country where we have high prevalence of undernourishment in the general population, it is important to know the dietary status of our patients as a whole to design a fitting diet plan for the patients

1.3. Significance of the study

It is established that MNT should be incorporated in the treatment plan of the diabetic patient, It is also demonstrated that there isn't a "fit-for-all" dietary regimen. MNT is to be tailored according to the patients' condition. This process should under normal circumstances should be undertaken in collaboration with a registered dietitian.

Considering the condition of the country we are in, it will be difficult to have a registered dietitian involve in the management of each our patients. Hence a general recommendation based on the status of our patients maybe the step forward.

In the general population the prevalence of undernourishment is significant. As mentioned above some studies have also identified undernourished patients with type 2 diabetes. Therefore the MNT recommendation of the west cannot be applied in our diet up across the border. Taking these factors into account knowing the nutritional status and patterns of our patients with type 2 diabetes is mandatory to design a general recommendation.

The information to be gathered in this study could help in designing an appropriate and customized diet plan based on the majority character of our patients and the commonly available food items which can be a small jumpstart in helping to achieve a positive clinical outcomes

2. Literature review

2.1. Nutritional status of type 2 diabetes patients

The prevalence of type of 2 diabetes is increasing as the way of life shifts to a sedentary one. The major pathogenesis attributed to the disease is insulin resistance and relative decreased insulin production. In the western most type 2 diabetes patients tend to be in the higher end of the BMI cut points. But even obese patients were found to be undernourished in some of the studies sited below.

Different studies have attempted to study the nutritional status of patients with T2DM. Studies done in Middle East, Asian and African countries will be reviewed here.
The first study was done in Turkey by Ali Tamer et al in 2018. It included 580 patients with type 2 diabetes who presented to the outpatient clinic. They used SGA and MNA to screen for malnutrition and found that 11.4% and 9% of the patients had malnutrition(under nutrition) according to SGA and MNA respectively (9). But most patients were found to be overweight. The median BMI of patients labeled to have malnutrition was 28. The study concluded suggesting a higher cut off for BMI and fat % may be necessary to detect malnutrition as most patients are obese. The study in Gaza done by El BibeisiAH et al. was primarily to study the association of complications with malnutrition. Based on the nutritional screening scores around 31.5% had malnutrition. While the mean BMI was more than 30. (8). In the Philippines 150 pts with type 2 diabetes were assessed for malnutrition using SGA and 45% of the patients had severe malnutrition. Similar to the previous study patients who were overweight(around 37%) according to the BMI cut off points were found to have high nutrition risk as well according to the SGA score. (10) . A recent study published in the year 2019 done by FZ Kaidi et al. in Morocco was actually designed to assess under nutrition in obese elderly

diabetic patients. Hence only T2DM patients who have BMI of more than 30 and older than 65 years old were included and undernutrition was assessed using serum albumin and mini nutritional assessment tool which is validated for the elderly. Undernutrition was found in 10.8% of patients and 28.3% presented with a risk of malnutrition.(11)

The following studies assessed the prevalence of obesity but didn't look into the presence of under nutrition in those patients. A study done in Saudi Arabia by El-Sayed H. Bakr , a cross sectional study conducted on 51 patients at AL-Noor specialist Hospital the mean BMI was 31.59+/- 5.538kg/m2 (12). A Nigerian stud y done in 2 teaching hospitals and which included around 90 respondents reported 59.5% of them to be overweight and 13.5% obese (13). Another study done in Sudan Khartoum reported 30% of the participants to be obese and 15 % to be overweight (14)

2.2. Dietary patterns

The afore mentioned study in Sudan has studied the dietary pattern of the respondents. Most patients had low intake of fiber , non starchy vegetables and fruits. On the other hand they had higher intake of fat (14). On the contrary in the Nigerian study found that majority of the patients take protein based diet. Unlike the patients in the Sudanese study patients had a higher consumption of fish which has high protein value enabling to meet the daily nutritional requirement (13) . The dietary pattern f type 2 diabetes patients was assessed in 2016 in some of the public hospitals in Addis Ababa. The study identified five dietary patterns. Within these patterns the carbohydrate mean intake was higher than the recommendation while the intake of fat, protein and fiber were within the recommended ranges.

