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Research Article

Diabetes Self-Management Education's Effect on Patients' Glycated Haemoglobin and Foot Self-Care at Two Hospitals in Ebonyi State, Nigeria

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ABSTRACT

Background: Type 2 Diabetes Mellitus (T2DM) can worsen foot injuries. This study compared the effects of Face to Face (F2F) and Blended Diabetes Self-Management Education (BDSME) on Glycated Haemoglobin (HbA1c) and foot self-care among T2DM patients in two tertiary hospitals in Ebonyi State, Nigeria.

Methods: A two-group pre and post quasi-experimental design was adopted for the study. Using cluster random sampling, 178 participants were selected out of 1,187 registered diabetic patients and enrolled into two groups (89 in BSDME and 89 in F2F). The F2F group received 2-hour in-person training sessions every three weeks based on the American Association of Diabetes Educators' seven-process model (AADE7) curriculum. The BDSME group received the in person sessions and three take home online videos on diabetes management. Data were collected using a demographic survey, electronic HbA1c analyzer, and the Diabetic Foot Disease and Foot Care Questionnaire (r = 0.88). Descriptive statistics, chi squared and independent sample t-test were used for data analyses at $p < 0.05$.

Results: At baseline, the BDSME group had lower HbA1c ($p = 0.03$) but inadequate foot care ($p = 0.001$) than the F2F group. At six months follow-up, the BDSME group's HbA1c remained lower ($p = 0.001$), and the foot self-care became significantly better ($p = <0.001$) than in the F2F group.

Conclusion: In comparison to F2F, BDSME performed better at sustaining long-term adherence to diabetes foot self-care. Nursing care providers should consider BDSME for improving diabetes foot self-care.

***Keywords*:** *Type 2 Diabetes Mellitus, Foot care, Glycated haemoglobin, Self-management education*

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INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a chronic non-communicable disease caused by insulin dysfunction and marked by hyperglycaemia (Goswami, 2024). Over 346 million people are affected globally, and the prevalence is expected to double by 2030 if no drastic intervention is implemented (Farag et al., 2021). T2DM risk factors include ageing, obesity, poor diet and inactivity (Rajput et al., 2022). The condition reduces quality of life and predisposes affected persons to severe foot injuries and Nigeria has the largest burden in Africa (Tella et al., 2021). Foot ulcer is the most common complication of T2DM and it results in 80% of surgical amputation in affected persons when the foot is not adequately cared for (Wazqar et al., 2021). The rising prevalence of T2DM and its foot ulcer complication highlights a need for persons living with the condition to learn about the proper foot self-care as a preventive measure. Conventionally, T2DM is managed through hospital-based care where patients receive instructions and glucose monitoring. After discharge however, some patients forget the content of hospital-based teachings and adopt unorthodox practices due to the lack of knowledge reinforcement tools (Bosun-Arije et al., 2019). This highlights the need for tools that can reinforce teachings on sustainable diabetes self-management beyond the hospital environment.

The American Diabetes Association (2018) recommends self-management education to lower blood sugar and reduce complications such as foot injuries. Scannell et al. (2025) and Yimer et al. (2025) acknowledged that Diabetes self-management education (DSME) is cost-effective when combined with drug therapy. DSME conventionally involves face-to-face (F2F) teachings that complement medication in blood glucose control (Alonso-Carril et al., 2024). Nonetheless, Agofure and Oghenerume (2022) mentioned that the persistent knowledge and awareness gaps indicate that the F2F approach has limited effectiveness. This underscores the urgent need for an improved DSME approach. Blended Diabetes Self-Management Education (BDSME) is a modification to the routine DSME (Ghiyasvandian et al., 2023). BDSME combines F2F sessions and mobile self-paced video demonstrations to guide patients and reinforce effective diabetes self-care behaviours post-discharge.

The glycated haemoglobin (HbA1c) test measures average blood glucose over three months (Huang et al., 2021). An HbA1c above 6.5% suggests T2DM (Nozawa et al., 2022). The HbA1c parameter guides diagnosis and effective clinical monitoring. Additionally, Foot care in diabetes involves daily inspection, washing, drying, and wearing comfortable shoes. Regular self-inspection enables early detection of changes and timely reporting to healthcare providers. Proper washing and drying helps maintain cleanliness, while foamy shoes protect pressure points from breakdown. Sari et al. (2020) observed that adequate foot self-care significantly reduced hospital readmissions and amputations. Hence, consistent foot care practices remain vital for preventing foot complications in diabetes. On this premise, a study that will examine the effectiveness of BDSME in reducing HbA1c and improving foot self-care in comparison to the usual DSME cannot be overemphasised, especially in Nigeria.

