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T2DM management, knowledge,  
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## Knowledge and Diet Adherence to Type II Diabetes Mellitus Management in Akre District in Kurdistan Region of Iraq

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### ABSTRACT:

**Background:** Type II diabetes mellitus constitutes a major global public health concern, with its management significantly dependent on patient awareness and compliance with dietary guidelines. As a complex disease, it possesses a genetic component; epigenetics may elucidate the unexplained heritability and non-genetic factors, such as physical activity, nutrition, obesity, and ageing, which influence its development and management.

**Objectives:** to assess the knowledge and dietary adherence of T2DM patients and to determine the relationship between their knowledge and diet management in the Akre District, Kurdistan Region of Iraq.

**Methods:** A cross-sectional design was used to examine the correlation among knowledge, dietary adherence, and obstacles to managing T2DM in the Akre District of the Kurdistan Region of Iraq from September 2024 to May 2025. A total of 300 T2DM patients were chosen, aged between 18-65 years. A structured questionnaire was used to gather the data for the current study, which consisted of three sections. The first deals with patients' demographic information, the second assesses the patients' knowledge about diabetes, and the third is related to diet adherence and its barriers in the management of their diabetes. The data were analyzed using frequency, percent, mean, standard deviation, Chi-square, and Fisher's exact test.

**Results:** This study resulted in approximately three-fourths of the diabetic patients, 224 (74.7%), having an average knowledge of DM management, 259 (86.3%), exhibiting partial adherence to diet management, and indicated a highly significant association ( $P = 0.004$ ) between patients' knowledge and their adherence to management of their diabetes.

**Conclusions:** The present study concluded that the predominant number of participants have an average knowledge of T2DM management with partial adherence to diet management. Therefore, enhancing diabetes-related nutritional knowledge via individualized education and assistance is crucial for improving dietary adherence among T2DM patients.

## INTRODUCTION

Diabetes mellitus (DM) encompasses a group of metabolic disorders characterized by impairments in insulin secretion (van Wilpe et al., 2023), insulin action or both, leading to hyperglycemia and associated complications, including chronic failure, damage, and dysfunction of blood vessels, the heart, nerves, kidneys, and eyes (Saadi and Omer, 2020; Yedjou et al., 2023).

Individuals with T2DM are often vulnerable to problems influenced by both modifiable and non-modifiable risk factors (Osei, 2025). T2DM, being a complex disease, possesses a genetic component; epigenetics may elucidate the unexplained heritability, and it is significantly affected by non-genetic factors such as physical activity, nutrition, obesity, and ageing (Ling et al., 2022). T2DM is a major global health concern, impacting about 500 million individuals worldwide and can be effectively treated with lifestyle modifications and behavioral changes in conjunction with glucose-lowering medications (Norman et al., 2024). This disease constitutes almost 90% of all diabetes cases, and the data from the World Health Organization (WHO) reveals that diabetes ranked among the 10 leading causes of mortality in 2019 (Souza et al., 2023). The WHO believes that T2DM is the third-highest risk factor for early mortality worldwide, preceded only by high blood pressure and tobacco (Baroni et al., 2022). Diabetes is a chronic condition with various complications necessitating extensive understanding and management (Alaofè et al., 2021). Adherence to diet is fundamental to T2DM management and constitutes the primary therapeutic approach; therefore, defining adherence and comprehending its obstacles may facilitate the development of more effective strategies and instruments to enhance dietary adherence in people with T2DM (Al-Salmi et al., 2022). Effective dietary therapies for remission or postponed progression necessitate substantial modifications to existing procedures; consequently, negative perceptions of dietitians and dietary recommendations may impede outcomes for individuals with T2DM (Boocock et al., 2021). Nonetheless, non-compliance with T2DM treatment protocols is an escalating issue within minority populations where T2DM is significantly widespread (Townsend, 2020). The World Health Organization defines adherence as "the degree to which the patient complies with medical directives." Effective care of T2DM necessitates adherence to medicine as well as lifestyle directives, including enhanced physical activity, particular food plans, smoking cessation, and rigorous monitoring of blood glucose levels (Sachkouskaya et al., 2022). Patients with T2DM may have three supplementary obstacles regarding diet adherence. The diabetic diet must be tailored to accommodate the client's weight, glucose levels, and the type and stage of the condition (Jung et al., 2024). Secondly, many medical and nutritional authorities provide disparate dietary regimens for T2DM. Thirdly, as nutritional sciences advance, the notion of a diabetic-friendly diet also progresses. (Al-Salmi et al., 2022). Understanding dietary control in T2DM may significantly impact food choices and eating habits (Han et al., 2020). The absence of compliance and monitoring of these behaviors may complicate the management of T2DM (Hamzi et al., 2024). Research has demonstrated that self-management education can decrease glycemic levels by 30%-80%. Furthermore, diabetes education can enhance glycemic control, modify individuals' behaviors, encourage self-management, and diminish complications and disease progression (Shiferaw et al., 2021; Pérez-Rivas et al., 2023). Further study underscores that organized education is essential in assisting patients in attaining glycemic control and maintaining essential lifestyle modifications. Early comprehensive education markedly diminishes diabetic consequences (Powers et al., 2020; Martha and Kehinde, 2025). The patients' perception of diabetes severity significantly influences patient education, as effective diabetes management necessitates enduring and difficult behavioral modifications. Such alterations are improbable to be sustained unless individuals comprehend and acknowledge the grave nature of the sickness (Alaofè et al., 2021).

