

Dietary Non-adherence and Associated Factors among Adults with Type 2 Diabetes in Ethiopia: A Sequential Explanatory Mixed- Methods Study

Abowak Ulfata Megersa

ulfataabowak@gmail.com

At Addis Ababa Health Bureau, Kolfe District 9 Health Center

Kinfe Haile Wachima

Saint Paul Hospital Millennium Medical College

Research Article

Keywords: Dietary, non-adherence, diabetes, Shaggar, Ethiopia

Posted Date: October 19th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-9868231/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

Background

Diabetes mellitus (DM) is one of the leading causes of death globally and the most rapidly growing cause of health loss. Current evidence strongly suggests that lifestyle changes, along with weight reduction, seem to overcome the genetic risk of the disease in individuals with pre-diabetes or recent type 2 DM. Despite efforts, adherence to dietary recommendations remains limited in Ethiopia.

Methods

Sequential explanatory mixed methods were employed, with a quantitative cross-sectional study, followed by semi-structured interviews in public health facilities in Shaggar City. For the quantitative phase, 588 type 2 diabetic patients were selected using systematic random sampling. Quantitative data were summarized using descriptive statistics, and logistic regression was performed to identify factors associated with non-adherence to dietary recommendations. Qualitative data were analyzed using a thematic analysis approach.

Results

The magnitude of non-adherence to dietary recommendations was 68.90% (95% confidence interval [CI]: 64.9%, 72.8%). In multivariable logistic regression, household food insecurity (Adjusted Odds Ratio (AOR) = 4.04; 95% CI (2.07, 7.90), poor dietary knowledge (AOR = 2.14; 95% CI:(1.28–3.58), poor family support (AOR = 4.23; 95% CI: (2.44–7.31), normal body weight (AOR = 0.37, 95% CI (0.18–0.77), overweight (AOR = 0.41, 95% CI: (0.18–0.92) compared to obese, less than five years of follow-up (AOR = 2.56, 95% CI: (1.26–5.17), not receiving printed nutritional health education materials (AOR = 2.51; 95%CI: (1.31–4.81), and not accessing audio visual nutritional education (AOR = 1.98; 95%CI: (1.003–3.93) were significantly associated with non-adherence to dietary recommendations. Thematic analysis revealed that financial constraints, inflation, poor dietary knowledge, sedentary lifestyle, poor family support, and recent diagnosis of diabetes were barriers to adherence to dietary recommendations.

Conclusions

The magnitude of non-adherence to dietary recommendations was high, with multiple individual, household, and healthcare-related factors. Qualitative findings further highlighted economic constraints, sedentary lifestyle, and poor knowledge as key barriers, underscoring the need for multifaceted interventions to improve dietary adherence among diabetic patients.

Introduction

Diabetes mellitus (DM) is one of the leading causes of death and among the top ten most significant drivers of disease burden globally(1). It is a major cause of premature death and disability. Currently, more than 500 million individuals deal with diabetes globally, and this number is expected to increase to 783 million by 2045. In 2021 alone, 6.7 million individuals between the ages of 20 and 79 years died owing to diabetes-related reasons. Healthcare costs related to diabetes are approaching one trillion United States dollars and are projected to surpass this amount by 2030(2). Currently, 24 million adults in Africa have diabetes, and this number is projected to rise by 129% to reach 55 million adults by 2045. In Africa, the rate of premature death due to diabetes is 58%, surpassing the global average of 48%. Additionally, the region's standardized death rate for diabetes is 48 per 100,000 people, which is more than double the global rate of 23 per 100,000. In 2021, more than 1.9 million people in Ethiopia had diabetes(3).

Diet is considered a modifiable factor contributing to the development of type 2 diabetes(4). A balanced diet focusing on whole grains, lean proteins, fruits, and vegetables can help to control blood glucose levels and reduce the risk of diabetes and its complications(5). Current evidence strongly suggests that lifestyle changes, along with weight reduction, overcome the genetic risk of the disease in individuals with pre-diabetes or recent type 2 diabetes(6). When diabetes is not appropriately controlled, it leads to complications that pose a risk to health and put life in danger. It affects the heart, blood vessels, eyes, kidneys, and nerves, eventually causing heart disease and stroke, reduced quality of life, and may even result in death(7). To reduce the risk of type 2 diabetes mellitus and its complications, the WHO recommends a healthy body weight, being active daily for 30 minutes, and consuming the recommended diets(3).

Different studies have reported that older age(8),(9) poor social support, lack of nutritional education, unaffordability of recommended diets(10–13), low perceived importance of dietary recommendations, stress, poor appetite, long time to cook the recommended diet, and social events contribute to non-adherence to dietary recommendations(12). Patients' dietary habits are traced back to cultural, environmental, social, and religious influences of their respective societies(14).

In order to tackle diabetes mellitus, the Ministry of Health of Ethiopia has developed a national strategic plan for non-communicable diseases (NCDs) that primarily targets the reduction of unhealthy dietary habits, physical inactivity, tobacco use, and harmful alcohol consumption. Additionally, the Ethiopian Public Health Institute (EPHI) has established Food-Based Dietary Guidelines aimed at promoting sustainable healthy diets(15). Despite these efforts, adherence to dietary recommendations is poor(16, 17). Dietary adherence and its components require further studies that dive deep to develop more effective management strategies for type 2 diabetes patients(14). The basic premise behind using a mixed-methods research design is that combining more than one type of data source provides a more comprehensive understanding of a research problem compared with a one-dimensional methodological approach(18). Therefore, this study aimed to assess non-adherence to dietary recommendations and its associated factors among patients with type 2 diabetes mellitus attending chronic outpatient departments of public health facilities in Shaggar City, Oromia, Ethiopia, in 2025.

Material and methods

Study setting and period

This study was conducted at public health facilities in the city of Shaggar. Shaggar City is a metropolitan city in the Oromia regional state, located around the capital, Addis Ababa City. City residents are agricultural and semi-agrarian residents with a population of 2,873,093, of which 1,379,629 are men. Shaggar City has 12 sub-cities and 36 districts(19). It encompasses 28 public health centers, 2 public hospitals, and 80 health posts. The city's workforce consists of 1,460 health professionals and 266 health extension workers. Most of these public health facilities have chronic outpatient care clinics that mainly provide services for diabetes mellitus, hypertension, and bronchial asthma. The number of patients with diabetes mellitus on follow-up in public health facilities in this city was 4569(20). The study was conducted from March to May, 2025.

Study design

Sequential explanatory, mixed methods were employed, comprising a cross-sectional survey followed by semi-structured interviews.

Source population

The source populations were all patients with type 2 diabetes who were followed up in the chronic outpatient care department of public health facilities in Shaggar city.

Study population for quantitative study

The study populations were randomly selected type 2 diabetic patients 18 years or older at follow-up in the chronic care outpatient department.

Study population for qualitative study

The study populations were purposively selected type 2 diabetic patients 18 years or older at follow-up in the chronic outpatient department.

Eligibility criteria

Inclusion criteria

Patients diagnosed with type 2 diabetes mellitus visiting the chronic outpatient departments of public health facilities in Shaggar City were included in this study.

Exclusion criteria

Patients diagnosed with type 2 diabetes mellitus for less than three months, pregnant and lactating women, and patients requiring constant medical support and monitoring were excluded from this study.

Sample size determination

Sample size determination for quantitative study

The sample size was determined using a single population proportion formula, considering the following assumptions: the magnitude of non-adherence to dietary recommendations among patients with type 2 diabetes mellitus (64.2%), based on a study conducted at Adama Hospital Medical College(21), a 95% confidence level, and a 5% degree of precision. Considering a 10% nonresponse rate and a design effect of 1.5, the final sample size was 588.

Sample size determination for qualitative study

The study participants were selected until the saturation level was reached. Data saturation was achieved by conducting 17 interviews.