Diabetic foot ulcer mortality among Nigerians with T2DM is 40.5%, which is higher than the 14% average in Africa (Adeleye et al., 2020; Agofure & Oghenerume, 2022). The prevalence of T2DM among Nigeria rose from 2% in 1990 to 10.4% in 2021, affecting 12.5 million people (Adeloye et al., 2017; Bashir et al., 2021). Hospital-based education is now inadequate as patients often relapse post-discharge and have foot complications (Costello et al., 2025). Unpublished records from the two largest tertiary hospitals in Ebonyi revealed an average of 47% re-hospitalization due to uncontrolled HbA1c and foot self-care in the year 2024. This further highlights the need to examine the effectiveness of BDSME on HbA1c and foot self-care. The research question for this study was articulated using the Population, Intervention, Comparison, Outcome, and Time (PICOT) strategy as follows: Among T2DM patients in two tertiary hospitals in Ebonyi State (P), what is the effectiveness of the BDSME (I) compared to the F2F DSME (C) on HbA1c and Foot self-care (O) at 6 months of intervention follow-up (T).

MATERIALS AND METHODS

A two-group pre and post quasi-experimental design was adopted for this study. The research was conducted at the Alex Ekwueme Federal University Teaching Hospital (AEFUTHA) in Abakaliki and David Umahi Federal University Teaching Hospital (DUFUTH) in Uburu, all in Ebonyi State, south-eastern Nigeria. Ethical clearance was obtained from AEFUTHA and DUFUTH health research ethics committees.

The population for this study was 1,187 registered patients living with diabetes (AEFUTHA = 961, DUFUTH = 226). After 10% increase for potential fallout, a sample size of 89 for the BDSME and 89 for the F2F groups was determined using the G*Power statistical software tool (version 3.1.9.7, developed by

the University of Düsseldorf in 1992). Cluster random sampling was applied in the selection of participants with the hospitals serving as the geographical clusters.
This study utilized a researcher-designed socio-demographic survey, a 12-item free standardized Diabetic Foot Disease and Foot Care Questionnaire (DFDFCQ; Al-Busaidi et al., 2020), and an electronic COBAS B 101 HbA1c point-of-care analyzer (manufactured in 2013 by Roche Diagnostics GmbH, Basel, Switzerland). The socio-demographic part of the questionnaire (Section A) comprised five items that were designed to extract information on participants' age, gender, employment status, co-morbidity and health insurance enrolment status. The section B had the DFDFCQ which assessed foot self-care. The DFDFCQ employed a 4-point scoring system for each of the 12 items. All the positively worded items had a designated point value ranging from 0 - 4 (never = 0, rarely = 1, monthly = 2, weekly = 3, and daily = 4). The total score was calculated by adding up the points for each question. The range of score for each respondent was 0-48. A higher score depicted better foot self-care. Scores of 0-12 = very poor, 13-24 = poor, 25-36 = fair, and 37-48 = good foot care (Al-Busaidi et al., 2020).

The COBAS B 101 HbA1c point-of-care analyzer is an instrument that measures HbA1c levels in a small (2 µL) sample of capillary blood. The analyzer uses a disposable single-use test cartridge that is pre-loaded with reagents and calibrators, making it easy to use and ensuring consistent results. The analyzer required only a few drops of blood to complete a test in 4 minutes, making it ideal for use in urgent clinical situations. The COBAS B 101 analyzer has an HbA1c measurement range of 4-14% (Diabetes Control and Complications Trial/National Glyco haemoglobin Standardization Programme, DCCT/NGSP) and a coefficient of variation of less than 2%. The HbA1c tests were done and results were reported by the research assistant (a certified and licensed medical laboratory scientist) into the provided space in Section C of the questionnaire.

For content validity of the questionnaire, three Associate Professors from Department of Nursing, Ebonyi State University evaluated the questionnaire and had an agreement index of 0.963, which exceeded the 0.7 benchmark for acceptable validity (Polit & Beck, 2021). Reliability was tested on 18 diabetic patients at the neighbouring Enugu State University Teaching Hospital using the split-half method. The test yielded a reliability index of 0.887, confirming high reliability (Polit & Beck, 2021).