2.3. Risk factors associated with malnutrition

Two of the Asian studies have tried to see the risk factors associated with malnutrition specifically focusing on under nutrition assessed by different nutrition scores. In the

Philippines' study the risk factors associated with high nutritional risk for malnutrition were abnormal BMI; underweight and obese class 2 (P<0.001), lower albumin (p=0.005) and lower total lymphocyte count (P<0.001) (10). The study in Turkey found weight loss, change in dietary intake and diminished physical activity to be significantly associated with malnutrition. (9)

2.4. Malnutrition and clinical outcomes

Studies have shown that malnutrition in type 2 Diabetes could be associated with complications. The study done in Gaza strip designed to study the complication in association with malnutrition. The result revealed that patients with low risk malnutrition had a lower odds for high blood pressure(OR 0.063 CI 95% (.013-.305)),, eye problems(OR 0.391 CI 95% (.225-.680)), kidney problems(OR 0.431 CI 95% (.197-.942)), heart problems, (OR 0.167 CI 95% (.050-.557)) and extremities problems(OR 0.499 CI 95% (.281-.885)) with P value less than 0.05 for all compared with those in the high risk of malnutrition. (8) In the study done in Turkey glycated hemoglobin was significantly higher in patients with malnutrition. The median hemoglobin A1c was 9 in the malnourished group and 8.1 in those with normal nutritional status which was statistically significant with P value of 0.01. (9). Most African studies focus on malnutrition in the form of obesity which is associated poor glycemic control as written in standard text books.

3. Objectives

3.1. General objective

- To assess the nutritional status and dietary patterns of Type 2 Diabetes patients in TASH endocrine clinic

3.2. Specific objectives

- To assess nutritional status of our patients using BMI and SGA scores
- To identify factors associated with malnutrition
- To identify dietary pattern

4. Methodology

4.1. Study setting

4.1.1. Study area

The study was undertaken in Tikur Anbessa Specialized Hospital which is a tertiary Hospital found in Ethiopia, Addis Ababa. The Hospital is one of the hugest hospitals in the country established in the year 1972 G.C by the late Emperor Hailesilasse. The hospital gives multidisciplinary health care services to the population of the country. It is also part of Addis Ababa University running as the school of health science offering both undergraduate and postgraduate studies. The Endocrine clinic is part of the internal medicine department. The clinic has 6 sessions per week serving patients with endocrine diseases. Out of the 6 sessions 4 of them are allocated for diabetic patients including gestational diabetic clinic and diabetic foot clinic.

4.1.2. Study period

The study was conducted in the month of October, 2020 in the endocrine clinic of TASH.

4.2. Study Design

A prospective cross sectional study design was used to assess the nutritional status and dietary pattern of type 2 diabetic patients who has follow up at the endocrine clinic.

4.3. Source and study population

The source population of this study were all type 2 Diabetes patients who came to the endocrine clinic in the study period. The study population were all patients who gave consent to participate in the study as long as they or their attendants could recall their diet for the past 2 days and their weight and height could be measured

4.4. Sampling size and sampling technique

All patients that came to the clinic during the study period were considered for the study and were assigned numbers and the patients assigned with even number were included to randomize the sample.

4.5. Inclusion and exclusion criteria

4.5.1. Inclusion criteria

- Age above 18
- Patients with T2DM who has follow up at TASH endocrine clinic

4.5.2. Exclusion criteria

- Patients unwilling to give an informed consent
- Patients whose weight and height cannot be measured
- Patients who cannot recall the food items they have taken in the past 2 days

4.6. Study variables

4.6.1. Dependent variable

- Nutritional status of the patients
- Dietary pattern of the patients

4.6.2. Independent variables

- Age
- Sex
- Occupation
- Level of education
- Income
- Marital status
- Duration of the diagnosis and follow up
- Types of diabetic medication
- Diabetic complications
- Other comorbidities and medications
- GI symptoms that persisted for more than 2 weeks
- Weekly diet history
- 2 consecutive days diet recall
- Weight change
- Appetite change
- Functional capacity
- Exercise
- Weight
- Height

4.7. Operational definitions

Type 2 Diabetes:- Patients labeled to have type 2 Diabetes in the previous follow ups

Malnutrition:- will be defined according to the BMI and SGA as follows

BMI

- <16:- severe malnutrition
- 16-16.99:- moderate malnutrition
- 17-18.49:- mild malnutrition
- 18.5-24.9:- normal
- 25-29.9:- overweight
- 30-34.9:- class 1 obese
- 35-39.9:- class II obese
- >=40:- class III obese

SGA:- identifying data on weight change, dietary intake change, gastrointestinal symptoms, changes in functional capacity, assessment of fat and muscle stores and the presence of edema and ascites

- SGA score A:- normal nutrition status
- SGA score B and C:- malnourished

SGA classification:- The ranks of A, B, and C in the SGA are assigned on the basis of subjective weighting.

- A patient with weight loss and muscle wasting who is currently eating well and gaining weight is classified as well nourished. (SGA score A)
- A patient with moderate weight loss (between 5% and 10%), continued compromise in food intake, continued weight loss, progressive functional impairment, and moderate stress due to illness is classified as moderately malnourished. (SGA score B)
- A patient with severe weight loss (>10%), poor nutrient intake, progressive functional impairment, and muscle wasting is usually classified as having severe malnutrition. (SGA score C)

Diabetic complications:- any vascular and non vascular complications of diabetes with the diagnosis made for the patients' clinical and laboratory features by the following physician will be documented as a diabetic complication

Pattern of diet intake

- Often:- more than 2 times per week
- Occasional:- less than 1 times per two weeks

4.8. Data collection procedures

4.8.1. Data collection instrument

Data was collected using a structured questionnaire that is derived from similar studies mostly done in African and Middle East countries and adapted to address the objectives of this study. The questionnaire was initially prepared in English and those questions that require the verbal interaction of the participants were translated to Amharic for eases of the collector and the interviewee.