Sampling technique and procedures

Sampling technique and procedures for quantitative study

A multi-stage sampling technique was employed in this study. There were 12 sub-cities and 30 public health facilities in Shaggar City. Four of the 12 sub-cities were randomly selected using the lottery method. These were the Burayu, Sebeta, Koye Feche, and Furi sub-cities, respectively. Nine public health facilities were randomly selected. These centers were the Dima Hospital, Burayu Health Center, Alemgena Health Center, Walate Health Center, Anne Dima Health Center, Sebeta Health Center, Tulu Dimtu Health Center, Kilinto Health Center, and Insilale Health Center. Study participants were selected through systematic sampling. The total number of individuals diagnosed with type 2 diabetes mellitus over an average of three months was 2,085.

Sampling technique and procedures for qualitative study

A purposive sampling technique was used to derive a maximum variation sample of individuals who differed across multiple criteria, such as age, sex, education, income, occupation, marital status, etc., to achieve an optimum mix-matrix(22). The purpose of using the maximum variation technique was to gather different lived experiences. These individuals were selected from the members sampled during the quantitative phase. Therefore, connecting was used to integrate both methods through the interlinkage of the dataset in the sampling frame(23).

Study variables

Dependent variable: Non-adherence to dietary recommendations

Independent variables:

Socio-demographic characteristics included: sex, age, level of education, marital status, religion, monthly income, and family size.

Behavioral, knowledge, and psychosocial factors: alcohol consumption, smoking, food habits, family support, and social events.

Health status and health-related factors: such as comorbidities, duration of DM, Body Mass Index (BMI), and Fasting Blood Sugar (FBS).

Health information (education) factors: health education, printed/IEC materials, nutritional education, sources of information, understanding information, etc.

Operational definitions

Body mass index (BMI) is a screening tool used to measure the ratio of weight to height and to estimate the amount of body fat (underweight $< 18.5 \text{ kg/m}^2$, normal BMI $18.5 \text{ kg/m}^2 < 25 \text{ kg/m}^2$, overweight 25 kg/m^2 to $< 30 \text{ kg/m}^2$, obesity greater than or equal to 30 kg/m^2)(24).

The habit of smoking: Participants who smoked ≥ 100 cigarettes in their lifetime and/or currently smoked cigarettes were considered as smoker in this study(25).

Alcohol consumption: Participants who consumed ≥ 3 drinks per day for females, ≥ 4 drinks per day for males were considered alcohol drinkers in this study(26).

Physical exercise: Participants who engaged in physical activity lasting 30 min/day for at least five days per week were considered to be engaged in regular physical exercise(27).

Dietary non-adherence was assessed using PDAQ (Perceived Dietary adherence Questionnaire). It contains nine questions with Likert scale options ranging from 0 to 7. The answer was determined using

a seven-point Likert scale to respond to the question “How many days out of the past 7 days did you...?” Higher scores demonstrated better adherence, except for items 4 and 9, which signified bad choices (foods high in sugar or fat). Higher scores reflected lower adherence; therefore, to compute the total PDAQ score, the scores for these items were inverted. Patients were considered to have dietary adherence if they consumed a healthy diet for at least four days in the week. A response of less than four days per week was considered as dietary non-adherence(28).

Family support: The family support questionnaire was designed to assess the family's perspective on their support network and their willingness to assist individuals with type 2 diabetes mellitus in adopting healthier eating habits, and was originally developed by Hensarling from different literature. HDFSS is defined as how people with type 2 diabetes view their families' support. Good family support is indicated if the score is high. The HDFSS consists of 24 questions (0 = never, 1 = hardly ever, 2 = sometimes, 3 = most of the time, and 4 = all of the time)(29,30).

Dietary knowledge was assessed using a questionnaire prepared after an intensive review of the literature. It consisted of 21 multiple-choice questions (MCQs). The questions were designed to assess patients' dietary knowledge. Each MCQ item had only one correct answer. Responses were coded as 1= correct, 0= wrong, or I do not know. The score ranged from 0 to 21, with a higher score indicating a higher level of dietary knowledge (DK). The quantitative score variable was categorized as percentage. A score <50% indicated poor dietary knowledge, whereas a score ≥ 50 indicated good dietary knowledge(31–33).

Household Food insecurity was measured using the Food and Nutrition Technical Assistance (FANTA) tool and Household Food Insecurity Access Scale (HFIAS). This consists of nine occurrence questions that represent a generally increasing level of severity of food insecurity (access), and nine “frequency-of-occurrence” questions that were asked as a follow-up to each occurrence question to determine how often the condition has occurred. The frequency-of-occurrence question was skipped if the respondent reported that the condition described in the corresponding occurrence question had not been experienced in the previous four weeks (30 days). Therefore, a food insecure household is a household that worries about not having enough food sometimes or often, and/or is unable to eat preferred foods, and/or eat a more monotonous diet than desired, and/or some foods rarely considered undesirable. And/or sacrifice quality more frequently by eating a monotonous diet or undesirable foods sometimes or often, and/or has started to cut back on quantity by reducing the size or number of meals, rarely or sometimes. And/or running out of food, going to bed hungry, or going a whole day and night without eating (34).

Data collection tool, methods and procedures

Data collection tool, methods and procedures for quantitative study

The data collection tool used in this study had four major parts. A structured questionnaire was developed in English and translated into Afan Oromo, where four trained clinical nurses collected data from public health facilities of Shaggar sub-cities that provide NCD services in the morning, and a medical chart review was applied for the specified biochemical laboratory results.

Data collection tool, methods and procedures for qualitative study

In-depth interviews were conducted to explore perceived barriers to adherence to dietary recommendations. The checklist/semi-structured questions were developed after the quantitative study findings, and were prepared in English and translated into Afan Oromo. The duration of each interview was based on the interviewees' interview conditions, which varied from 40 to 60 min. In-depth interviews, were conducted face-to-face, and audio was recorded and transcribed verbatim.

Data quality control

Data quality control for quantitative study

The questionnaire was pretested on 5% of patients with type 2 diabetes mellitus in Holeta Town prior to the actual data collection. The questionnaire was modified and corrected based on the pre-test results. During the data collection process, four experienced clinical nurses were recruited and trained for data collection. On each data collection day, the principal investigator checked and reviewed the collected data for completeness.

Data quality assurance for qualitative study

In this study, trustworthiness is ensured by applying the principles of credibility, transferability, dependability, and confirmability. To ensure credibility, prolonged engagement was conducted during the interviews. To ensure transferability, detailed descriptions of participants were established in the context of their demographics, background, and experience. Dependability was ensured by providing a clear description of the research design, data collection methods, and the analysis process. Confirmability was established through member checking by providing respondent validations(35–37).

Data processing and analysis

Data processing and analysis for quantitative study

Data were cleaned, coded, and entered into the Statistical Package for the Social Sciences (SPSS) Windows version 27 for analysis. Descriptive statistics were used to assess basic socio-demographic

characteristics and the prevalence of non-adherence to dietary recommendations. Bivariate logistic regression analyses were performed to determine the crude association between independent and dependent variables. Factors with p values less than 0.25 were entered into multivariable logistic regression models to control for confounding factors. The strength of statistical association was measured by adjusted odds ratio (OR) at 95% confidence interval (CI) and a p-value < 0.05. The goodness of fit was tested using the Hosmer-Lemeshow goodness-of-fit. To determine the correlation between the independent variables, a multicollinearity test was performed using collinearity statistics, and assuming no collinearity was detected.

Data processing and analysis for qualitative study

The audio-recorded interviews were transcribed verbatim and typed using Microsoft Word. It was then imported into qualitative data analysis software (open code) and analyzed using a thematic analysis model. Each interview text was scrutinized several times and first-level codes were extracted by breaking down the texts. The initial codes were then categorized according to their similarities and differences, and second-level codes were produced by naming each category, repeating the categorization, combining similar codes, and adding new emerging codes.

Ethical considerations

This study was conducted after obtaining ethical approval from the Institutional Review Board of Saint Paul Hospital, Millennium Medical College (SPHMMC). Oral consent was obtained from all participants prior to the interview. Verbal informed consent was approved by the Ethics Research Review Board of Saint Paul Hospital Millennium Medical College and the study was conducted under the Declaration of Helsinki. In addition, all responses were kept confidential and the questionnaire was anonymous. At the end of the interview, health information regarding adherence to the dietary recommendations was provided. An individual with diabetes complications during data collection was treated according to the treatment protocol.