## METHODOLOGY

### Design of the study

The current study employed the descriptive (cross-sectional) design to achieve the goals and objectives set for this study.

### Setting of the study

The study was conducted in the Non-Communicable Diseases Unit of Gulan Governmental General Hospital in Akre City, Duhok Governorate. It is the only Non-Communicable Diseases Unit in Akre City and its surrounding areas.

### Sample and sampling of the study

The total number of people with T2DM who were registered at the time of this study started Non-Communicable Diseases Unit at Gulan General Hospital in Akre City, was 2,258, between the ages at 18 and 65. A total of 300 participants, both male and female, were selected using a convenience sampling method. using the online Raosoft sample size calculator based on Confidence Level 95%, Margin of Error 5%, and population probably 18.2% in Duhok Governorate. After applying the Raosoft calculator, the result was 208 participants, and this number was extended to 300 to increase the study's confidence. The data were gathered using a structured questionnaire, which was prepared through an extensive review of related literature, global questionnaires, and previous research studies. Besides, based on the study's aim and objectives, the questionnaire consisted of three sections. The first section of the questionnaire is, dealing with patients' personal demographic information, the second section of the questionnaire assesses the patient's knowledge about diabetes and consists of fourteen questions, with three

answers being (No, not sure, Yes), which are scored as 1, 2, and 3, respectively, and the level of patients' knowledge by using the cut-off point as Poor knowledge (14-23), Average (24-33), and Good Knowledge (34-42). Section three of the questionnaire is related to diet adherence in the management of T2DM includes 42 diverse questions about the diet, the answers to these questions were (Always, Sometimes, Never) with scores of 3, 2, and 1, respectively, and the calculation of the level of the patients' diet adherence in the management of their diabetic condition was through adapting a cut-off as Non-low adherence (42-69), Partial adherence (70-97), Strict adherence (98-126), while assessing the barriers that prevent adherence to a diet in the management of T2DM included seven questions, which are rated as (Always, Sometimes, Never) and scored as 3, 2, and 1, respectively, the questions that had the opposite direction from the above rating and scoring were managed through reversing their score to obtain accurate results. Likewise, the significance of the barriers towards diet adherence of patients in managing their T2DM was indicated by calculating the barriers' items mean score as Non-significant (1-1.66), Significant (1.67-2.33), and Highly significant (2.34-3). During the direct interviews, a cumulative blood sugar (HbA1c) test was conducted in the laboratory for each participant to determine the extent to which participants' adherence to T2DM management, controls, and prevention of elevated blood sugar levels, followed by the collection of data. The interview took place between 48-55 minutes for each participant and was conducted individually on both day and evening times. After collecting data from the study participants, the data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) software, IBM version 26. This analysis includes descriptive methods such as frequency, percent, mean, and standard deviation. While the analytical method was done using the Chi-square, Fisher's exact test.

## Administrative Arrangement and Ethical Considerations

Firstly, the study is approved by both the Scientific Committee of Duhok Polytechnic University/ College of Health and Medical Techniques and the Ethical Committee of the General Directorate of Health in Duhok governorate/ Directorate of Planning (31072024-6-47). And then permission was obtained from the Duhok Directorate of Health, as well as permission was taken from the Directorate of Health in Akre and Gulan General Hospital. Then, before data collection, the author started by explaining the study objective and the method to obtain patients' consent to participate in this study.

## RESULTS

This study presents the results of 300 T2DM patients to meet the study objectives. Therefore, the age distribution revealed that half of the participants are within the 55–65 years 150 (50%), and an average age of 52.28 years. About Two-thirds are female, 199 (66.3%), while males accounted for 33.7%, and housewives 181 (60.3%), followed by those in the government sector (17.3%). Their educational attainment shows that 172 (57.3%) of participants are illiterate. A smaller proportion has achieved higher education, with only 19 (6.3%) being college graduates. Most participants are married, 272 (90.7%). Nearly all participants, 297 (99%), identify as Kurds, with Arabs making up only 1%. Close to two-thirds of them are urban residents, 198 (66%), followed by rural (18.3%) and suburban (15.7%). The maximum number of participants is non-smokers, 249 (83%). Their socioeconomic status (SES) indicates that most participants fall into the “average” SES category, with 269 (89.7%) participants, and a mean SES score of 51.58. Table 1.

