

Relationship Between Nutrition Education and Dietary Compliance in Patients with Non-Communicable Diseases: A Cross-Sectional Study

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ABSTRACT

Introduction: Non-communicable diseases (NCDs) are the leading cause of morbidity and mortality worldwide, and dietary management is a cornerstone of their prevention and control. However, dietary compliance among patients with NCDs remains suboptimal. Nutrition education is considered a key strategy to improve adherence, yet evidence regarding its real-world association with dietary compliance across diverse NCD populations remains limited. This study aimed to analyze the relationship between nutrition education and dietary compliance among patients with non-communicable diseases.

Methods: An analytical cross-sectional study was conducted among 100 adult patients diagnosed with hypertension, type 2 diabetes mellitus, dyslipidemia, or cardiovascular disease. Data were collected through structured interviews and medical record review. Nutrition education exposure was categorized as adequate or inadequate based on documented counseling sessions. Dietary compliance was assessed using a validated adherence questionnaire. Bivariate analysis was performed using the Chi-square test, and multivariate logistic regression was applied to determine independent associations, with statistical significance set at $p < 0.05$.

Results: 60% of respondents received adequate nutrition education, and 65% were dietarily compliant. Patients who received adequate nutrition education were significantly more likely to adhere to recommended dietary guidelines ($p = 0.001$). After adjustment for sociodemographic and clinical variables, adequate nutrition education remained an independent predictor of dietary compliance (AOR=4.32; 95% CI: 1.85–10.09).

Conclusion: Nutrition education is significantly associated with improved dietary compliance among patients with NCDs. Integrating structured and repeated nutrition education into chronic disease management programs may enhance adherence and improve long-term health outcomes.

Keywords: Dietary Compliance; Health Education; Non-Communicable Diseases; Nutrition Therapy.



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INTRODUCTION

Non-communicable diseases (NCDs) represent the dominant global health burden and are responsible for the majority of premature mortality worldwide. According to the World Health Organization (WHO), NCDs account for more than 70% of all global deaths annually, with cardiovascular diseases, diabetes mellitus, chronic respiratory diseases, and cancers being the principal contributors (Abdeen et al., 2025). The increasing prevalence of NCDs is strongly associated with modifiable behavioural risk factors, particularly unhealthy dietary patterns characterised by excessive intake of salt, sugar, and saturated fat, and insufficient intake of fruits, vegetables, and fibre (Aderoju et al., 2025). In clinical practice, inadequate dietary control significantly accelerates disease progression, increases the risk of complications, and elevates healthcare costs (Anisha et al., 2024).

Dietary management is a cornerstone of NCD treatment. Evidence-based nutritional guidelines emphasize sodium restriction for hypertension, carbohydrate regulation for diabetes, lipid modification for dyslipidemia, and caloric balance for obesity (Cando et al., 2024). When properly implemented, medical nutrition therapy improves metabolic parameters, enhances treatment outcomes, and reduces morbidity. However, despite well-established guidelines and increasing public awareness campaigns, dietary compliance among patients with NCDs remains suboptimal. Many patients struggle to translate nutritional knowledge into sustained behavioral change (Chiu et al., 2025). Barriers include limited health literacy, socioeconomic constraints, cultural food practices, low motivation, inadequate counseling time, and inconsistent follow-up (Damigou et al., 2025).

Nutrition education is widely regarded as a strategic intervention to improve dietary compliance. It involves structured counseling, individualized meal planning, behavioral change techniques, and reinforcement strategies delivered by healthcare professionals (Elkomy & Jackson, 2024). The effectiveness of nutrition education is grounded in behavioural science frameworks, such as the Health Belief Model and Social Cognitive Theory, which highlight the roles of perceived benefits, self-efficacy, and reinforcement in shaping health behaviour (Gomes et al., 2024). Several studies have demonstrated that patients who receive structured and repeated nutrition education show improved dietary knowledge and short-term adherence (Gulhane et al., 2026).