Results

Quantitative results

Socio-demographic characteristics of the study participants

A total of 582 of 588 patients with type 2 diabetes mellitus participated in this study, yielding a response rate of 98.97%. Of the participants, 298 (51.20%), were female. The mean ($\pm$ SD) age of the participants was 56.8 ($\pm$ 11.40) years. Around six in ten participants, 359 (61.70%), were between the ages of 18 and 59 years old. Among the participants, 217 (37.30%), did not have a formal education, while 199 (34.20%),

attended primary education. Most of the participants, 429 (73.70%), were married. Regarding religion, 202 (34.70%), were Orthodox, followed by 199 (34.20%) Muslims. Among the participants, 473 (81.30%), were urban residents. Among the participants, 190 (32.60%) were merchants, 223 (38.30%) had a monthly income of less than 7,000.00 ET birr, and more than half, 324 (55.70%), had family members greater than or equal to five members. Furthermore, more than half of the participants, 340 (58.40%), lived in food-insecure households. (Table 1)

Table 1
Socio-demographic characteristics of patients with type 2 diabetes mellitus attending public health facilities of Shaggar City, Oromia, Ethiopia 2025

Variables	Category	Frequency	Percentage
Gender	Male	284	48.8
	Female	298	51.2
Age	18–59	359	61.7
	>/= 60	223	38.3
Level of education	No formal education	217	37.3
	Primary education (Grade 1–8)	199	34.2
	Secondary education	101	17.4
	College and above	65	11.2
Marital status	Single	29	5.0
	Married	429	73.7
	Divorced	75	12.9
	Widowed	49	8.4
Religion	Protestant	156	26.8
	Muslim	199	34.2
	Orthodox	202	34.7
	Catholic	14	2.4
	Wakefata	11	1.9
Place of residence	Urban	473	81.3
	Rural	109	18.7
Occupation	Merchant	190	32.6
	Civil servant	148	25.4
	Housewife	84	14.4
	Others (farmer, artist, religion leader, daily laborer)	160	27.5
Monthly income	< 7000	223	38.3
	7000–12000	165	28.4
	> 12000	194	33.3

Variables	Category	Frequency	Percentage
Family size	< 5	258	44.3
	>/= 5	324	55.7
Household's food security status	Food insecure	340	58.4
	Food secure	242	41.6

Behavioral, Knowledge, and Psychosocial characteristics of the participants

Among the total participants, 20 (3.4%), were smokers, 126 (21.6%), used alcohol, and approximately one-third of the participants, 185 (31.8%), engaged in regular physical exercise. Of the total participants, 359 (61.7%), had poor dietary knowledge, and 306 (52.6%), had experienced poor family support. (Table 2)

Table 2
Behavioral, Knowledge, and Psychosocial characteristics of patients with type 2 diabetes mellitus attending public health facilities of Shaggar City, Oromia, Ethiopia 2025

Variable	Category	Frequency	Percentage
Smoking	No	562	96.6
	Yes	20	3.4
Alcohol consumption	No	456	78.4
	Yes	126	21.6
Physical exercise	No	397	68.2
	Yes	185	31.8
Dietary knowledge	Poor dietary knowledge	359	61.7
	Good dietary knowledge	223	38.3
Family support	Poor family support	306	52.6
	Good family support	276	47.4

Health status, health-related, and health/nutritional education characteristics of the participants

The mean body mass index was 25.60 kg/m² (SD, ± 4.63). Among all the participants, 230 (39.5%), were classified as overweight and 111 (19.1%), as obese. Most participants, 428 (73.5%), had no comorbid diseases. In addition, 317 (54.5%), participants had fasting blood glucose levels less than 126

mg/dl. Furthermore, the mean duration of follow-up was 8.9 years (SD $\pm$ 6.2). Of the 582 participants, 543 (93.3%), had received health education on nutrition, 150 (25.8%), had received printed health education materials, and 121 (20.8%), had received audio-visual nutritional health education. (Table 3)

Table 3
Health status, health-related, and health education characteristics of patients with type 2 diabetes mellitus attending public health facilities of Shaggar City, Oromia, Ethiopia 2025

Variable	Category	Frequency	Percentage
Body mass index	Underweight (< 18.50 kg/m ²)	47	8.1
	Normal BMI (18.50–25 kg/m ²)	194	33.3
	Overweight (25 kg/m ² -30 kg/m ²)	230	39.5
	Obese ($\geq$ 30 kg/m ²)	111	19.1
Have comorbidity	No	428	73.5
	Yes	154	26.5
Fasting blood glucose /level of glycaemia	< 126	317	54.5
	$\geq$ 126	265	45.5
Duration of diabetes in years	< 5	207	35.6
	5–10	208	35.7
	> 10	167	28.7
Diabetes health educations on nutrition	No	39	6.7
	Yes	543	93.3
Received Printed health education materials on nutrition's	No	432	74.2
	Yes	150	25.8
Received audio-visual nutritional educations	No	461	79.2
	Yes	121	20.8

Magnitude of non-adherence to dietary recommendations

In this study, the magnitude of non-adherence to dietary recommendations was 68.90% (95% CI: 64.90–72.80) (Fig. 1). The question concerning the intake of foods high in sugar and fat received the highest average score, with a mean of 6.49 ± 0.96 and 6.42 ± 0.99 times per week, respectively. The mean ($\pm$ SD) of questions concerning following a healthful eating plan and consuming fruits and vegetables were

almost identical, which was $2.97(\pm 1.72)$ and $2.96(\pm 1.78)$, respectively. Also, the mean ($\pm$ SD) questions concerning eating carbohydrate-containing low glycemic index and fiber-rich foods were almost equal, which was $3.10(\pm 1.71)$ and $3.13 (\pm 1.86)$, respectively. Among the nine PDAQ groups, the question assessing the duration of fish consumption was the least, with a mean ($\pm$ SD) value of $0.12(\pm 0.53)$.

Factors associated with non-adherence to dietary recommendations of type 2 diabetes mellitus patients

In the binary logistic regression, variables such as sex, age, level of education, place of residence, occupation, monthly income, household food security status, alcohol consumption, regular physical exercise, dietary knowledge, family support, body mass index, fasting blood glucose level, duration of DM in years, diabetes health education on nutrition, printed health education materials on nutrition, and received audio visual nutritional health education were $p < 0.25$, and thus, entered into multivariable analysis.

However, after controlling for the possible effects of confounding factors, seven variables, namely: household food insecurity status, poor dietary knowledge, poor family support, body mass index (normal and overweight), less than five years of diabetes follow-up, lack of printed health education materials on nutrition, and not receiving audio visual nutritional health education were significantly associated with non-adherence to dietary recommendations.

The type 2 diabetic patients in households with food insecurity were 4.04 [(AOR = 4.04; 95% CI: (2.07–7.90))] times more likely to be non-adherent to dietary recommendations compared to patients in households with food security. The type 2 diabetic patients with poor dietary knowledge were 2.14 [(AOR = 2.14; 95% CI: (1.28–3.58))] times more likely to be non-adherent to dietary recommendations compared to patients with good dietary knowledge. The type 2 diabetic patients with poor family support were 4.23 [(AOR = 4.23; 95% CI: (2.44–7.31))] times more likely to be non-adherent to dietary recommendations compared to their counterparts. Patients with healthy weight and overweight were by 59% [(AOR = 0.41 95%CI: (0.18–0.92))] and by 63% [(AOR = 0.37; 95%CI: (0.18–0.77))] less likely to be non-adherent to dietary recommendations, respectively, compared to the obese patients. Patients with less than five years of diabetes follow-up were 2.56 [(AOR = 2.56 95%CI: (1.26–5.17))] times more likely to be non-adherent to dietary recommendations compared to those patients with ten years of diabetes follow-up. Regarding printed nutritional health education materials, type 2 diabetic patients who did not receive printed nutritional health education materials were 2.51 [(AOR = 2.51; 95%CI: (1.31–4.81))] times more likely to be non-adherent to dietary recommendations compared to patients receiving printed nutritional health education materials. Patients who did not access audiovisual nutritional education were 1.98 [(AOR = 1.98; 95%CI: (1.003–3.93))] times more likely to be non-adherent to dietary recommendations than their counterparts. (Table 4)