Table 1 indicates that approximately three-fourths of the diabetic patients, accounting for 224 (74.7%), have an average knowledge of DM management.

**Table 1:** Patient's knowledge of Diabetes Mellitus management.

| Category        | Knowledge level | Freq (%)   | Mean (SD)     |
|-----------------|-----------------|------------|---------------|
| Knowledge of DM | Poor knowledge  | 2 (0.7)    | 31.45 (3.218) |
|                 | Average         | 224 (74.7) |               |
|                 | Good Knowledge  | 74 (24.7)  |               |

A significant majority of diabetic patients, 259 (86.3%), exhibited partial adherence to diet management, achieving a mean score of 86.37 and a standard deviation of 9.297 (Table 2).

**Table 2:** Patient's diet adherence related to Diabetes Mellitus management.

| Category       | Diet adherence level | Freq (%)   | Mean (SD)     |
|----------------|----------------------|------------|---------------|
| Diet adherence | Non-low adherence    | 12 (4)     | 86.37 (9.297) |
|                | Partial adherence    | 259 (86.3) |               |
|                | Strict adherence     | 29 (9.7)   |               |

The diabetic patient identified significant barriers to the dietary regimen in relation to items 3, 4, 5, 6, and 7, with mean scores of 1.99, 1.78, 2.25, 2.31, and 1.89, respectively. No significant barriers were reported for the other items in Table 3.

**Table 3:** Diabetic Patients' barriers to adherence to a Dietary regimen

|   | Items                                                                                            | Never<br>F (%) | Sometimes<br>F (%) | Always<br>F (%) | Mean<br>of<br>Score | Sig. |
|---|--------------------------------------------------------------------------------------------------|----------------|--------------------|-----------------|---------------------|------|
| 1 | Having difficulties in maintaining a diet due to a lack of time.                                 | 215(71.7)      | 67 (22.3)          | 18 (6)          | 1.34                | N.S  |
| 2 | Having difficulties in maintaining a diet due to a lack of knowledge.                            | 149(49.7)      | 121 (40.3)         | 30 (10)         | 1.60                | N.S  |
| 3 | Having difficulties in maintaining a diet, due to nothing left to eat.                           | 80 (26.7)      | 142 (47.3)         | 78 (26)         | 1.99                | S    |
| 4 | Encounter barriers that prevent paying attention to what to eat, like social influence.          | 103(34.3)      | 161 (53.7)         | 36 (12)         | 1.78                | S    |
| 5 | Having financial means to cover the costs of the recommended diet for managing diabetes.         | 48 (16)        | 130 (43.3)         | 122(40.7)       | 1.75                | S*   |
| 6 | Having access to the foods recommended in the dietary plan.                                      | 35 (11.7)      | 137 (45.7)         | 128(42.7)       | 2.31                | S*   |
| 7 | Lack of support from family or healthcare providers discourages adherence to dietary guidelines. | 105 (35)       | 124 (41.3)         | 71(23.7)        | 1.89                | S    |

\*Reversed Score. N.S (Non-significant= 1-1.66), S (Significant = 1.67-2.33), H.S (Highly significant =2.34-3). The patient's knowledge indicated a highly significant association ( $P=0.004$ ) with their adherence to management of their T2DM condition at P-Value 0.05 for significance as presented in Table 4.

**Table 4:** Association between patients' knowledge and their adherence to diet management towards T2DM.

|                                           |                | Diet adherence level |                      |                     | P-Value |
|-------------------------------------------|----------------|----------------------|----------------------|---------------------|---------|
|                                           |                | Non-low<br>adherence | Partial<br>adherence | Strict<br>adherence |         |
| Knowledge of Diabetes Mellitus Management | Poor knowledge | 0 (0)                | 1(0.4)               | 1 (3.4)             | 0.004** |
|                                           | Average        | 12 (100)             | 197(76.1)            | 15 (51.7)           |         |
|                                           | Good Knowledge | 0 (0)                | 61 (23.6)            | 13 (44.8)           |         |

\*\* Fisher Exact Test.

Table 5 highlights a highly significant association between participants' residence and socioeconomic status and their diet adherence in managing Diabetes Mellitus, with P-values of 0.018 and 0.003, respectively. No significant associations were identified for the other variables, based on a significance threshold of P-value 0.05.