Nevertheless, important gaps remain in the literature. First, much of the existing evidence derives from interventional or experimental studies that assess short-term outcomes. At the same time, limited cross-sectional research evaluates real-world exposure to nutrition education and its association with actual dietary compliance in routine healthcare settings (Gurusamy et al., 2025). Second, prior studies often focus on single disease entities, such as diabetes or hypertension, thereby limiting the understanding of how nutrition education influences patients with multiple or diverse NCD conditions (Ibrahim et al., 2025). Third, measurement of dietary compliance varies considerably across studies, leading to inconsistent findings and limited comparability. Additionally, confounding variables such as age, educational level, income, disease duration, and comorbidity status are not consistently controlled, potentially biasing reported associations (Izquierdo et al., 2025).

In many low- and middle-income countries, structured nutrition education services are unevenly implemented, and the intensity and quality of counseling vary substantially between healthcare facilities (Lama et al., 2025). Consequently, empirical evidence assessing whether exposure to nutrition education is independently associated with improved dietary compliance remains insufficient. Understanding this relationship is essential for strengthening chronic disease management strategies and optimizing resource allocation within health systems.

The novelty of the present study lies in its comprehensive cross-sectional assessment of the relationship between nutrition education and dietary compliance among patients with diverse non-communicable diseases in a real-world clinical context. Unlike previous research that concentrates on disease-specific populations or controlled intervention settings, this study examines heterogeneous NCD patients receiving routine care. It applies standardized indicators

to measure dietary compliance aligned with clinical recommendations and incorporates multivariate analysis to adjust for sociodemographic and clinical confounders. This approach provides a more robust estimation of the association between nutrition education exposure and adherence behavior.

The objective of this study is to analyze the relationship between nutrition education and dietary compliance among patients with non-communicable diseases. Specifically, this study aims to: (1) describe the level and characteristics of nutrition education received by NCD patients; (2) assess the extent of dietary compliance based on recommended nutritional guidelines; and (3) determine whether nutrition education is significantly associated with dietary adherence after controlling for relevant confounding variables. The findings are expected to contribute to evidence-based strategies that enhance patient education, improve dietary adherence, and ultimately strengthen outcomes in chronic disease management.

RESEARCH METHODOLOGY

Study Design and Setting

This study employed an analytical cross-sectional design to examine the relationship between nutrition education and dietary compliance among patients with non-communicable diseases (NCDs). The research was conducted in outpatient clinics at secondary-level healthcare facilities that provide chronic disease management services. Data collection was carried out over three months to ensure adequate participant recruitment and variability of clinical characteristics.

Population and Sample

The study population consisted of adult patients (≥ 18 years) diagnosed with at least one non-communicable disease, including hypertension, type 2 diabetes mellitus, dyslipidemia, or cardiovascular disease, confirmed by medical records. Inclusion criteria were: (1) receiving treatment for at least six months, (2) having attended at least one follow-up visit during the study period, and (3) willing to provide informed consent. Patients with cognitive impairment, severe acute complications, or inability to communicate effectively were excluded. The total sample comprised 100 respondents who met the eligibility criteria and agreed to participate in the study. The sample size was determined using a formula for cross-sectional studies to detect an expected association between exposure (nutrition education) and outcome (dietary compliance) with a 95% confidence level and 80% statistical power. The calculated minimum sample requirement was adjusted to 100 participants to enhance statistical stability and compensate for potential incomplete responses. A systematic random sampling technique was applied using the outpatient registration list as the sampling frame. Eligible patients were selected at regular intervals based on the daily patient list until the required sample size of 100 respondents was achieved.

Variables and Operational Definitions

The independent variable was exposure to nutrition education. Nutrition education was defined as structured dietary counseling or educational sessions provided by healthcare professionals (physicians, nurses, or dietitians) within the past six months. Exposure was categorised as adequate (≥ 2 structured sessions or documented individualised counselling) or inadequate (< 2 sessions or no structured counselling). The dependent variable was dietary compliance. Dietary compliance was defined as adherence to disease-specific dietary recommendations, including sodium restriction (for hypertension), carbohydrate control (for diabetes), fat modification (for dyslipidemia), and overall balanced diet principles. Compliance was measured using a validated dietary adherence questionnaire scored on a Likert scale. Participants were categorised as compliant if their total score was $\geq 75\%$ of the maximum possible score. Covariates included age, sex, educational level, monthly income, duration of illness, type of NCD, comorbidity status, and health insurance coverage.