Table 4

Results of multivariable logistic regression analysis of factors associated with non-adherence to dietary recommendations among type 2 diabetes mellitus patients attending public health facilities of Shaggar city, Oromia, Ethiopia 2025

Variables	Category	Non-adherence to dietary recommendations				
		Dietary non-adherence	Dietary adherence	COR (95%CI)	AOR (95%CI)	p-value
Dietary knowledge	Poor	290(80.8%)	69(19.2%)	4.24(2.93–6.15)	2.14(1.28–3.58)	0.004*
	Good	111(49.8%)	112(50.2%)	1	1	
Family support	Poor family support	274(89.5%)	32(10.5%)	10.05(6.50–15.54)	4.23(2.44–7.31)	< 0.001*
	Good family support	127(46%)	149(54%)	1	1	
Body mass index	Underweight	43(91.5%)	4(8.5%)	2.97(0.97–9.09)	1.01(0.27–3.77)	0.989
	Normal weight	144(74.2%)	50(25.8%)	0.79(0.46–1.38)	0.41 (0.18–0.92)	0.031*
	Overweight	127(55.2%)	103(44.8%)	0.34(0.20–0.57)	0.37(0.18–0.77)	0.008*
	Obese	87(78.4%)	24(21.6%)	1	1	
Duration of diabetes follow up in years	< 5	157(75.8%)	50(24.2%)	1.54(0.98–2.43)	2.56(1.26–5.17)	0.009*
	5–10	132(63.5%)	76(36.5%)	0.85(0.56–1.31)	1.81(0.94–3.47)	0.076
	≥ 10	112(67.1%)	55(32.9%)	1	1	
Diabetes health educations on nutrition's	No	33(84.6%)	6(15.4%)	2.62(1.08–6.36)	1.23(0.398–3.79)	0.72
	Yes	368(67.8%)	175(32.2%)	1	1	
Printed health education materials on nutrition's	No	339(78.5%)	93(21.5%)	5.17(3.48–7.70)	2.51(1.31–4.81)	0.006*
	Yes	62(41.3%)	88(58.7%)	1	1	
Audio-visual nutritional educations	No	360(78.1%)	101(21.9%)	6.96(4.50–10.76)	1.98(1.003–3.93)	0.049*
	Yes	41(33.9%)	80(66.1%)	1	1	

Notes: *statistically significant variables; COR: Crude Odds Ratio, AOR: Adjusted Odds Ratio, CI: Confidence Interval

Qualitative study results

Socio-demographic characteristics of the participants

Seventeen participants were purposively selected from the public health facilities of Shaggar City. More than half of the participants, 10 (58.82%), were male. Approximately two-thirds of the participants, 11 (64.71%), were between 30–59 years old. Nearly half of the participants, 8 (47.06%) did not have formal education. The majority of the participants, 13 (76.47%), were married. More than one-third of the participants, 6 (35.29%), were orthodox followers. The majority of the participants, 15 (88.24%), were urban dwellers. More than one-third of the participants, 6 (35.30%), were daily laborers. More than half of the participants, 10 (58.82%), were from families with five or more members. Regarding monthly income, more than half of the participants, 9 (52.94%), earn less than 7,000.00 Ethiopian birr monthly. (Table 5)

Table 5
Socio-demographic characteristics of the participants included in the qualitative study
phase among type 2 diabetes mellitus patients attending public health facilities of
Shaggar city, Oromia, Ethiopia 2025

Variables	Category	Frequency	Percentage (%)
Gender	Male	10	58.82
	Female	7	41.18
Age	30–59	11	64.71
	>/= 60	6	35.29
Level of education	No formal education	8	47.06
	Primary education (Grade 1–8)	6	35.29
	Secondary education	1	5.88
	College and above	2	11.77
Marital status	Single	1	5.88
	Married	13	76.47
	Divorced	1	5.88
	Widowed	2	11.77
Religion	Protestant	4	23.53
	Muslim	5	29.41
	Orthodox	6	35.29
	Catholic	1	5.88
	Wakefata	1	5.88
Place of residence	Urban	15	88.24
	Rural	2	11.76
Occupation	Marchant	5	29.41
	Civil servant	4	23.53
	Housewife	2	11.76
	Daily laborer	6	35.30
Monthly income	< 7000	9	52.94
	7000–12000	5	29.41
	> 12000	3	17.65

Variables	Category	Frequency	Percentage (%)
Family size	< 5	7	41.18
	>/= 5	10	58.82

Qualitative Results

In-depth interviews were conducted with 17 participants. Data analysis generated five major themes explaining barriers to dietary adherence among patients with type 2 diabetes mellitus: socioeconomic and household food insecurity factors, behavioral and knowledge-related factors, psychosocial factors, access to health information, and duration since diagnosis of type 2 diabetes mellitus.

1. Socioeconomic and household food insecurity factors

Socioeconomic constraints emerged as the most prominent barrier to dietary adherence. Participants consistently reported that low income, inflation, unemployment or unstable employment, high food prices, and household food insecurity limited their ability to follow recommended diabetic diets.

Economic hardship was frequently described as making dietary adherence unrealistic. One participant explained: *“Can I adhere to my diabetic diet when even 1 kg of onion is one hundred and twenty Ethiopian Birr? ... my monthly income is so low; most of the time I can’t afford my diet ... I consume the same food with my family.”* (P1, 65-year-old female, Anne Dima Health Center)

Similarly, participants emphasized the absence of food security within households as a key constraint: *“Is it possible to adhere to a diabetic diet when there is not enough food in the house? ... No money, therefore no food security; that’s why I don’t follow the diabetic diet plan.”* (P2, 45-year-old male, Burayu Health Center)

Some participants further described dietary adherence as a “luxury” in the context of poverty and competing household needs. One participant stated: *“Following the diabetic diet is a luxury ... there is not enough food in our house. No money, so no food.”* (P3, 42-year-old male, Walate Health Center)

Another participant added *“Although I tried to follow the dietary recommendations provided by my doctor, I could not adhere to them because I did not have enough money to buy vegetables, fruits, fish, eggs, beans, and other recommended foods. Following the diabetic diet caused me anxiety and distress because of unaffordability.”* (P4, 40-year-old female participant, Dima Primary Hospital)

Employment-related mobility also influenced adherence. Participants working away from home reported relying on available meals at workplaces or restaurants, which limited control over food choices: *“When I am at work, I simply consume what others provide me ... I follow my dietary plan only on weekends.”* (P5, 35-year-old male, Anne Dima Health Center)

2. Behavioral and knowledge-related factors

Participants described behavioral preferences and limited knowledge as important barriers to adherence. These included preference for palatable foods, sedentary lifestyle, and insufficient understanding of appropriate diabetic diets.

Many participants reported a tension between knowledge and behavior, where awareness of dietary advice did not translate into practice. One participant noted: *"I have decided many times to follow my diet guidelines ... unfortunately; I find myself consuming food by my preferences. Those unhealthy foods are so delicious."* **(P6, 47-year-old male, Dima Primary Hospital)**

Food preference and perceived satiety were also important influences. A participant explained: *"I prefer foods my doctor says are unhealthy ... vegetables and beans do not make me feel full. Unless I eat raw meat and drink beer, I don't feel satiety."* **(P7, 40-year-old male, Burayu Health Center)**

In contrast, some participants reported limited knowledge and understanding of diabetic diets. An elderly participant stated: *"I don't know the diabetic diets ... I wish I could know them very well and follow them."* **(P8, 70-year-old female, Kilinto Health Center)**

Low literacy further compounded difficulties in understanding dietary instructions: *"I can't even write numbers ... it is difficult for me to understand what doctors are telling me about diet."* **(P9, 75-year-old male, Alemgena Health Center)**

3. Psychosocial factors

Psychosocial influences, particularly family dynamics, social expectations, emotional distress, and personal beliefs, were reported as major barriers to adherence.