**Table 5:** Association between patients' socio-demographic variables and their diet adherence to Diabetes Mellitus management.

|                   |                     | Diet adherence in Diabetes Mellitus management |                   |                  | P-Value |
|-------------------|---------------------|------------------------------------------------|-------------------|------------------|---------|
|                   |                     | Non-low adherence                              | Partial adherence | Strict adherence |         |
| Age years         | 25-34 Years         | 0 (0)                                          | 20 (90.9)         | 2 (9.1)          | 0.622** |
|                   | 35-44 Years         | 0 (0)                                          | 35 (85.4)         | 6 (14.6)         |         |
|                   | 45-54 Years         | 3 (3.4)                                        | 76 (87.4)         | 8 (9.2)          |         |
|                   | 55-65 Years         | 9 (6)                                          | 128 (85.3)        | 13 (8.7)         |         |
| Gender            | Male                | 3 (3)                                          | 87 (86.1)         | 11 (10.9)        | 0.726*  |
|                   | Female              | 9 (4.5)                                        | 172 (86.4)        | 18 (9)           |         |
| Employment Status | Government sector   | 1 (1.9)                                        | 43 (82.7)         | 8 (15.4)         | 0.319** |
|                   | Unemployment        | 0 (0)                                          | 22 (95.7)         | 1 (4.3)          |         |
|                   | Private sector      | 0 (0)                                          | 5 (71.4)          | 2 (28.6)         |         |
|                   | Self-employed       | 0 (0)                                          | 14 (93.3)         | 1 (6.7)          |         |
|                   | Housewife           | 9 (5)                                          | 155 (85.6)        | 17 (9.4)         |         |
|                   | Retired             | 2 (9.1)                                        | 20 (90.9)         | 0 (0)            |         |
| Education level   | Illiterate          | 7 (4.1)                                        | 151 (87.8)        | 14 (8.1)         | 0.472** |
|                   | Read and write      | 3 (7.7)                                        | 33 (84.6)         | 3 (7.7)          |         |
|                   | Primary education   | 0 (0)                                          | 33 (89.2)         | 4 (10.8)         |         |
|                   | Secondary education | 1 (3)                                          | 28 (84.8)         | 4 (12.1)         |         |
|                   | College graduate    | 1 (5.3)                                        | 14 (73.7)         | 4 (21.1)         |         |
| Marital Status    | Married             | 12 (4.4)                                       | 232 (85.3)        | 28 (10.3)        | 0.822** |
|                   | Single              | 0 (0)                                          | 11 (91.7)         | 1 (8.3)          |         |
|                   | Divorced            | 0 (0)                                          | 1 (100)           | 0 (0)            |         |
|                   | Widowed             | 0 (0)                                          | 15 (100)          | 0 (0)            |         |
| Ethnicity         | Kurd                | 12 (4)                                         | 256 (86.2)        | 29 (9.8)         | 1.000** |
|                   | Arab                | 0 (0)                                          | 3 (100)           | 0 (0)            |         |
| Residency         | Urban               | 7 (3.5)                                        | 166 (83.8)        | 25 (12.6)        | 0.018** |
|                   | Suburban            | 4 (8.5)                                        | 43 (91.5)         | 0 (0)            |         |
|                   | Rural               | 1 (1.8)                                        | 50 (90.9)         | 4 (7.3)          |         |

|                                        |                 |          |            |           |         |
|----------------------------------------|-----------------|----------|------------|-----------|---------|
| Cigarette Smoking                      | 0               | 11 (4.4) | 214 (85.9) | 24 (9.6)  | 0.945** |
|                                        | 1               | 1 (2.8)  | 32 (88.9)  | 3 (8.3)   |         |
|                                        | 2               | 0 (0)    | 11 (84.6)  | 2 (15.4)  |         |
|                                        | 3               | 0 (0)    | 2 (100)    | 0 (0)     |         |
| Duration of diabetic mellitus in years | <10 Years       | 5 (2.7)  | 159 (85.9) | 21 (11.4) | 0.261** |
|                                        | 10-20 Years     | 7 (6.6)  | 91 (85.8)  | 8 (7.5)   |         |
|                                        | > 20 Years      | 0 (0)    | 9 (100)    | 0 (0)     |         |
| Socioeconomic Status                   | Low (5-35)      | 1 (9.1)  | 10 (90.9)  | 0 (0)     | 0.003** |
|                                        | Average (36-66) | 11 (4.1) | 233 (86.6) | 25 (9.3)  |         |
|                                        | High (67-96)    | 0 (0)    | 16 (80)    | 4 (20)    |         |

\*Chi Square, \*\* Fisher Exact Test.