Following ethical approval, the participants were recruited during clinic visits. Informed consents were obtained, anonymity maintained through coded identifiers, and confidentiality protected to safeguard participants' rights. Baseline socio-demographic data, foot care practices, and HbA1c were assessed. Questionnaires were self-administered within 20 minutes. HbA1c was measured using the COBAS B 101 analyzer, with blood samples collected through fingertip pricks by the research assistant (medical laboratory scientist). The F2F and BDSME groups received in-person DSME that was guided by the American Association of Diabetes Educators' (2020) seven-process model (AADE7) curriculum. The AADE7 covered healthy eating, physical activity, glucose monitoring, medication adherence, problem-solving, healthy coping, and risk reduction. Foot care was emphasised, including daily inspection, washing, moisturising, nail trimming, proper footwear, and avoiding barefoot walking or heat exposure. The session began with introductions, knowledge assessment, and a 105-minute teaching segment, and a 10-minute question and answer segment. The BDSME received an additional a five-minute take home video that demonstrated diabetes care. Reinforcement included weekly two-hour sessions for three weeks in the first three months and two weeks after three months. The F2F group received only the face-to-face discussion. At six months, both groups completed questionnaires on socio-demographics and foot self-care, while HbA1c was reassessed using the same COBAS B 101 analyzer procedure.

IBM SPSS 25 software was used to code and analyse data. Descriptive statistics (frequency, percentage, mean, standard deviation) summarised socio-demographics, foot care, and HbA1c. Chi squared was used to compare demographic values while independent sample t-test was used to compare the pre- and post-intervention measures at 5% significance.