Data Collection Procedures

Data were collected through structured face-to-face interviews using standardized questionnaires and review of medical records for clinical confirmation. The questionnaire consisted of three sections: sociodemographic characteristics, exposure to nutrition education,

and dietary compliance assessment. Before data collection, the instrument was pilot-tested for clarity and reliability. Internal consistency was evaluated using Cronbach's alpha (acceptable threshold ≥ 0.70).

Data Analysis

Data were entered and analyzed using statistical software. Descriptive statistics were used to summarise participant characteristics, nutrition education exposure, and dietary compliance. Categorical variables were presented as frequencies and percentages, while continuous variables were expressed as means and standard deviations. Bivariate analysis was conducted using the Chi-square test to assess the association between nutrition education and dietary compliance. Variables with p-values <0.25 in the bivariate analysis were included in multivariate logistic regression to determine the independent association between nutrition education and dietary compliance, controlling for potential confounders. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) were reported. Statistical significance was set at $p < 0.05$.

Ethical Considerations

Ethical approval was obtained from the Institutional Review Board of the participating institution. Written informed consent was obtained from all participants before data collection. Participant confidentiality was ensured by anonymizing data and restricting access to research personnel only.

RESULTS

This section presents the study's findings on the relationship between nutrition education and dietary compliance among patients with non-communicable diseases. The results are organized into three main parts: (1) description of respondents' sociodemographic and clinical characteristics, (2) distribution of nutrition education exposure and levels of dietary compliance, and (3) analysis of the association between nutrition education and dietary compliance using bivariate and multivariate statistical tests. The findings are reported in accordance with the study objectives and analytical framework.

Table 1. Sociodemographic and Clinical Characteristics of Respondents

Variable	Frequency (n)	Percentage (%)
Age ≥ 45 years	62	62.0
Female	58	58.0
Secondary education or higher	64	64.0
Duration of illness ≥ 5 years	55	55.0
Hypertension	46	46.0
Type 2 Diabetes Mellitus	38	38.0
Dyslipidemia / Cardiovascular disease	16	16.0

The majority of respondents were aged ≥ 45 years (62%) and female (58%). Most participants had at least secondary education (64%), and more than half had lived with their disease for five years or longer (55%). Hypertension was the most common diagnosis (46%), followed by type 2 diabetes mellitus (38%).

Table 2. Distribution of Nutrition Education Exposure and Dietary Compliance

Variable	Frequency (n)	Percentage (%)
Adequate nutrition education	60	60.0
Inadequate/no education	40	40.0
Dietary compliant	65	65.0
Dietary non-compliant	35	35.0

Sixty per cent of respondents reported receiving adequate nutrition education in the past six months. Overall, 65% of participants met the criteria for dietary compliance according to disease-specific recommendations.

Table 3. Association Between Nutrition Education and Dietary Compliance

Nutrition Education	Compliant (n, %)	Non-Compliant (n, %)	p-value
Adequate (n=60)	48 (80.0%)	12 (20.0%)	0.001
Inadequate (n=40)	17 (42.5%)	23 (57.5%)	

Chi-square test was applied.

Among respondents who received adequate nutrition education, 80% were compliant with dietary recommendations. In contrast, only 42.5% of those with inadequate or no nutrition education were compliant. The association between nutrition education and dietary compliance was statistically significant ($p = 0.001$), indicating a meaningful relationship between the variables.