## DISCUSSION

In this study, most diabetic patients (74.7%) demonstrated a moderate level of knowledge about DM management, while only 0.7% had poor knowledge and 24.7% possessed good knowledge. This suggests that overall awareness among participants was generally average. According to the results of a recent study by Muhaisen and Yasir (2024) demonstrated good knowledge of DM management with a Mean of 2.35 and SD 0.46. In contrast, the study by Phoosuwan et al. (2022) in Thailand reported that the majority of respondents (96.7%) had poor knowledge, with none reaching a good knowledge level, indicating that the participants in the present study were relatively better informed. This difference could be due to variations in educational background, access to health information, and the availability of diabetes education programs between the two populations. Nevertheless, the fact that only about one-quarter of participants demonstrated good knowledge highlights the ongoing need for targeted educational interventions to improve patients' understanding and self-management of diabetes.

Concerning patients' adherence to diet in managing their T2DM, a significant majority of diabetic patients who took part in the current study reported partial adherence to their dietary management, achieving a mean score of 86.37 and a standard deviation of 9.297. This indicates that although the majority of patients somewhat comply with dietary requirements, there is potential for improvement to achieve stricter adherence, which is vital for effective diabetes care. The current study results do not correspond with research performed in Eastern Ethiopia, which indicates that 62.5% out of 307 T2DM patients displayed poor adherence to their dietary guidelines (Mohammed et al., 2020). In another study by Klinovszky et al. (2019), respondents reported lower adherence (13.3%) to diet in the management of T2DM. The cultural differences can affect their dietary behaviors and habits directly and indirectly.

According to results related to the barriers to adhering to diet guidelines in the management of T2DM, this research discovered multiple substantial obstacles to dietary compliance among diabetic patients. A majority of patients reported that they have not encountered issues stemming from time limits, implying that such limitations are not a significant concern for most participants. Likewise, they had never encountered difficulties from insufficient knowledge in maintaining a diet. A study in Pakistan identified insufficient awareness of dietary advice as the predominant barrier to adherence among individuals with T2DM (Shabbir et al, 2024). A lack of knowledge and dietary education was reported by 87% of study participants as the main barrier hindering adherence to recommended diets (Ayele et al., 2018). Participants indicate facing challenges due to insufficient availability of food choices, underscoring that dietary limitations might intermittently result in a sense of deprivation. As stated in a report by Alrasheeday et al. (2024), barriers to getting a healthy diet were presented among 34.9% of patients. Societal influences have arisen as barriers that also significantly impact the patient's attention to the diet they have to follow. A review by Iqbal (2023) explores how cultural factors affect the eating behaviors of T2DM patients in British South Asian populations. Likewise, financial limitations constitute a significant barrier, indicating challenges in affording the prescribed diet. A research paper by Breuing et al. (2020) identified economic barriers as a significant obstacle preventing individuals with T2DM from accessing healthier diet options. Access to therapeutic food stands for a significant additional barrier to diet adherence, as reported by the patients in obtaining it. A study published in the Egyptian Family Medicine Journal presented perceived

adherence and barriers to dietary advice among individuals with T2DM. It reveals a lack of access to a therapeutic diet as a significant obstacle for them (Abdelsalam et al, 2022). Besides the above, the participant has proven that a lack of support from family or healthcare providers discourages their adherence to dietary guidelines, which is a significant barrier that prohibits compliance with their food guidelines. These findings are consistent with other studies that demonstrate the importance of family support in affecting diabetic self-management behaviors, particularly in preserving dietary compliance (Hiefner et al., 2024; Fauziansyah et al., 2025). This aligns with the importance of family and healthcare providers in facilitating T2DM patients' dietary adherence.

This study found a significant association between patients' knowledge of diabetes management and their adherence to dietary recommendations. Individuals with higher levels of knowledge were more likely to follow dietary guidelines either partially or strictly, whereas those with limited understanding demonstrated minimal adherence. These findings align with the results of Abose et al. (2024) in Ethiopia, which showed that better-informed patients were more compliant with dietary recommendations, while poor knowledge was linked to lower adherence. Similarly, Alsaidan et al. (2025) in Saudi Arabia reported that knowledge gaps hindered proper dietary practices, with patients possessing greater diabetes-related knowledge exhibiting improved adherence. Overall, these results highlight the importance of patient education in enhancing dietary adherence among people with T2DM and suggest that targeted educational interventions may effectively support better diabetes management outcomes.