The questionnaire had 6 parts. The first part recorded the patient's socioeconomic back ground. The second part recorded the medical history of the patients including the time of diagnosis and duration of follow up, the types of medications they are on, diabetic complications the patient is diagnosed with, comorbidities and persistent GI symptoms. The third part documented the dietary and weight history. Weight and appetite change were inquired along with the functional capacity and exercise pattern. In the 4^{th} part weight and height were measured and documented. The 5^{th} section dealt with investigation results that were retrieved from the patients' electronic medical documentations. Most recent records of FBS, Hgba1c, lipid profile test, creatinine and albumin were recorded. The final part grossly assessed if the patient has the bare minimum knowledge and practice about MNT

4.8.2. Data quality management

Questionnaire was translated to Amharic and it was filled by nurses working at Endocrine clinic. The objective of the study and the fashion in which the questionnaire is to be filled was discussed in detail with the interviewers. The filled questionnaires were collected daily from the clinic and were checked for completeness. The patients' electronic medical data was rechecked by the investigator to check for additional or missing information. Amendments were done after assessing the daily gap found upon revision of the filled questionnaire.

4.8.3. Data analysis and presentation

The IBM SPSS statistic software package version 26 was used for analysis. The collected data was verified and validated before and after entry. Descriptive analysis are presented in the form of frequencies and percentages. Associations between the variables were analyzed using methods that fit the variable type. P value of <0.05 is used to show statistical significance. Bivariate and multivariate logistic regressions analysis were performed for variables which were found to be associated.

4.9. Ethical consideration

Before the study took place the proposal was submitted both to the department of internal medicine and the ethical clearance committee members and was approved. The patients to be involved in the study had the objective of study explained to them and the consent form was read to them. Those patients who agreed to take part in the study signed an informed consent. The patients were told that they had the right to withdraw from the interview session before completion if they decide to. The data is used using the medical record number and their names will not be disclosed.

4.10. Dissemination of the result

Upon completion of the study and the write up, the result will be presented to the department of internal Medicine, college of Health Science of AAU to be accessible for future reference

4.11. Limitation of the study

This study is useful as it will inform us about the nutritional status of our patients with type 2 diabetes. That knowledge could aid in formulation of a more refined customized diet plans for these patients.

However the study is going to be conducted only in a single center. TASH is a territiary hospital where patients come usually when referred from other hospitals for specialized treatment. Therefore may have a more severe form in the spectrum of the disease. Hence generalization of this information to our general population may not be appropriate

5. Result

5.1. Sociodemographic characteristics

A total of 109 diabetic patients took part in the study. Out of the 109, 38(34.9%) were male and 71(65.1%) were females. The age range was between 28 and 75 with mean age of 51.2 (SD 11.8). Majority of the patients were between the age range of 50-59 (28.4%). Most patients were stay at home mothers (35, 32.1%),. The mean of the income of the participants was 2109 (SD=3415). Around 77 (70.6%) of the participants earned below the mean. 7.3% of the patients could neither read nor write, 37.6% had completed high school and 28.4% had completed elementary level of education. All of the patients except 7 of them were from Addis. 80.7% of them were married.

Among the participants in the study 55(51.4%) had been diagnosed with Type 2 DM more than 10 years back and 36 of them (33.6%) were diagnosed in the past 5 years. The mean of the duration of diabetes since diagnosis was 10.8(SD=8). 80 (73.4%) of them had additional comorbidities unrelated directly to the diabetes. The most commonly identified comorbidity was hypertension (60.5%) followed by dyslipidemia (40.3%) and cardiac disease(6.4%). HIV and thyroid disease accounted for 2.7% and 0.9% respectively. Around 36% of the patients had both hypertension and dyslipidemia and 1.8% have both hypertension and cardiac disease. 43.1% were using oral hypoglycemic agents while 22.9% were using insulin alone. The rest of the participants used both insulin and oral hypoglycemic agents. Around 36.7% of the study participants had diabetes related complications. The most common complication was neuropathy (17.4%) followed by nephropathy (12.8%) and retinopathy (11.9%). Gastropathy and peripheral arterial disease accounted for 0.9% each and IHD accounted for 1.8%. 2.7% of the patients had both nephropathy and retinopathy.