Lack of family support was frequently mentioned. One participant explained: *"My family consumes according to their preferences ... they hardly encourage me to follow my diabetic diet."* **(P10, 66-year-old female, Sebeta Health Center)**

Some participants reported social isolation during meals and emotional distress: *"How can I follow it alone? My family does not support me ... being alone is equal to death."* **(P11, 79-year-old female, Tulu Dimtu Health Center)**

Family cohesion sometimes influenced dietary choices negatively, as participants prioritized shared meals over dietary restrictions: *"I don't separate my meals from my family ... I give priority to my children."* **(P12, 38-year-old female, Tulu Dimtu Health Center)**

Social events such as weddings and gatherings were also described as barriers: *"At weddings or conferences, it is impossible to follow my diet plan..."* **(P13, 51-year-old male, Walate Health Center)**

In addition, some participants expressed skepticism toward medical dietary advice, emphasizing personal beliefs: *"Doctors say eat this but not that... this does not make sense for me..."* **(P14, 60-year-old male, Dima Primary Hospital)**

4. Access to health information

Participants reported insufficient and unclear dietary counseling, limited educational materials, and lack of practical guidance as barriers to adherence.

Dietary advice was often perceived as abstract and difficult to implement. One participant stated: *“What the doctor says is not clear ... I get confused because they say eat these but not those ... there are no pictures or videos.”* (P15, 50-year-old male, Walate Health Center)

Similarly, participants emphasized the lack of practical nutrition education tailored to diabetes management: *“They always tell me what to avoid, but they do not explain how to eat properly in daily life.”* (P16, 48-year-old female, Kilinto Health Center)

5. Duration since diagnosis of diabetes

Participants who were newly diagnosed with diabetes reported greater difficulty in adhering to dietary recommendations due to limited experience and insufficient practical guidance.

One participant explained: *“I was diagnosed with diabetes a few months ago ... I get confused in aligning myself with doctor’s advice because the education is vague and unclear.”* (P17, 55-year-old male, Anne Dima Health Center)

Discussion

This study aimed to assess the non-adherence to dietary recommendations and associated factors in patients with type 2 diabetes. The magnitude of non-adherence to dietary recommendations among patients with type 2 diabetes was 68.90%. In this study, households’ food insecurity status, poor dietary knowledge, poor family support, body mass index (normal and overweight), less than five years of diabetes follow up, lack of printed health education materials on nutrition, and not receiving audio visual nutritional health education were significantly associated with non-adherence to dietary recommendations.

The magnitude of this study is consistent with those of other studies: 64.3% in Jimma(9), 64.4% in Central Ethiopia(38), 64.2% in Adama(21), 62.5% in Afar(39), 62.5% in Dire Dawa(40), and 67.3% in Addis Ababa(41).

The observed magnitude of non-adherence to diabetes dietary recommendations was lower than the magnitude of non-adherence to dietary recommendations in different studies: 74.3% in Gondar(12), 84.3% in Nepal(42), and 97.5% in Egypt(43). This discrepancy might be attributed to differences in dietary assessment methods, variations in access to diabetes nutrition education, cultural dietary practices, and availability of recommended foods may have contributed to the observed differences.

This prevalence of non-adherence to dietary recommendations is higher than that in other studies: 53% in Nepal(10), 46.8% in Bahirdar(13), 58.95% in Ethiopia, which has a pooled prevalence(17), 55.8% in Central Ethiopia(44), 14.8% in Uganda(45), 37.2% in Addis Ababa(46), 51.8% in Illuababor(47), 29.4% in Ghana(48) and 49.3% in the Ashanti region of Ghana(49). These disparities might be due to differences in the study setting, sample size, socio-demographic characteristics of the participants, tools used for measuring the dependent variable, or outcome(44).

This study found a strong association between household food insecurity and non-adherence to dietary recommendations among patients with type 2 diabetes mellitus. Patients from food-insecure households were four times more likely to be non-adherent compared with those from food-secure households. The qualitative findings further expanded this association by demonstrating how financial hardship, inflation, and limited household income constrained participants' ability to follow recommended diabetic diets. Participants frequently described diabetic diets as financially unaffordable, particularly in the context of rising food prices and competing household needs. As a result, many participants reported relying on inexpensive and less diverse foods rather than recommended dietary options. This finding suggests that structural economic constraints substantially influence dietary behaviors among patients with type 2 diabetes. This finding is consistent with studies conducted in Ethiopia by Tezera et al., which identified food insecurity as a strong predictor of non-adherence to dietary counseling(41) and Abose et al., who reported higher odds of dietary non-adherence among food-insecure patients(21). Similarly, qualitative findings from studies conducted in Ghana by Wilson et al.,(49) and a study in Kenya, by Mokaya et al.,(50) also identified low income as a major barrier to healthy dietary practices.

Poor dietary knowledge was significantly associated with non-adherence to dietary recommendations. Patients with poor dietary knowledge were twice as likely to be non-adherent compared with those who had good dietary knowledge. The qualitative findings further expanded this association by revealing that limited understanding of diabetic diets, low literacy, and inadequate nutritional awareness contributed to confusion regarding appropriate dietary practices. Participants frequently reported difficulty understanding dietary instructions and distinguishing between recommended and non-recommended foods. These findings suggest that insufficient nutritional understanding may hinder patients' ability to translate dietary recommendations into everyday practice. The present finding is consistent with a study conducted by Wilson et al., which reported that increased diabetes-related nutritional knowledge was associated with improved dietary adherence(49). Similarly, a systematic review and meta-analysis conducted by Bekele et al., demonstrated that dietary knowledge positively influenced adherence to diabetic diets(51). Comparable findings were also reported by Saliya et al., who found that patients with better knowledge had higher odds of good dietary practice(44). However, this finding contrasts with a study conducted in Singapore by Han et al., which reported no significant association between dietary knowledge and adherence(52). The qualitative findings of the current study are also supported by Saliya et al., where participants identified inadequate knowledge regarding nutrition, exercise, and self-care practices as barriers to effective dietary adherence(44).

This study revealed a strong association between poor family support and non-adherence to dietary recommendations among patients with type 2 diabetes mellitus. Patients who reported poor family support were four times more likely to be non-adherent compared with those who had adequate family support. The qualitative findings further expanded this association by demonstrating how psychosocial factors, including unsupportive family eating practices, social gatherings, emotional distress, low motivation, and social pressure, hindered adherence to recommended diets. Participants described difficulties maintaining dietary modifications when family members consumed different foods, during communal eating occasions, and in situations where they lacked encouragement or emotional support from relatives. These findings suggest that inadequate social and family support may negatively influence dietary adherence through reduced motivation, emotional isolation, and difficulty sustaining behavioral change. The present finding is consistent with studies conducted in Ethiopia by Tirfie et al., Negera and Epiphany both of which identified poor social support as a predictor of non-adherence to dietary recommendations (9, 13). Similarly, qualitative findings from a study conducted in the UK by Gibson et al., highlighted social influences and exposure to unhealthy foods in workplaces as barriers to dietary adherence (53). Comparable findings were also reported by Bukhsh et al., where participants identified the lack of diabetes-specific foods during social gatherings and marriage ceremonies as a challenge to adherence (54). A study conducted by Mostafavi-Darani et al., reported that longstanding family eating habits and inadequate social support negatively affected patients' ability to maintain recommended dietary practices(55).

In this study, body mass index was a factor for non-adherence to dietary recommendations. Patients with normal BMI and overweight were 59% and 63% less likely to be non-adherent to dietary recommendations, respectively, than obese patients. This was expanded by in-depth interviews; the participants mentioned that physical inactivity and food consumption in their preferences resulted in non-adherence to dietary recommendations. This highlights that sedentary lifestyles, such as physical inactivity and eating habits, interlink with obesity, resulting in non-adherence to dietary recommendations. Research conducted by Rukiya et al. supported this study and showed that patients with abdominal obesity were more likely to be non-adherent than healthy weight(47).