On the subject of the association of patients' sociodemographic variables with their adherence to diet management. The results of the current study disclose a highly significant association between patients' dietary adherence in managing T2DM and those who resided in an urban area and had an average socioeconomic status, with a P-value of 0.05. Compatible with a study by Mohammed et al. (2020) indicated that patients living in urban areas with a monthly income exceeding 1000 Ethiopian Birr were more likely to adhere to a good diet. Further findings on dietary complexity in the treatment of T2DM are discussed in a research article that indicates dietary adherence is closely related to economic level, and patients with low incomes tend to demonstrate poorer commitment (Tang and Yang, 2025).

## **LIMITATION**

The main barrier that the authors faced is the low willingness of the patients to participating in this study

## **CONCLUSION**

The present study concluded that the predominant of participants have an average knowledge of T2DM management with partial adherence to diet management, despite experiencing numerous barriers to the dietary regimen. Moreover, patients' knowledge related to T2DM management, urban residence, and socioeconomic status was associated with their dietary compliance. Therefore. Enhancing diabetes-related nutritional knowledge via individualized education and assistance is crucial for improving dietary adherence among T2DM patients.

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## **CONFLICTS OF INTEREST**

The authors declare that no conflict of interest when conducting this study.

## **Research data**

The authors declare that all the study data are available to submit.

## REFERENCE

- [1] Van Wilpe R, Hulst AH, Siegelaar SE, Devries JH, Preckel B & Hermanides J (2023). Type 1 and other types of diabetes mellitus in the perioperative period. What the anaesthetist should know. *Journal of Clinical Anesthesia*; 84(111012) <https://doi.org/10.1016/j.jclinane.2022.111012>
- [2] Saadi HF & Omer WO (2020). The Effect of a Nutrition Education Program on Improving Hemoglobin A1c and Body Mass Index of Patients with Type 2 Diabetes Mellitus in Erbil City: A Non-Randomized Clinical Trial. *Polytechnic Journal*; 10(1): 5 <https://doi.org/10.25156/ptj.v10n1y2020.pp25-31>
- [3] Yedjou CG, Grigsby J, Mbemi A, Nelson D, Mildort B, Latinwo L & Tchounwou PB (2023). The management of diabetes mellitus using medicinal plants and vitamins. *International Journal of Molecular Sciences*; 24(10): 9085 <https://doi.org/10.3390/ijms24109085>
- [4] Osei TB. 2025. Dietary behaviour and type 2 diabetes mellitus among sub-Saharan African populations under transition. <https://doi.org/10.11588/heidok.00035419>
- [5] Ling C, Bacos K & Rönn T (2022). Epigenetics of type 2 diabetes mellitus and weight change—a tool for precision medicine? *Nature Reviews Endocrinology*; 18(7): 433-48 <https://doi.org/10.1038/s41574-022-00671-w>
- [6] Norman K, Mustafa ST, Cassim S, Mullins H, Clark P, Keenan R, et al. (2024). General practitioner and nurse experiences of type 2 diabetes management and prescribing in primary care: a qualitative review following the introduction of funded SGLT2i/GLP1RA medications in Aotearoa New Zealand. *Primary Health Care Research & Development*; 25(e34) <https://doi.org/10.1017/S1463423624000264>
- [7] Souza SD, Rahmah AM, Murtada H, Fadel H, Kakil D, Altaie J, Savo A, et al. (2023). An Observational Study to Evaluate Demographic Variables, Clinical Characteristics of Type 2 Diabetes Mellitus Patients Reporting to a Healthcare Facility in Iraq. *Int. J. Med. Pharm. Res.*, 11 (1), 15-23. Available from: [https://www.researchgate.net/publication/373980307\\_International\\_Journal\\_of\\_Medicine\\_and\\_Pharmaceutical\\_Research\\_Res\\_e\\_s\\_e\\_a\\_r\\_c\\_h\\_A\\_r\\_t\\_i\\_c\\_l\\_e\\_An\\_Observational\\_Study\\_to\\_Evaluate\\_Demographic\\_Variables\\_Clinical\\_Characteristics\\_of\\_Type\\_2\\_Diabetes\\_Mellitu](https://www.researchgate.net/publication/373980307_International_Journal_of_Medicine_and_Pharmaceutical_Research_Res_e_s_e_a_r_c_h_A_r_t_i_c_l_e_An_Observational_Study_to_Evaluate_Demographic_Variables_Clinical_Characteristics_of_Type_2_Diabetes_Mellitu)
- [8] Baroni I, Caruso R, Dellafiore F, Ausili D, Barelo S, Vangone I, et al. (2022). Self-care and type 2 diabetes mellitus (T2DM): a literature review in sex-related differences. *Acta Biomed*; 93(4):e2022277. <https://doi.org/10.23750/abm.v93i4.13324>
- [9] Alaofè, H., Hounkpatin, W.A., Djrolo, F., Ehiri, J., Rosales, C. (2021). Knowledge, attitude, practice and associated factors among patients with type 2 diabetes in Cotonou, Southern Benin. *BMC Public Health*; 21, 1-11. <https://doi.org/10.1186/s12889-021-10289-8>
- [10] Al-Salmi N, Cook P & D'souza MS (2022). Diet adherence among adults with type 2 diabetes mellitus: A concept analysis. *Oman Medical Journal*; 37(2): e361 <https://doi.org/10.5001/omj.2021.69>
- [11] Boocock RC, Lake AA, Haste A, Moore HJ (2021). Clinicians' perceived barriers and enablers to the dietary management of adults with type 2 diabetes in primary care: a systematic review. *Journal of Human Nutrition and Dietetics*; 34(6): 1042-52 <https://doi.org/10.1111/jhn.12875>
- [12] Townsend AM. 2020. Factors affecting adherence to diabetes management recommendations among Afro-Caribbean farm workers. Walden University. <https://www.proquest.com/openview/192a20f723f7ff4f610bd323b41fae5b/1?pq-origsite=gscholar&cbl=18750&diss=y>
- [13] Sachkouskaya A, Sharshakova T, Kovalevsky D, Rusalenko M, Savasteeva I, Goto A, et al. (2022). Barriers to prevention and treatment of type 2 diabetes mellitus among outpatients in Belarus. *Frontiers in Clinical Diabetes and Healthcare*; 2(797857) <https://doi.org/10.3389/fcdhc.2021.797857>
- [14] Jung, D. H., Han, J. W., Shin, H., & Lim, H.-S. (2024). Tailored Meal-Type Food Provision for Diabetes Patients Can Improve Routine Blood Glucose Management in Patients with Type 2 Diabetes: A Crossover Study. *Nutrients*, 16(8), 1190. <https://doi.org/10.3390/nu16081190>
- [15] Han CY, Chan CGB, Lim SL, Zheng X, Woon ZW, Chan YT, et al. (2020). Diabetes-related nutrition knowledge and dietary adherence in patients with Type 2 diabetes mellitus: A mixed- methods exploratory study. *Proceedings of Singapore Healthcare*; 29(2): 81-90 <https://doi.org/10.1177/2010105820901742>
- [16] Hamzi AM, Zamburi MM, Albishi EMM, Hatamihattan RA, Albannaa RM, Kuzay SA, et al. Healthcare Workers' Knowledge, Attitude and Practices Towards the Care for Patients with Type 2 Diabetes Mellitus In Saudi Arabia: Narrative Review. *JICRCR*. 2024;7(S9):1799-806. Available from: <https://jicrcr.com/index.php/jicrcr/article/view/839>