Table 4. Multivariate Analysis of Factors Associated with Dietary Compliance

Variable	Adjusted Odds Ratio (AOR)	95% CI	p-value
Adequate nutrition education	4.32	1.85 – 10.09	0.001
Secondary education or higher	1.76	0.78 – 3.95	0.172
Duration ≥ 5 years	1.42	0.63 – 3.21	0.392

After adjusting for potential confounders, respondents who received adequate nutrition education were 4.32 times more likely to demonstrate dietary compliance compared to those who received inadequate education (AOR = 4.32; 95% CI: 1.85–10.09; $p = 0.001$). Educational level and illness duration were not statistically significant predictors in the adjusted model. These findings indicate that nutrition education is an independent and strong predictor of dietary compliance among patients with non-communicable diseases.

This study identifies a strong and statistically significant association between nutrition education and dietary compliance among patients with non-communicable diseases. Respondents who received adequate, structured nutrition education demonstrated substantially higher adherence to disease-specific dietary recommendations than those with limited or no educational exposure. Approximately two-thirds of participants achieved dietary compliance, indicating that adherence remains suboptimal despite ongoing clinical management. Bivariate analysis revealed a significant relationship between nutrition education and compliance behavior. This association persisted in multivariate logistic regression analysis after adjusting for age, educational level, and duration of illness. Patients who received adequate nutrition education were more than 4 times as likely to comply with recommended dietary guidelines as their counterparts. These findings confirm that nutrition education is an independent and influential determinant of dietary behaviour.

In contrast, sociodemographic factors such as formal education level and illness duration were not statistically significant predictors in the adjusted model. This suggests that structured, repeated, and targeted dietary counselling may have a greater impact on behavioural adherence than background characteristics alone. The results emphasise the pivotal role of systematic nutrition education in strengthening chronic disease management and improving patient adherence.

DISCUSSION

This study demonstrates a significant and independent association between nutrition education and dietary compliance among patients with non-communicable diseases (NCDs). Patients who received adequate, structured nutrition education were more than 4 times as likely to adhere to recommended dietary guidelines as those who received limited or no counselling. Although approximately two-thirds of respondents achieved dietary compliance, a substantial proportion remained non-adherent, indicating persistent behavioral gaps in chronic disease management. Sociodemographic variables, such as formal education level and illness duration, were not statistically significant predictors in the adjusted model, highlighting the central role of targeted nutrition education rather than background characteristics alone (Lim et al., 2025).

The findings can be interpreted through established behavioral change frameworks. The Health Belief Model posits that individuals are more likely to adopt recommended health behaviours when they perceive susceptibility to disease complications, recognise the benefits of taking action, and receive cues to act (Ovai et al., 2026). Structured nutrition education may strengthen perceived severity and benefits while providing actionable guidance, thereby facilitating dietary adherence. Similarly, Social Cognitive Theory emphasises the roles of self-efficacy and reinforcement in behaviour change (Prinelli et al., 2026). Repeated dietary counselling likely enhances patients' confidence in managing food choices and navigating environmental barriers, thereby increasing the likelihood of sustained compliance (Rahman, 2025).

Furthermore, patient-centred education aligns with principles of self-management in chronic care models. Nutrition education serves not only as information transfer but also as a behavioural intervention that improves decision-making capacity, goal-setting, and problem-solving skills (Ravali et al., 2025). The strong adjusted odds ratio observed in this study suggests that structured dietary counselling is a critical enabling factor in translating knowledge into practice (Saleh et al., 2026).

The present findings are consistent with international evidence demonstrating the effectiveness of nutrition education in improving dietary behaviors among patients with chronic diseases (Singh et al., 2025). Several global studies have reported significant improvements in glycemic control, blood pressure regulation, and lipid profiles following structured dietary counseling interventions. Cross-sectional and quasi-experimental studies in Asia, Europe, and North America have similarly identified positive associations between professional nutrition counselling and higher adherence scores. Regionally, studies conducted in low- and middle-income settings have reported mixed findings (Stubbendorff et al., 2025). Some investigations indicate strong positive effects of repeated nutrition education on dietary adherence among patients with type 2 diabetes and hypertension, while others report modest or non-significant associations. Divergence in findings may stem from variability in counselling intensity, follow-up duration, measurement instruments, and cultural dietary patterns (Sun et al., 2025). Compared to studies focusing exclusively on single disease entities, the present study expands the scope by examining heterogeneous NCD populations within routine clinical settings, thereby enhancing external validity (Suprpto, 2026).