In this study, having less than five years of diabetes follow-up was one of the factors associated with non-adherence to dietary recommendations. Patients with less than five years of follow-up were three times more likely to be non-adherent to dietary recommendations compared to patients with ten years of diabetes follow-up. This finding was corroborated by the interviews; participants mentioned that being newly diagnosed with diabetes made it difficult to follow dietary recommendations due to confusion and lack of practical education on diabetic diets. This is consistent with the study conducted by Tirfie et al., who found that participants who had lived with diabetes for less than five years were more likely to have dietary non-adherence(13). In contrast, Atinafu and Tilahun KN showed that patients who were diagnosed with type 2 diabetes before five years were more likely to adhere to dietary recommendations than their counterparts(46).

Lack of printed health education materials on nutrition and not receiving audiovisual nutritional health education were among the factors of non-adherence to dietary recommendations among patients with type 2 diabetes in this study. Regarding printed nutritional health education materials, type 2 diabetic patients who did not receive printed nutritional health education materials were three times more likely to be non-adherent to dietary recommendations compared to patients who received printed nutritional health education materials.

Patients who did not access audio visual nutritional education materials were two times more likely to be non-adherent to dietary recommendations than their counterparts. This was expanded by interviews: lack of nutritional education, lack of printed and audio-visual health education materials, unclear counseling, and lack of practical dietary education were barriers leading to non-adherence to dietary recommendations.

Several studies supported this; for instance, a study conducted by Ayele et al. showed that the occurrence of poor adherence to dietary recommendations was higher among patients who had not received any education about dietary recommendations from healthcare providers compared to their counterparts(12), supporting the findings of a study conducted by Tirfie et al., which demonstrated that patients who had not received nutritional education at the hospital were more likely to have dietary non-adherence(13). Another study conducted in Addis Ababa supported this finding, which showed that patients who received diabetic nutrition education were more likely to adhere to dietary guidelines than those who did not receive diabetic nutrition education(46). A study conducted by Rukiya et al. supported this finding, which demonstrated that patients who did not receive written dietary instruction were more likely to be non-adherent(47). A study conducted by Adem et al. demonstrated that study participants who had received counseling on a healthy diet were more likely to have good adherence to dietary recommendations(40). Furthermore, a study conducted by Abebe et al. showed that lack of dietary education was a major barrier to dietary adherence(39). In contrast to the quotes of the participants in this study, a study conducted by Wilson et al. claimed that the dietary education provided by nurses at the hospital enabled participants to adhere to dietary recommendations(49).

Conclusions

This study revealed that more than two-thirds of the patients with type 2 diabetes were non-adherent to dietary recommendations. Factors such as household food insecurity, poor dietary knowledge, poor family support, body mass index (normal and overweight), being less than five years after being diagnosed with diabetes, lack of printed health education materials on nutrition, and lack of audio visual nutritional health education were significantly associated with non-adherence to dietary recommendations. This is expanded by qualitative findings: socioeconomic factors (financial constraints, unaffordability of diabetic diet, household food insecurity), behavioral factors, lack of dietary knowledge, lack of family support, lack of access to information, and recent diagnosis of diabetes are barriers resulting in non-adherence to dietary recommendations. These findings have important implications for the management of diabetes. Diabetes care services should implement a

multidimensional, patient-centered strategy that integrates routine screening for household food insecurity with strengthened linkages to social support programs, alongside promotion of affordable, locally appropriate diets. Continuous, culturally tailored nutrition education should be embedded within routine follow-up, incorporating family involvement and individualized counseling based on body mass index, with intensified support for patients with shorter durations of diabetes follow-up. Ensuring the consistent availability of printed nutrition education materials and the use of audio-visual educational tools within health facilities may further reinforce dietary messages and improve adherence to recommended dietary practices. In addition, the government should work with stakeholders to alleviate economic hardships and reduce current inflation, focusing on providing the necessary support for diabetic individuals who face financial constraints, as well as supplementing the necessary diabetic diets.

Although both quantitative and qualitative study designs have been employed, limitations are inevitable. First, because the study was conducted in a facility, it cannot truly represent all patients with type 2 diabetes (lack of generalizability). Second, in the quantitative phase of the cross-sectional study design, the direction of the causal relationship between variables cannot always be determined. Third, the use of self-reporting in assessing non-adherence to dietary recommendation resulted in overestimation or underestimation due to social desirability bias.

Abbreviations

AOR	Adjusted Odds Ratio
BMI	Body Mass Index
CI	Confidence Interval
COR	Crude Odds Ratio
DM	Diabetes Mellitus
EPHI	Ethiopian Public Health Institute
FBDG	Food Based Dietary Guideline
FBS	Fasting Blood Sugar
NCDs	Non Communicable Diseases
PDAQ	Perceived Dietary Adherence Questionnaire
USD	United States Dollar
WHO	World Health Organization

Declarations

Ethics Approval and Consent to Participate

This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Institutional Research Ethics Review Committee of St. Paul's Hospital Millennium Medical College, Ethiopia (Ref.No.PM23/547) on March 19, 2025. Prior to participation, all study participants were informed about the purpose, procedures, potential risks, and benefits of the study. Written informed consent was obtained from each participant before enrollment, and confidentiality of the information collected was maintained throughout the study.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

This research did not receive funding.

Author Contributions

AUM and KHW conceived and designed the study proposal and supervised data collection, cleaning, and feeding the data to a computer. AUM analyzed and interpreted the data and drafted the manuscript for important intellectual content. All authors have read and approved the final manuscript.

Acknowledgments

We would like to express our appreciation to all participants.

References

1. Ong KL, Stafford LK, McLaughlin SA, Boyko EJ, Vollset SE, Smith AE, et al. Global, regional, and national burden of diabetes from 1990 to 2021, with projections of prevalence to 2050: a systematic analysis for the Global Burden of Disease Study 2021. *Lancet*. 2023;402(10397):203–34. 10.1016/S0140-6736(23)01301-6.
2. Webber S. International Diabetes Federation 10th edition [Internet]. *Diabetes Research and Clinical Practice*; 2021 [cited 2025 Jun 21]. pp. 147–8. Available from: www.diabetesatlas.org.

3. World Health Organization. Diabetes WHO fact sheet [Internet]. 2024. Available from: <https://www.who.int/news-room/fact-sheets/detail/diabetes>
4. Araujo RBC, Pimentel-Nunes P. Microbiota Modulation in Patients with Metabolic Syndrome [Internet]. 2022. Available from: <https://doi.org/10.3390/nu14214490>
5. Nadhiya J, Vijayalakshmi MK, Showbharnikhaa S. A Brief Review on Diabetes Mellitus. Vols. 117–121. 2023;117–121:5. 10.5281/zenodo.10631511
6. Uusitupa M, Schwab U. Evolving nutritional therapy for diabetes mellitus. *Nutrients*. 2020;12(2). 10.3390/nu12020423 . PubMed PMID: 32041141.
7. Roglic Gojka. Global report on diabetes [Internet]. Switzerland, Geneva: World Health Organization. 2016. 86 p. Available from: http://www.who.int/about/licensing/copyright_form/index.html
8. Haniyeh AM, Mozghan K, Mohammad S, Sharifi H. Adherence to Medication, Diet and Physical Activity and the associated factors amongst patients with Type 2 Diabetes. *Diabetes Ther*. 2020;11. 10.6084/m9.figshare.11358593.
9. Zeleke Negera G, Charles Epiphany D. Prevalence and Predictors of Non-adherence to Diet and Physical Activity Recommendations among Type 2 Diabetes Patients in Southwest Ethiopia: A Cross-Sectional Study. *Int J Endocrinol*. 2020;2020:8. 10.1155/2020/1512376.
10. Upreti AS, Aryal B, Kuikel J, Sharma MK. Dietary practices of type 2 diabetes mellitus patients concerning Pender's health Promotion Model in Lalitpur district, Nepal. *Hum Nutr Metab*. 2024;38. 10.1016/j.hnm.2024.200288.
11. Eshete A, Lambebo A, Mohammed S, Shewasinad S, Assefa Y. Effect of nutritional promotion intervention on dietary adherence among type II diabetes patients in North Shoa Zone Amhara Region: quasi-experimental study. *J Health Popul Nutr*. 2023;42(1). 10.1186/s41043-023-00393-3 . PubMed PMID: 37254151.
12. Ayele AA, Emiru YK, Tiruneh SA, Ayele BA, Gebremariam AD, Tegegn HG. Level of adherence to dietary recommendations and barriers among type 2 diabetic patients: a cross-sectional study in an Ethiopian hospital. *Clin Diabetes Endocrinol*. 2018;4(1). 10.1186/s40842-018-0070-7.
13. Tirfie M, Tadesse S, Woldie H, Weldegiorgis T, Birhanu M, Shibabaw T. Dietary non-adherence and associated factors among individuals with diabetes who are on treatment follow up at Felege-Hiwot Referral Hospital, Northwest Ethiopia. *Heliyon*. 2020;6(8). 10.1016/j.heliyon.2020.e04544.
14. Haridas S, Ebanazar KK. Barriers in Adherence to Diet in Patients with Type-2 Diabetes: A Literature Review. *Trans Biomed Eng Appl Healthc*. 2023;4(1).
15. Federal Government of Ethiopia, Ministry of Health, Ethiopian Public Health Institute. Ethiopia: Food-Based Dietary Guidelines-2022. Addis Ababa, Ethiopia; 2022.
16. Bekele TH, De Vries JHM, Feskens EJM, De Weijer A, Brouwer ID, Covic N, et al. Development of the Ethiopian Healthy Eating Index (Et-HEI) and evaluation in women of reproductive age. *J Nutr Sci*. 2023;12. 10.1017/jns.2022.120 . PubMed PMID: 36721718.
17. Abate TW, Tareke M, Abate S, Tegenaw A, Birhanu M, Yirga A, et al. Level of dietary adherence and determinants among type 2 diabetes population in Ethiopian: A systemic review with meta-analysis.