RESULTS

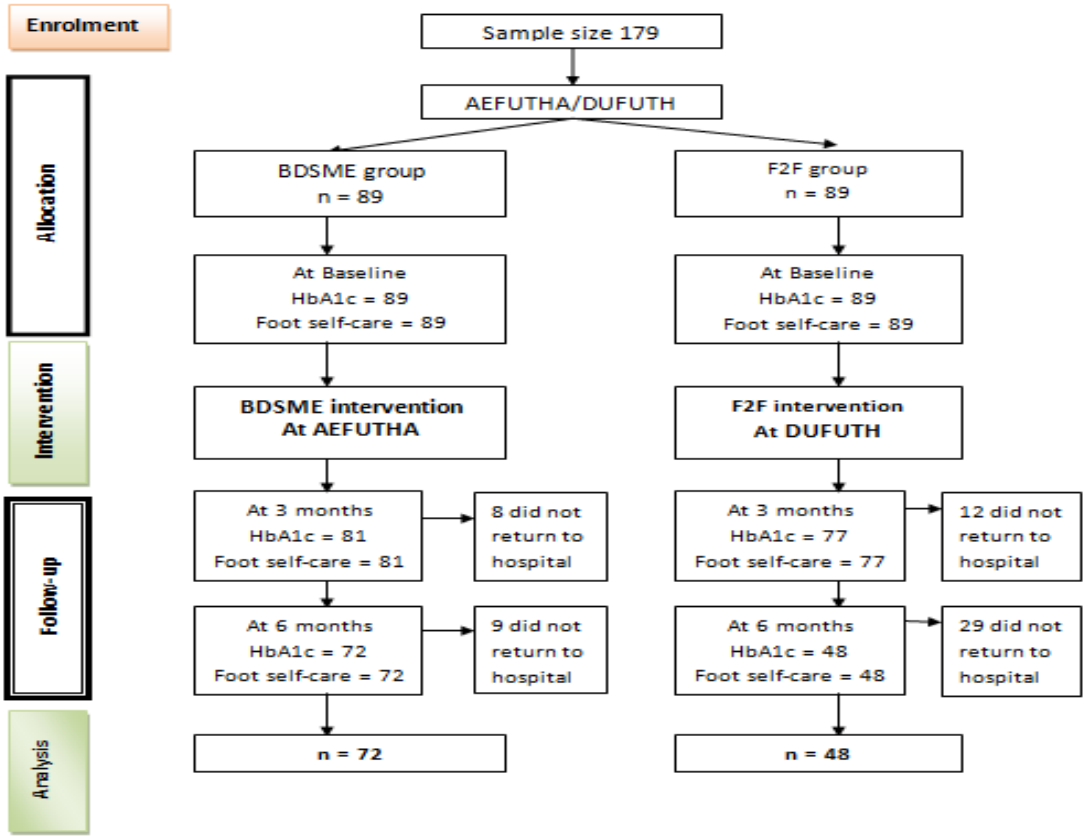

Figure 1: CONSORT flow diagram for the study

Figure 1 presents the Consolidated Standards of Reporting Trials (CONSORT) flow diagram and showed that the study enrolled 179 participants, allocated equally into BDSME and F2F groups. At baseline, both groups had 89 participants. At 6 months follow-up, attrition reduced BDSME to 72 and F2F to 48.

Table 1: Demographic profile of T2DM Patients (N = 178)

Category	BDSME, n (%)	F2F, n (%)	*p* value
n	89	89	
Age range (in years)			<0.001
30-39	2 (2.2)	5 (5.6)	
40-49	16 (18.0)	29 (32.6)	
50-59	19 (21.3)	32 (36.0)	
60-69	38 (42.7)	13 (14.6)	
70-79	14 (15.7)	10 (11.2)	
Gender			0.078
Male	35 (39.3)	23 (25.8)	
Female	54 (60.7)	66 (74.2)	
Employment status			<0.001
Employed	67 (75.3)	24 (27.0)	
Unemployed	22 (24.7)	65 (73.0)	
Co-morbidity			
Hypertension	28 (31.5)	82 (92.1)	<0.001
Heart disease	5 (5.6)	9 (10.1)	0.265
Stroke	47 (52.8)	6 (6.7)	<0.001
Kidney disease	15 (16.9)	1 (1.1)	<0.001
Over weight/Obesity	69 (77.5)	5 (5.6)	<0.001
High cholesterol	36 (40.4)	4 (4.5)	<0.001
Sleep disorder	1 (1.1)	1 (1.1)	1.000
Depression	45 (50.6)	6 (6.7)	<0.001
Fatty liver disease	0 (0.0)	3 (3.4)	0.081
Health insurance enrolment			<0.001
Insured	78 (87.6)	44 (49.4)	
Uninsured	11 (12.4)	45 (50.6)	

P <0.05 = significant difference, n = frequency, % = percent.

Table 1 presents the demographic profile of T2DM Patients and revealed that the BDSME group had more of older adults, males, and employed individuals, while the F2F group had more females and unemployed participants. Hypertension was more among F2F participants, whereas stroke, kidney disease, obesity, high cholesterol, and depression were more common co-morbidities in BDSME. Health insurance coverage was significantly higher in the BDSME group.

Table 2: Baseline HbA1c among participants

HbA1C measures	BDSME, (n = 89)	F2F, (n = 89)	Independent sample t-test	Degree of freedom	*P* value
Mean	7.85	9.71	2.14	176	0.034
SD	1.11	8.12			
Std. Error Mean	0.12	0.86			

SD = standard deviation, Std Error = Standard error, p < 0.05 = significant

Table 2 presents the baseline HbA1c among participants and revealed that mean HbA1c was significantly lower in the BDSME group compared to the F2F group. There was better glycaemic control among BDSME participants at baseline.

Table 3: Baseline foot self-care among participants

Item	BDSME, n = 89		F2F, n = 89		Independent sample t-test	*P value*
	Mean	SD	Mean	SD		
*How often do you look at the bottom of your feet?	1.46	1.10	4.00	1.62	13.94	<0.001
*How often do you wash your feet with mild soap and water?	4.52	1.24	4.18	0.75	2.21	0.028
*How often do you check in-between your toes?	1.47	0.92	3.75	0.92	16.53	<0.001
*How often do you dry in-between your toes?	1.94	1.61	4.21	0.65	12.32	<0.001
*How often do you test your bath water's temperature with a thermometer?	1.01	0.11	1.04	0.21	1.36	0.175
*How often do you inspect the inside of your shoes before you wear them?	1.03	0.32	2.64	1.45	10.23	<0.001
* How often do you soak your feet in hot or warm water or place your feet near a heat source?	1.02	0.21	1.83	0.38	17.66	<0.001
* How often do you apply lubricants or moisturizer on your feet but not in-between the toes?	1.74	0.44	4.08	1.20	17.27	<0.001
* How often do you walk around the house barefooted or in stocking feet?	4.79	0.76	5.00	0.00	2.65	0.009
* How often do you cut or trim your toe nails?	2.89	0.94	3.07	0.25	1.75	0.082
* How often do you smoke?	5.00	0.00	5.00	0.00	-	1.000
How often do you wear protective footwear?	2.47	1.57	4.38	0.49	10.96	<0.001
Mean Foot self-score	***29.34***	***1.52***	***43.18***	***1.23***	***66.77***	***<0.001***