The convergence of this study's findings with much of the global literature may be attributed to the standardised operationalisation of both exposure (adequate nutrition education) and outcome (dietary compliance based on guideline-aligned scoring) (Suprpto & Kadang, 2026). The multivariate approach further strengthens the robustness of the association by accounting for potential confounders. Differences in healthcare infrastructure and delivery models may explain divergence from studies reporting weaker associations. In some settings, nutrition education may be sporadic, brief, or delivered without structured follow-up, reducing its behavioral impact (Tadjoedin et al., 2026). Cultural norms and socioeconomic constraints may also moderate the effectiveness of dietary counseling. In contexts where healthy food options are financially inaccessible or culturally unfamiliar, education alone may be insufficient to induce compliance. Additionally, measurement heterogeneity, such as reliance on self-reported dietary recall without validated scoring systems can contribute to inconsistent results across studies (Thao et al., 2024).

Strengths and Limitations

This study has several strengths. First, it applies an analytical cross-sectional design with clearly defined operational criteria for both nutrition education exposure and dietary compliance. Second, the use of multivariate logistic regression allows adjustment for relevant sociodemographic and clinical confounders, thereby increasing the internal validity of the findings. Third, inclusion of patients with diverse non-communicable diseases enhances generalizability across chronic disease populations rather than limiting inference to a single diagnostic group. However, several limitations should be acknowledged. The cross-sectional design precludes causal inference; therefore, temporal relationships between nutrition education

and dietary compliance cannot be definitively established. Self-reported dietary adherence may introduce recall bias or social desirability bias, potentially overestimating compliance levels. The sample size, although statistically adequate, was limited to a single healthcare setting, which may affect broader generalizability. Additionally, the study did not measure qualitative dimensions of education, such as counselling quality, duration, or provider competency, which could influence behavioural outcomes.

Despite these limitations, the findings provide important empirical evidence for integrating structured, repeated nutrition education into routine chronic disease management programs. Strengthening the intensity, consistency, and monitoring of dietary counseling services may represent a cost-effective strategy to improve adherence and reduce long-term complications among patients with non-communicable diseases.

CONCLUSIONS

This study confirms that nutrition education is significantly and independently associated with dietary compliance among patients with non-communicable diseases. Patients who received adequate, structured nutrition education demonstrated substantially higher adherence to disease-specific dietary recommendations than those with limited or no educational exposure. After adjusting for sociodemographic and clinical factors, nutrition education remained a strong predictor of compliance, indicating its central role in shaping health behavior beyond background characteristics. These findings directly address the study objective by demonstrating that structured nutrition education improves dietary adherence in routine clinical settings. Although a majority of participants achieved compliance, a considerable proportion remained non-adherent, underscoring the need for strengthened educational strategies.

From a policy perspective, integrating standardized, repeated, and patient-centred nutrition education into chronic disease management programs should be prioritized. Health systems should ensure the availability of trained nutrition professionals, structured counseling protocols, and routine monitoring of dietary adherence. Strengthening evidence-based nutrition education interventions may enhance long-term disease control and reduce complications associated with non-communicable diseases.

Ethical Considerations

This study received ethical approval from the Institutional Review Board (IRB) of the participating healthcare institution before data collection. All participants were informed about the study objectives, procedures, potential risks, and their rights to decline or withdraw at any time without consequences to their treatment. Written informed consent was obtained from each respondent. Participant confidentiality was strictly maintained by anonymising all collected data and using identification codes rather than personal information. Data were stored securely and accessed only by authorised research team members. The study was conducted in accordance with established ethical principles for research involving human subjects.

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Authors' contributions

Abubakar Betan* conceptualized and designed the study, conducted data collection and analysis, and drafted the initial manuscript. Anwarul Azim Majumder contributed to the study design, provided critical intellectual input, supervised the research process, and reviewed and revised the manuscript. Both authors approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

Conflict of interest

The authors declare that there is no conflict of interest related to this study.

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