Table 1 Sociodemographic characteristics of patients who were on follow up at TASH endocrine clinic in the month of October 2020 (n=109)

Variables	Frequency	Percent
Sex		
Male	38	34.9
Female	71	65.1
Age (in years)		
<= 51 years	54	49.5
> 52 years	55	50.5
Occupation		
Civil servant	20	18.3
Self employed	24	22
Home maker	35	32.2
unemployed	30	27.5
Income		
< = 2100 Birr	77	70.6
>2100 Birr	32	29.4
Education		
unable to read/write	8	7.4
elementary	31	28.7
highschool completed	42	38.9
diploma	16	14.8
degree or more	11	10.2
Marital status		
single	4	3.7
married	88	80.7
divorced or widowed	17	15.6

Duration of Type 2 DM (in years)		
<=11	66	61.7
>11	41	38.3
Type of medication		
Oral hypoglycemic only	47	43.1
Insulin only	25	22.9
Both	37	33.9
Comorbidities		
Hypertension	66	60.5
Dyslipidemia	44	40.3
Cardiac disease	7	6.4
HIV	3	2.7
Thyroid disease	1	0.9
Diabetes related complications		
Neuropathy	19	17.4
Nephropathy	14	12.8
Retinopathy	13	11.9
IHD	2	1.8
PAD	1	0.9
Gastropathy	1	0.9

5.2. Laboratory features and Health status

Among the participants 68 (62.4%) patients had Hgba1c done in the past 6 months with mean of 9 (SD=2.5) and range of 10 (minimum=5.9, maximum=16). Out of those patients who had recent hgba1c, only 13 (19.1%) of those patients had Hgba1c of less than 7. 17(25%) of them had hgba1c level of 10 or more. The mean of their FBS was 154.7 (SD=57.2). 42(39.3%) had FBS of 130 or less. 22 (20.6%) of them had FBS of 200 or more

Out of the 109 patients enrolled in the study 63(57.8%) and 65 (59.6%) had recent LDL and HDL done respectively. Out of those who had the investigation 36(57.1%) had LDL value of more than 100 and 25(38.5%) had TG of more than 150.

When asked if there has been any weight loss in the past 3 months 21 (19.2%) had weight loss of different degrees. Out of all of the enrolled patients, 7.3% had less than 5% of weight loss, 10.1% had weight loss ranging between 5 and 10 % and 1.8% had weight loss of more than 10%. 34 (31.2%) of the patients had appetite loss of variable degree in the past 6 months. Out of all the enrolled patients 20.2% of the patients claimed that their appetite has decreased in the range between 10 and 25 percent. Out of those who had appetite loss around 85.3% of them had dietary change because of it. Out of those who had dietary change 79.4% of them were using a suboptimal solid diet and 5% are taking hypocloric liquid diet. The remaining patients with appetite loss had no dietary change.

Regarding their functional status 61(56%) were working properly while 33(30.3%) were working suboptimally. 15(13.8%) are ambulatory but are not working. There were no bedridden patients. Patients were assessed for four GI symptoms including nausea, vomiting, diarrhea and decreased appetite. 38(34.9%) have had atleast one of those symptoms persistently for a duration of 2 weeks in the past 3 months. Out of the symptomatic patients15.8% have had 2 symptoms and 10.5% have had 3 symptoms out of 4. Out of the 109 participants 87(79.8%) claimed that they do regular exercise. The mean of exercise duration, calculated in minutes per week was 182.7 (SD=14.4 minimum=14, maximum 630). The most common exercise type was walking(67, 74.4%). 35(32.1%) of the patients claimed to adhere to lifestyle modification properly 55(50.5%) partially and 19(17.4%) not at all.

Table 2 Laboratory features and health status of patients who were on follow up at TASH endocrine clinic in the month of October 2020 (n=109)

variables	Frequency	Percent
FBS		
<=130 mg/dl	42	38.5
>130 mg/dl	65	59.6
HgbA1c (%)		
<=7	13	19.1
7.1- 9.9	38	55.9
>=10	17	25.0
LDL (mg/dl)		
=<70	11	17.5
71-99	16	25.4
>=100	36	57.1
TG (mg/dl)		
<=150	40	61.5
>150	25	38.5
Weight loss		
<5%	8	7.3
5-10%	11	10.1
>10%	2	1.8
No weight loss	83	76.1
not sure	5	4.6
Appetite loss		
< 10%	3	2.8
10-25%	22	20.2
26-50%	7	6.4
51-75%	2	1.8
No appetite loss	69	63.3
not sure	6	5.5

Functional status		
working properly	61	56.0
working suboptimally	33	30.3
ambulatory but not working	15	13.8
Exercise Duration (in minutes/week)		
<=74	15	20.5
75-149	16	21.9
>=150	42	38.5

5.3. Dietary pattern and nutritional status

The mean of the BMI of the participants was 27.6(SD=4.5) with the minimum of 18.3 and maximum of 41. Majority of the patients(40.2%) had BMI in the range of 25-29.9. Subjective global assessment was done for all of the participants. 30(27.5%) of the patients were labeled under SGA class B which falls under mild to moderate under nutrition. Out of these undernourished patients 53.3% of them were labeled as overweight or obese when assessed with BMI. Abnormal BMI was found to be associated with SGA score of B ((p=0.02, COR:- 2.87 95%CI (1.2-6.9))