- PLoS ONE. 2022;17(10 October). 10.1371/journal.pone.0271378 . PubMed PMID: 36215272.
18. Guest G, Fleming P. Mixed Methods Research. In: Public Health Research Methods [Internet]. 1 Oliver's Yard, 55 City Road London EC1Y 1SP: SAGE Publications, Inc.; 2015. pp. 581–614. Available from: <https://methods.sagepub.com/book/public-health-research-methods/i2807.xml> 10.4135/9781483398839.n19
 19. Mideksa G, Botore A, Abdo B. Investigation of cholera outbreak and its determinants in Shaggar city, Oromia, Ethiopia, 2024: a case-control study [Internet]. Research Square; 2024. Available from: <https://www.researchsquare.com/article/rs-4483047/v1> 10.21203/rs.3.rs-4483047/v1
 20. Shaggar city health office. Shaggar city health office annual report 2024.
 21. Abose S, Dassie GA, Megerso A, Charkos TG. Adherence to recommended diet among patients with diabetes mellitus type 2 on follow-up at Adama Hospital Medical College, Ethiopia. *Front Med*. 2024;11. 10.3389/fmed.2024.1484071.
 22. Dworkin SL. Sample size policy for qualitative studies using in-depth interviews. *Archives of Sexual Behavior*. Springer Science and Business Media, LLC; 2012. pp. 1319–20. 10.1007/s10508-012-0016-6 . PubMed PMID: 22968493.
 23. Fetters MD, Curry LA, Creswell JW. Achieving integration in mixed methods designs - Principles and practices. *Health Serv Res*. 2013;48(6 PART2):2134–56. 10.1111/1475-6773. .12117 PubMed PMID: 24279835.
 24. CDC, Adult BMI. Categories [Internet]. 2025. Available from: <https://www.cdc.gov/>
 25. Jeong SM, Yoo JE, Park J, Jung W, Lee KN, Han K, et al. Smoking behavior change and risk of cardiovascular disease incidence and mortality in patients with type 2 diabetes mellitus. *Cardiovasc Diabetol*. 2023;22(1). 10.1186/s12933-023-01930-4 . PubMed PMID: 37516874.
 26. Abuse NloA, Alcoholism. NIAAA Physicians' Guide [Internet]. 1995. Available from:
 27. Colberg SR, Sigal RJ, Yardley JE, Riddell MC, Dunstan DW, Dempsey PC, et al. Physical activity/exercise and diabetes: A position statement of the American Diabetes Association. *Diabetes Care*. American Diabetes Association Inc.; 2016. pp. 2065–79. 10.2337/dc16-1728 . PubMed PMID: 27926890.
 28. Bai RRKR. Perceived Dietary Adherence and its Barriers to Dietary recommendations among DM patients. *Innov J Nurs Heal*. 2020;6(3):1–5.
 29. Hendra D, Driposwana Putra I, Marcelina S, Simamora AA, Kesehatan I, Negeri P. Relationship between Family System Support and Diet Compliance in Diabetes Mellitus Patients. *J Keperawatan Prior*. 2025;8(1).
 30. Ihsan M, Rahmadiyah DC. Relationships between Family Support of Type 2 Diabetics and the Utilization of Healthcare Facilities in Tebet. *UI Proc Health Med*. 2020;4(1). 10.7454/uiphm.v4i1.261.
 31. Abboud M, Nacouzi C, Chahine Z, Atallah A, Hleyhel M. Dietary Knowledge and Eating Habits among Patients with Type 2 Diabetes in Lebanon. *Glob Health Epidemiol Genomics*. 2024;2024. 10.1155/2024/3623555 PubMed PMID: 38356468.

32. Sami W, Alabdulwahhab KM, Hamid MRA, Alasbali TA, Alwadani FA, Ahmad MS. Dietary knowledge among adults with type 2 diabetes—kingdom of Saudi Arabia. *Int J Environ Res Public Health*. 2020;17(3). 10.3390/ijerph17030858 . PubMed PMID: 32019083.
33. Aikabeli Priscilla O. Dietary Knowledge, Attitude and Adherence among Diabetic Patients attending Outpatient Clinics in Selected Hospitals in Benin Metropolis. *Int J Educ Excell Innov*. 2024;01(06):15. 10.5281/zenodo.14564709.
34. Coates J, Swindale A, Bilinsky P. Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide: Version 3 [Internet]. 2007. Available from: www.fantaproject.org.
35. Ahmed SK. The pillars of trustworthiness in qualitative research. *J Med Surg Public Health*. 2024;2:100051. 10.1016/j.glmedi.2024.100051.
36. Kocaman R. A Practical Guideline for Addressing Data Trustworthiness in Qualitative Research. In: *Qualitative Research Methods for Dissertation Research*. IGI Global; 2024. pp. 317–45. 10.4018/979-8-3693-3069-2.ch011
37. Kakar ZUH, Rasheed R, Rashid A, Akhter S, CRITERIA FOR ASSESSING, AND ENSURING THE TRUSTWORTHINESS IN QUALITATIVE RESEARCH. *Int J Bus Reflect*. 2023;4(2):150–73. 10.56249/ijbr.03.01.44.
38. Tirfessa D, Abebe M, Darega J, Aboma M. Dietary practice and associated factors among type 2 diabetic patients attending chronic follow-up in public hospitals, central Ethiopia, 2022. *BMC Health Serv Res*. 2023;23(1). 10.1186/s12913-023-10293-1 . PubMed PMID: 37978526.
39. Abebe A. Adherence Levels to Dietary Recommendations and Barriers among Type-2 Diabetic Patients on Follow-up at Mohammed Akila General Hospital: Cross Sectional Study Design. *Curr Res Diabetes Obes J*. 2023;16(5). 10.19080/crdoj.2023.16.555947.
40. Adem F, Tadiwos Y, Woldekidan NA, Degu A, Mohammed AS. Level of adherence to the dietary recommendation and glycemic control among patients with type 2 diabetes mellitus in Eastern Ethiopia: A cross-sectional study. *Diabetes Metab Syndr Obes*. 2020;13:2605–12. 10.2147/DMSO.S256738.
41. Tezera R, Sahile Z, Yilma D, Misganaw E, Amare E, Haidar J. Food security status of patients with type 2 diabetes and their adherence to dietary counselling from selected hospitals in Addis Ababa, Ethiopia: A cross-sectional study. *PLoS ONE*. 2022;17(4 April). 10.1371/journal.pone.0265523 . PubMed PMID: 35421127.
42. Baral J, Karki KB, Thapa P, Timalisina A, Bhandari R, Bhandari R et al. Adherence to Dietary Recommendation and Its Associated Factors among People with Type 2 Diabetes: A Cross-Sectional Study in Nepal. *J Diabetes Res*. 2022;2022. 10.1155/2022/6136059 PubMed PMID: 36313817.
43. Abdelsalam SE, Ismaail MA, Hassan SI, Sultan EA, Elsherif OE, Salama HM. Perceived Adherence and Barriers to Dietary Recommendations among Type 2 Diabetic Patients in a Family Practice Clinic, Suez Canal University Hospitals. *Egypt Fam Med J*. 2022;6(1). <https://doi.org/10.21608/efmj.2023.132549.1099>.