- [17] Shiferaw WS, Akalu TY, Desta M, Kassie AM, Petruca PM & Aynalem YA (2021). Effect of educational interventions on knowledge of the disease and glycaemic control in patients with type 2 diabetes mellitus: a systematic review and meta-analysis of randomised controlled trials. *BMJ open*; 11(12): e049806 <https://doi.org/10.1136/bmjopen-2021-049806>
- [18] Pérez-Rivas, F. J., Rico-Blázquez, M., López-López, C., Domínguez-Fernández, S., Cobos-Serrano, J. L., & Ajejas Bazán, M. J. (2023). 'Learning by doing', a model for improving the promotion of healthy lifestyles by student nurses. *BMC nursing*, 22(1), 236. <https://doi.org/10.1186/s12912-023-01398-3>
- [19] Powers, M. A., Bardsley, J. K., Cypress, M., Funnell, M. M., Harms, D., Hess-Fischl, A. et. al. (2020). Diabetes self-management education and support in adults with type 2 diabetes: A consensus report of the American Diabetes Association, the Association of Diabetes Care & Education Specialists, the Academy of Nutrition and Dietetics, the American Academy of Family Physicians, the American Academy of PAs, the American Association of Nurse Practitioners, and the American Pharmacists Association. *Diabetes Care*, 43(7), 1636–1649. <https://doi.org/10.2337/dci20-0023>
- [20] Martha JM & Kehinde OO. Dietary Educational Program and Its Effect on the Knowledge of Patients with Diabetes Mellitus in Rivers State Nigeria. *IJCSRR*. 2025;8(2):740-8 <https://doi.org/10.47191/ijcsrr/V8-i2-20>
- [21] Muhaisen, A. S. and Yasir, A. A. (2024) “Self-Care Practices Regarding Eating Habits, Knowledge of Diet and Exercise for Type II Diabetic Patients”, *South Eastern European Journal of Public Health*, pp. 797–804. <https://doi.org/10.70135/seejph.vi.1563>
- [22] Phoosuan, N., Ongari, P., & Hjelm, K. (2022). Knowledge on diabetes and its related factors among the people with type 2 diabetes in Thailand: a cross-sectional study. *BMC public health*, 22(1), 2365. <https://doi.org/10.1186/s12889-022-14831-0>
- [23] Mohammed AS, Adem F, Tadiwos Y, Woldekidan NA, Degu A (2020). 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, Metabolic Syndrome and Obesity*, 13, 2605-12. <https://doi.org/10.2147/DMSO.S256738>
- [24] Klinovszky, A., Kiss, I. M., Papp-Zipernovszky, O., Lengyel, C., & Buzás, N. (2019). Associations of different adherences in patients with type 2 diabetes mellitus. *Patient Preference and Adherence*, 13, 395–407. <https://doi.org/10.2147/PPA.S187080>
- [25] Shabbir S, Amer M, Mughal S, Rashid T; Habiba (2024). Assessment of barriers to the dietary adherence among type 2 diabetic patients in Pakistan: A cross-sectional study. *J Pak Med Assoc*;74(9):1638-1644. <https://doi.org/10.47391/JPMA.10782>
- [26] Ayele AA, Emiru YK, Tirunch SA, Ayele BA, Gebremariam AD, Tegegn HG, (2018). Level of adherence to dietary recommendations and barriers among type 2 diabetic patients: a cross-sectional study in an Ethiopian hospital. *Clin Diabetes Endocrinol*; 4(21). <https://doi.org/10.1186/s40842-018-0070-7>
- [27] Alrasheeday AM, Alshammari HS, Alshammari B, Alkubati SA, Llego JH, Alshammari, AD, et.al, (2024). Perceived Barriers to Healthy Lifestyle Adherence and Associated Factors Among Patients with Type 2 Diabetes Mellitus: Implications for Improved Self-Care. *Patient Preference and Adherence*;18, 2425–2439. <https://doi.org/10.2147/PPA.S432806>
- [28] Iqbal S, (2023). Cultural factors influencing the eating behaviours of type 2 diabetes in the British South-Asian population: a scoping review of the literature. *Journal of Global Health Reports*. 2023;7:e2023050. <https://doi.org/10.29392/001c.84191>
- [29] Breuing J, Pieper D, Neuhaus AL, Heß S, Lu`tkemeier L, Haas F, et al. (2020) Barriers and facilitating factors in the prevention of diabetes type 2 and gestational diabetes in vulnerable groups: A scoping review. *PLoS ONE* 15(5): e0232250. <https://doi.org/10.1371/journal.pone.0232250>
- [30] Abdelsalam S, Ismail M, Hassan S, Sultan E, Elsherif O, Mikhail Salama H. (2022). Perceived Adherence and Barriers to Dietary Recommendations among Type 2 Diabetic Patients in a Family Practice Clinic, Suez Canal University Hospitals. *The Egyptian Family Medicine Journal*, 6(1):95-107. <https://doi.org/10.21608/efmj.2023.132549.1099>
- [31] Hiefner A R, Raman S, Woods S B. (2024). Family Support and Type 2 Diabetes Self-Management Behaviours in Underserved Latino/a/x Patients. *Annals of Behavioral Medicine*, 58(7):477-487. <https://doi.org/10.1093/abm/kaae023>