The type of food the participants consumed daily was assessed. 17 (15.7%) of the participants consumed vegetables on daily basis and 5(4.6%) of them consumed vegetables at least once a week. 47(43.1%) of the participants claimed to never take potatoes but around 51(46.8%) of them consumed it occasionally. Banana and orange were the most common fruits included in the participants' diet. Around 22% and 17.4% took banana and orange often respectively. 29.4% of them took other fruits often as part of their diet. Regarding meat products 78(71.6%) of the participants never take fish. 91(83.5%) of the patients had chicken, 71(65.1%) had mutton and 59(54.1%) of them took beef occasionally. 20(`18.3%) of the participants claimed to have milk daily, 36(33%) often and 16(14.7%)of them never have milk. When asked about bread product

51(46.8%) of the patients never consume white bread, 54(49.5%) of them never consume whole wheat bread and around 45(41.3%) of the patients consumed barely bread occasionally. 57(52.3%) and 60(55%) consumed pasta and rice occasionally respectively. 91(83.5%) of the patients never consume alcohol and 81(74.3%) of the patients never take deep fried foods.

Table 3 Dietary pattern of patients who were on follow up at TASH endocrine clinic in the month of October 2020

Variables	Frequency	Percentage
Vegetables		
daily	17	15.7
often	48	44.4
occasionally	37	34.3
once a week	5	4.6
never .	1	.9
Potatoes		
often	4	3.7
occasionally	51	46.8
once a week	7	6.4
never	47	43.1
Fruits		
Banana		
daily	14	12.8
often	24	22.0
occasionally	48	44.0
once a week	13	11.9
never	10	9.2
Orange		
daily	11	10.1
often	19	17.4

occasionally	49	45.0
once a week	10	9.2
never	20	18.3
Other fruits		
daily	3	2.8
often	32	29.6
occasionally	43	39.8
once a week	8	7.4
never	22	20.4
Meat products		
Fish		
daily	1	0.9
often	4	3.7
occasionally	24	22.0
once a week	2	1.8
never	78	71.6
chicken		
often	1	0.9
occasionally	91	83.5
once a week	2	1.8
never	15	13.8
Mutton		
often	14	12.8
occasionally	71	65.1
once a week	2	1.8
never	22	20.2
Beef		
daily	2	1.8
often	24	22.0
occasionally	59	54.1
once a week	11	10.1

never	13	11.9
Milk/other dairy products		
daily	20	18.3
often	36	33.0
occasionally	30	27.5
once a week	7	6.4
never	16	14.7
Eggs		
daily	3	2.8
often	21	19.4
occasionally	52	48.1
once a week	8	7.4
never	24	22.0
Grain products		
White bread		
daily	3	2.8
often	10	9.2
occasionally	40	36.7
once a week	5	4.6
never	51	46.8
Whole wheat bread		
often	10	9.2
occasionally	45	41.3
never	54	49.5

Barley bread		
daily	9	8.3
often	25	22.9
occasionally	45	41.3
once a week	5	4.6
Pasta		
often	6	5.5
occasionally	57	52.3
once a week	9	8.3
never	37	33.9
Rice		
often	7	6.4
occasionally	60	55.0
once a week	6	5.5
never	36	33.0
Injera		
daily	88	80.7
often	21	19.3
Shiro		
daily	32	29.4
often	58	53.2
occasionally	16	14.7
once a week	2	1.8
never .	1	.9
Grain (lentil,pea etc..) stew		
daily	5	4.6
often	44	40.4
occasionally	35	32.1
once a week	12	11.0
never	13	11.9

Table 4 Nutritional status of patients who were on follow up at TASH endocrine clinic in the month of October 2020

Variables	Frequency	percentage
BMI(Kg/M^2)		
<18.49	1	0.9
18.5-24.9	31	29
25-29.9	43	40.2
30-34.9	27	24.8
35-39.9	3	2.8
>=40	2	1.8
SGA		
A	79	72.5
B	30	27.5

5.4. Knowledge and attitude towards dietary modification

33(30.3%) of the participants said never to have received advise from a health personnel about dietary modification while 31(28.4%0 said they have received advise intermittently. 45 (41.3%) of them said they have been advised about dietary modification on every visit. When asked if there are prohibited food for diabetic patients 78(71.6%) of them said sugar, fat bread and potatoes are prohibited. 18(16.5%0 of them said wheat products are prohibited. 80(73.4%) of the participants said fruits and vegetables are advocated foods. 42(38.5%) of the patients felt that their lifestyle has been compromised due to the lifestyle modification.