44. Saliya SA, Ashine TM, Heliso AZ, Babore GO, Birhanu B, Hailu AG, et al. Dietary Practices and Associated Factors Among Adult Diabetic Patients at Academic Tertiary-Level Hospitals in Central Ethiopia: Convergent Mixed Study. *SAGE Open Nurs.* 2024;10. 10.1177/23779608241279151.
45. Yusuf Bello Muazu. Assessing Prevalence and Correlates of Non-Adherence to Dietary Guidelines in Type 2 Diabetic Patients at Jinja Regional Referral Hospital. *IAA J Appl Sci.* 2023;10(1). 10.59298/IAAJAS/2023/7.1.1000.
46. Atinafu WT, Tilahun KN. Assessment of adherence to dietary recommendations and associated factors among type 2 diabetic patients in selected hospitals in Addis Ababa, Ethiopia. *Front Nutr.* 2024;11. 10.3389/fnut.2024.1474445.
47. Rukiya D, Beakal Z, Tefera B. Nonadherence to dietary recommendation and associated factors among type 2 diabetic patients in Illubabor zone, South West Ethiopia. *Glob J Obes Diabetes Metab Syndr.* 2020;053–9. 10.17352/2455-8583.000048.
48. Atosona A, Yiadom LB, Alhassan B, Kelli H, Gaa PK, Kalog GLS. Dietary compliance and its determinants among type 2 diabetes patients in Tamale Metropolis, Ghana. *J Health Popul Nutr.* 2024;43(1). 10.1186/s41043-024-00588-2 . PubMed PMID: 38898496.
49. Wilson D, Diji AKA, Marfo R, Amoh P, Duodu PA, Akyirem S, et al. Dietary adherence among persons with type 2 diabetes: A concurrent mixed methods study. *PLoS ONE.* 2024;19(5 May). 10.1371/journal.pone.0302914 . PubMed PMID: 38713660.
50. Mokaya M, Saruni E, Kyallo F, Vangoitsenhoven R, Matthys C. Perceived facilitators and barriers to healthy dietary behaviour in adults with type 2 diabetes mellitus in Kenya: a qualitative study. *Public Health Nutr.* 2022;25(12):3335–43. 10.1017/S136898002200221X.
51. Bekele H, Asefa A, Getachew B, Belete AM. Barriers and Strategies to Lifestyle and Dietary Pattern Interventions for Prevention and Management of TYPE-2 Diabetes in Africa, Systematic Review. *J Diabetes Res.* 2020;2020. 10.1155/2020/7948712 PubMed PMID: 32766315.
52. Han CY, Chan CGB, Lim SL, Zheng X, Woon ZW, Chan YT, et al. Diabetes-related nutrition knowledge and dietary adherence in patients with Type 2 diabetes mellitus: A mixed-methods exploratory study. *Proc Singap Healthc.* 2020;29(2):81–90. 10.1177/2010105820901742.
53. Gibson R, D’Annibale M, Oliver N, McGowan B, Forbes G, Crayton E, et al. Exploration of the individual, social and environmental factors influencing dietary behaviour in shift workers with type 2 diabetes working in UK healthcare—The Shift-Diabetes Study: A qualitative study using the theoretical domains framework. *Diabet Med.* 2024;41(2). 10.1111/dme.15179 . PubMed PMID: 37452826.
54. Bukhsh A, Goh BH, Zimbudzi E, Lo C, Zoungas S, Chan KG, et al. Type 2 Diabetes Patients’ Perspectives, Experiences, and Barriers Toward Diabetes-Related Self-Care: A Qualitative Study From Pakistan. *Front Endocrinol.* 2020;11. 10.3389/fendo.2020.534873.
55. Mostafavi-Darani F, Zamani-Alavijeh F, Mahaki B, Salahshouri A. Exploring the barriers of adherence to dietary recommendations among patients with type 2 diabetes: A qualitative study in Iran. *Nurs Open.* 2020;7(6):1735–45. 10.1002/nop2.558.

Figures

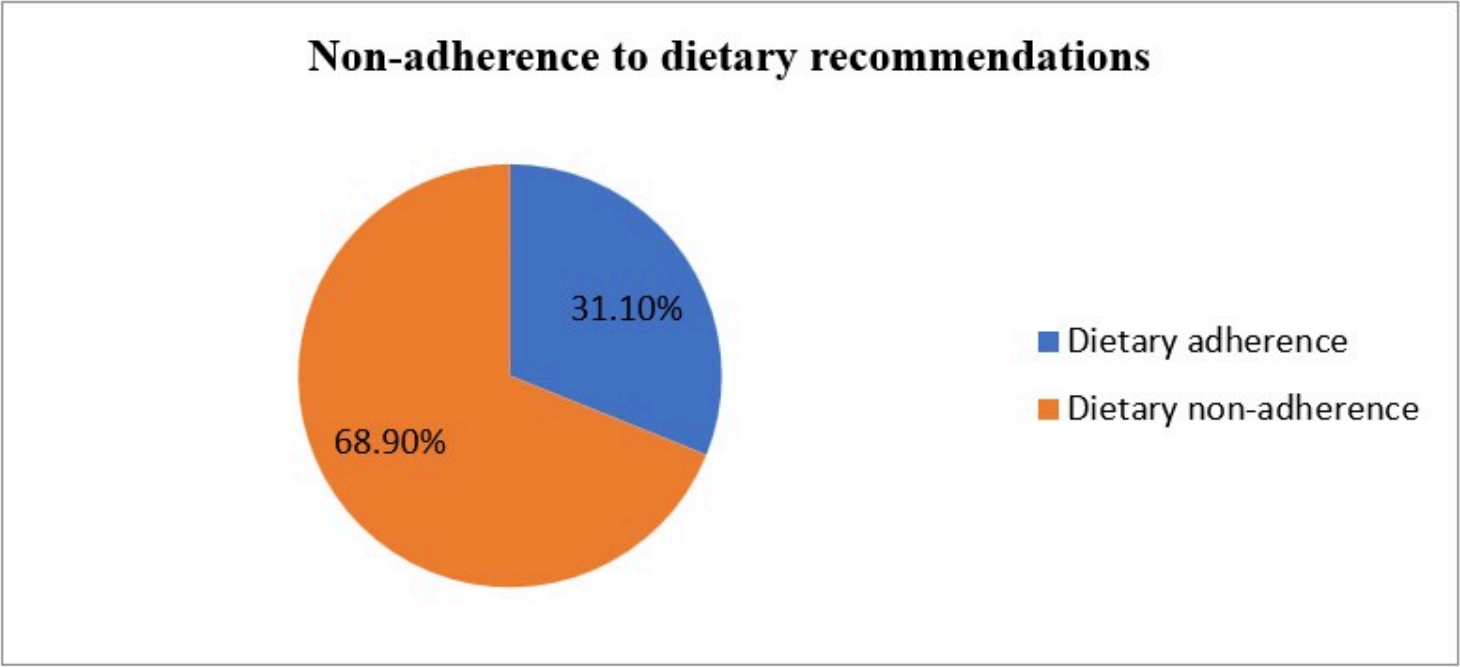


Figure 1

Magnitude of non-adherence to dietary recommendations among type 2 diabetic patients attending public health facilities of Shaggar city, Oromia, Ethiopia 2025

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Questionnaires.pdf](#)