- [32] Fauziansyah A, Arifin MF, Pitaloka D, Miyah W M. (2025). Family Instrumental Support and Dietary Compliance in Type II Diabetes Mellitus Patients: A Cross-Sectional Study. *Innovative: Journal Of Social Science Research*, 5(3):2121-29. <https://doi.org/10.31004/innovative.v5i3.19211>
- [33] Abose S, Dassie GA, Megerso A, Charkos TG (2024). Adherence to recommended diet among patients with diabetes mellitus type 2 on follow-up at Adama Hospital Medical College, Ethiopia. *Front. Med.*; 11:1484071. <https://doi.org/10.3389/fmed.2024.1484071>
- [34] Alsaidan, A. A., Alanazi, M. I., & Thirunavukkarasu, A. (2025). Assessment of Diabetes-Related Knowledge and Dietary Patterns Among Type 2 Diabetes Mellitus Patients in Central Saudi Arabia: Insights for Tailored Health Education Strategies. *Healthcare*, 13(3), 233. <https://doi.org/10.3390/healthcare13030233>
- [35] Tang Y, Yang D. (2025). Overcoming dietary complexity in type 2 diabetes: influencing factors and coping strategies. *Eur J Med Res* **30** Article number:82. <https://doi.org/10.1186/s40001-025-02318-8>