5.5. Associations

Three factors were identified to have statistically significant association with moderate malnutrition or SGA level B using multivariate logistic regression analysis. These are presence of GI symptoms (P=0.000, 95% CI (3.9-78.4) AOR=17.5) , presence of diabetic complications

(P=0.031, 95% CI (1.2-19.7) AOR=4.8) and appetite loss (P=0.000, 95%CI (7.97-148) AOR=34.4).

Table 5 Multivariate analysis between diabetic complication, GI symptoms and appetite change

	Sig.	AOR	95% C.I.for EXP(B) Lower	Upper
Diabetic complications	.031	4.763	1.153	19.675
GI symptoms	.000	17.498	3.907	78.360
Appetite change	.000	34.361	7.974	148.059

6. Discussion

The objective of this study is to assess the nutritional status and dietary patterns of Type 2 Diabetes patients in TASH endocrine clinic. The incidence of under nutrition in diabetic patients even when found to be classified as overweight or obese using the BMI index is used for evaluation was speculated. In this study 69.6% of the patients had a BMI of 25 or more. Out of these patients 21.3% of them were found to have mild to moderate under nutrition when assessed using the SGA. Similar studies have reported malnutrition among overweight and obese diabetic patient ranging between 10% and 37%. In the study done in Gaza 31.5% of the patients who had a BMI of more than 30 were found to be malnourished when assessed using nutritional screening tools(8). Another study conducted in Morocco involving elderly obese diabetic patients stated that 10.8% of those patients were found to be undernourished (11). In the Philippines' study 37% of the overweight patients were found to have high nutrition risk when assessed using the SGA (10)

The association between malnutrition and diabetic complications was illicited in some studies. In this study there was a statistically significant association between classification based on SGA and diabetic complications (P=0.031, 95% CI (1.2-19.7) AOR=4.8) On the same token the turkey study showed Hgba1c was higher in the malnourished group (9) and the Gaza study stated that patients with lower risk of malnutrition had lower odds for number of diabetic complications (8).

In this study Diabetic complications, gastrointestinal symptoms and appetite change were found to have statistically significant association with moderate nutrition. Patients with GI symptoms P=0.000, 95% CI (3.9-78.4) AOR=17.5) , appetite change(P=0.000, 95%CI (7.97-148) AOR=34.4) and diabetic complications (P=0.031, 95% CI (1.2-19.7) AOR=4.8) are more likely to be in the category of SGA level B which is designated as mild to moderate malnutrition. This is in line with the Turkish study which stated appetite change as one of the risk factors for malnutrition(9) . Presence of GI symptoms and diabetic complications were not mentioned in neither the Turkey's nor the Philippines' study as a risk factor.

7. Conclusion

Majority of the participants in this study were found to be obese but among the obese patients, there is a significant number of undernourished patients. The presence of gastrointestinal symptoms such as nausea, vomiting, loss of appetite and diarrhea, diabetic complications and appetite changes were found to be associated with under nutrition

8. Recommendations

- Nutritional assessment tools in addition to BMI are needed to determine the true nutritional status of the patients
- Patients should frequently be screened for gastrointestinal symptoms, diabetic complications and appetite change
- Customized dietary plan preparation and patient consultation needs to be incorporated in the regular follow up of diabetic patients

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10. Annexes

10.1. Informed Consent Form

Acute kidney injury is one of the complications of critically ill patient, which happen to determine their outcomes as well. This study aims to see the incidence of this disease in the ICU. The information obtained will be used by policy makers and managing physicians for better care of individual patient and the strategic control of this disease.

For this reason, we kindly request you to participate in the study by responding to the interview and information gathered from medical record chart. We assure you that confidentiality of the information obtained is kept. If you have any questions we will be so happy to entertain them.

I confirm that I have understood what has been read/what I have read has been clear to me, and I have agreed to participate in the study.

Name_____

Signature_____

ስለ ጥናቱ

በምርምርጥናቱላይሲሳተፉማንነቶጥናቱከሚያካሂዱግለሰቦችዉጪማንምአያዉቅም፣የጥናቱአ ላማለትምህርትናለምርምርየሚዉልሲሆንምንምአይነትተፅኖበእርሶላይአያመጣም።ጥናቱላይከ ተሳተፉበኋላበማንኛዉምጊዜከጥናቱያለምንምችግርመዉጣትይችላሉ

በጥናቱላይከመሣተፎበፊትማንኛዉምዐይነትጥያቄካሎትጥናቱንየሚያደርገዉንባለሙያከላይበ ተጠቀሰውየስልክወይምየኢሜልአድራሻማግኘትይችላሉ።

በዚህጥናትላይለመሣተፍከተስማሙበፊርማዎትያረጋግጡ።

ስም ፡ .....

ፊርማ ፡ .....

10.2. English version Questionnaire

Nutritional profiles of type 2 DM patients on follow up at TASH Endocrine Clinic

1. Sociodemographic status

I care number:- _____	Age:- _____	Sex_____
Occupation:- _____	Income:- _____	Address:- _____
Level of education:- _____	Number of dependent staying with them _____	Marital status _____

2. Medical History

When was type 2 DM diagnosed?	
How many years on follow up at TASH?	
Which medications is the patient using for type 2 diabetes currently?	○ Oral hypoglycemic ○ insulin ○ both
Diabetic complications	○ Retinopathy diagnosed _____ yrs/mo back ○ Nephropathy diagnosed _____ yrs/mo back ○ Neuropathy diagnosed _____ yrs/mo back ○ Ischemic heart disease diagnosed _____ yrs/mo back ○ Diabetic foot ulcer diagnosed _____ yrs/mo back ○ Peripheral arterial disease ○ Cerebrovascular disease/stroke ○ Erectile dysfunction ○ Other_____
Other comorbidities	○ HTN

	○ Dyslipidemia ○ Cardiac disease ○ Renal disease ○ Asthma ○ COPD ○ ILD ○ Rheumatoid arthritis ○ Other_____
Other medications list	
GI symptoms that has persisted for more than 2 weeks	○ Nausea ○ Vomiting ○ Diarrhea ○ Loss of appetite
Recent history of hospitalization? (in the past 1 year)	○ No ○ Yes When was the admission? _____

3. Dietary and weight history

3.1. Weekly diet history

Food items	Number of times food is consumed per week					
	daily	Once per week	2-3x/week	>3x/week	occasionally	never
Injera						
Shiro wot						
Split peas/lentil stew/wot						
potato						
Other vegetables						
banana						
orange						
Other fruits						
Beef						
fish						
chicken						
Mutton (sheep meat)						
milk						

Butter						
Egg						
White bread						
Whole wheat bread						
Barley bread						
Pasta/macarooni						
rice						
kolo						
peanut						
alcohol Type and amount _____						
sugar How many teaspoon/day _____						
Added salt						
Artificial sweetener						
Soft drink						
Diet coke/other diet soft drink						
Sambusa/deep fried snacks						
The type of cooking oil usually used						

3.3 weight and functional status

Weight change in the past 6 months	○ loss ○ gain ○ no change ○ not aware	Previous weight_____ Recent weight_____ Estimate of wt loss if previous weight is unknown_____
Appetite change in the past 6 months	○ Increased ○ Decreased ○ same	Estimate of appetite change (in %)
If appetite is decreased what is the pattern	○ Suboptimal solid diet ○ Hypocaloric liquids ○ Starvation	
Functional capacity in the past 3 months	○ Bed ridden ○ Ambulatory but not working ○ Working sub optimally ○ active	

Exercise pattern and Type of exercise	○ don't exercise (reason_____) ○ walking ○ jogging ○ other	How many min per session_____ How many times per week_____

4. Antropometery and P/E

Weight	
Height	
Muscle wasting(quadriceps and deltoid)	
Subcutaneous fat loss (triceps)	
Ankle edema	

5. Important lab data

FBS	
HgbA1c	
LDL	
HDL	
TG	
Cholesterol	
Cr	
Albumin	
Total lymphocyte count	

6. Assessment of knowledge and Practice

1. How often are you advised on lifestyle modification?

☐ On every visit ☐ once in a while ☐ rarely ☐ never

2. Are there foods completely prohibited for diabetic patients? List them

_____

3. Are there foods diabetic patients are encouraged to take? List them

_____

4. Do you feel that the nutritional restriction that comes with diabetes has negatively impacted the quality of your life? If yes, how?

_____

5. Do you feel that you are adhering to the dietary advises as you should?

_____

10.3. Amharic version questionnaire

ቃለ መጠይቅ

1. የኑሮ ሁኔታ

I care number:- _____	ዕድሜ:- _____	ፆታ፡-_____
የስራ ዓይነት:- _____	ገቢ:- _____	የጋብቻ ሁኔታ፡- _____ ፡
የትምህርት ደረጃ:- _____	በቤት ውስጥ የሚያስተዳድሩት ሰው መጠን _____	አድራሻ _____

2. የህክምና ታሪክ

ስኩዋር እንዳለብዎ መቼ አወቁ?	
ለስንት አመታት በጥቁር አንበሳ ሆስፒታል የስኩዋር ክፍል ተከታተሉ?	
ለስኩዋር የሚወስዱዋቸው መድሀኒቶች ምንድን ናቸው?	○ ክኒን ○ መርፌ ○ ሁለቱንም
ሌሎች ተጉዋዳኝ ህመሞች	○ HTN ○ Dyslipidemia ○ Cardiac disease ○ Renal disease ○ Asthma ○ COPD ○ ILD ○ Rheumatoid arthritis ○ Other_____
ሌሎች የሚወስዱዋቸው ተጨማሪ መድሀኒቶች	
ከሁለት ሳምንት በላይ የዘለቁ የሆድ ዕቃ ህመሞች	○ ማቅለሽለሽ ○ ማስታወክ ○ ማስቀመጥ

	○ የምግብ ፍላጎት መቀነስ ○ ሌላ
ባለፈው አንድ አመት በሀመም ምክንያት ሆስፒታል ተኝተው ያውቃሉ?	○ አላውቅም ○ አውቃለሁ ○ ካወቁ ከስንት ጊዜ በፊት ነበረ? _____

3. የአበላልና የክብደት ታሪክ

3.1. የሣምንቱ ምግብ ታሪክ

የምግብ ዓይነቶች	በሳምንት ስንት ጊዜ የተጠቀሱትን ምግቦች ይመገባሉ					
	በየቀኑ	በሳምንት 1 ጊዜ	በሳምንት 2-3 ጊዜ	በሳምንት 3 ጊዜ በላይ	አልፎ አልፎ	በጭራሽ
እንጀራ						
ሽሮ ወጥ						
ምስር/አተር ወጥ						
ድንች						
ሌሎች አትክልቶች ግለጽ፡- _____						
ሙዝ						
ብርቱካን						
ሌሎች ፍራፍሬዎች ግለጽ፡- _____						
የበሬ ስጋ						
ዓሳ						
ዶሮ						
የበግ/የፍየል ስጋ						
ወተት						
ቅቤ						
እንቁላል						
ነጭ ፉሩኖ ዳቦ						

ጥቁር ዳቦ						
ገብስ ዳቦ						
ፓስታ/ መኮረኒ						
ሩዝ						
ቆሎ						
ለውዝ						
አልኮል ዓይነትና መጠን ግለጽ _____						
ስኩዋር ስንት ማንኪያ በቀን _____						
ጨው						
ማጣፈጫ/ Artificial sweetener						
ለስላሳ መጠጥ						
ስኩዋር የሌለው ለስላሳ መጠጥ						
የተጠበሱ ምግቦች (Sambusa/deep fried snacks)						
ምግብ ለመስራት የሚጠቀሙት የዘይት ዓይነት						

3.2. የክብደትና የአቅም ሁኔታ

ባለፉት 6 ወራት ውስጥ የነበረ የክብደት ለውጥ	○ መጨመር ○ መቀነስ ○ ለውጥ የለም ○ አላስተዋልኩም	የክብደት ለውጥ ከነበረ ምን ያህል ኪሎ ጨመሩ/ቀነሱ?
ባለፉት 6 ወራት ውስጥ የነበረ የምግብ ፍላጎት ለውጥ	○ መጨመር ○ መቀነስ ○ ለውጥ የለም ○ አላስተዋልኩም	የምግብ ፍላጎት ለውጥ ከነበረ በፐርሰንት ምን ያህል ጨመሩ/ቀነሱ?
የምግብ ፍላጎት ከቀነሰ በአሁኑ ወቅት ምን ይመገባሉ	○ የወትሮ ምግብ መጠኑ ተቀንሶ ○ ፈሳሽ ነገር ብቻ ○ ምንም አልመገብም	

ባለፉት 3 ወራት ያሎት የአቅም ሁኔታ	○ የአልጋ ቁራኛ ○ መጠነኛ የእለት እለት እንቅስቃሴ ብቻ ○ መጠነኛ ስራ እሰራለሁ ○ ስራ በአግባቡ እሰራለሁ	
ስፖርታዊ እንቅስቃሴ	○ አላደርግም (ምክኒያት_____) ○ የቤት ውስጥ ስራ ○ እርምጃ ○ ሶምሶማ ○ ሌላ	በሳምንት ስንት ቀን_____ ለስንት ደቂቃ_____

4. የእውቀትና የትግበራ ሁኔታ

4.1. ስለ አመጋገብዎና ስለ ስፖርታዊ እንቅስቃሴ ከሀኪምዎ ጋር በምን ያህል ጊዜ ይወያያሉዘ?

☐ በመጣሁ ቁጥር ☐ አልፎ አልፎ ☐ ተነጋግሬ አላውቅም

4.2. የስኩዋር ታካሚዎች መመገብ የለባቸውም ብለው የሚያስቡዋቸው ምግቦች አሉ? ካሉ እነማን ናቸው?

_____

4.3. የስኩዋር ታካሚዎች እንዲመገቡ ከሚበረታቱ ምግቦች መሃከል የተወሰኑትን ይጥቀሱ

_____

4.4. በስኩዋር ህመም ምክኒያት በአመጋገቦት ላይ ያስከተለው ግደባ በኑሮዎት ላይ አሉታዊ ተጽዕኖ አሳደሮዋል? ካሳደረ በምን መልኩ አሳደረ?

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4.5. ስለ አመጋገብዎና ስለ ስፖርታዊ እንቅስቃሴ የተሰጥዎትን ምክር ይተገብራሉ?

አልተገብርም

በከፊል እተገብራለሁ

በሙሉ እተገብራለሁ