*SD = standard deviation, n = sample size, * = Reverse scored items, p < 0.05 = significant, mean foot self-score <12 = very poor, 13-24 poor, 25-36 = fair, 37-48 = good*

Table 3 presents baseline foot self-care among participants and showed that foot self-care was significantly better in the F2F group compared to the BDSME group. The differences were statistically significant in foot inspection, hygiene, moisturising, footwear use, and protective behaviours in favour of the F2F group.

Table 4: HbA1c among participants at 6 months

HbA1C measures	BDSME, (n = 72)	F2F, (n = 48)	Independent sample t-test	Degree of freedom	*P* value
Mean	7.55	8.68	5.15	118	<0.001
SD	1.01	1.39			
Std. Error Mean	0.11	0.20			

SD = standard deviation Std Error = Standard error, p < 0.05 = significant

Table 4 presents the HbA1c among participants at 6 months and showed that the mean HbA1c was significantly lower in the BDSME group compared to the F2F group. Lower HbA1c indicates better long-term glycaemic control among BDSME participants.

Table 5: Foot self-care among participants at 6 months

Item	BDSME, n = 72		F2F, n = 48		Independent sample t-test	*P value*
	Mean	SD	Mean	SD		
*How often do you look at the bottom of your feet?	4.61	0.78	3.18	1.91	5.69	<0.001
*How often do you wash your feet with mild soap and water?	4.52	1.24	4.46	0.74	0.30	0.764
*How often do you check in-between your toes?	4.12	0.92	3.75	0.92	2.16	0.033
*How often do you dry in- between your toes?	4.30	0.99	3.49	1.48	3.59	<0.001
*How often do you test your bath water's temperature with a thermometer?	1.01	0.11	1.04	0.21	1.02	0.309
*How often do you inspect the inside of your shoes before you wear them?	4.55	0.62	2.31	1.26	12.94	<0.001
* How often do you soak your feet in hot or warm water or place your feet near a heat source?	2.96	0.71	1.83	0.38	10.09	<0.001
* How often do you apply lubricants or moisturizer on your feet but not in-between the toes?	3.63	1.07	3.02	1.53	3.07	0.011
* How often do you walk around the house barefooted or in stocking feet?	1.82	0.98	3.39	1.72	6.36	<0.001
* How often do you cut or trim your toe nails?	2.89	0.94	3.07	0.25	1.29	0.198
* How often do you smoke?	5.00	0.00	5.00	0.00	-	1.000
How often do you wear protective footwear?	3.72	1.32	2.78	1.54	3.57	<0.001
Mean Foot self-score	***43.13***	***1.22***	***37.32***	***1.08***	***26.73***	***<0.001***

*SD = standard deviation, n = sample size, * = Reverse scored items, p < 0.05 = significant, mean foot self -score <12 = very poor, 13-24 poor, 25-36 = fair, 37-48 = good*

Table 5 presents the foot self-care among participants at 6 months and revealed that foot self-care was significantly better among BDSME participants than F2F. There were higher mean scores in foot inspection, drying, shoe checks, moisturising, footwear use, and reduced barefoot walking.

DISCUSSION

This study found that BDSME participants had significantly lower baseline HbA1c than F2F participants. This finding may be due to employment and health insurance rates. Employment provides financial stability that may support access to medication and recommended foods. Conversely, unemployed F2F participants likely faced financial stress that limit healthcare access and contribute to poorer glycaemic control. The baseline HbA1c range (7.8–9.7%) was higher than those reported in China (6.5–6.9%, Yu et al., 2022), but similar to India (6.9–9.3%, Singh et al., 2022) and Lebanon (8.6–8.9%, Sukkarieh-Haraty et al., 2022). These variations highlight the role of socioeconomic factors and healthcare infrastructure in diabetes outcomes. China's lower levels may reflect stronger healthcare access and early interventions. The similarities with India and Lebanon may suggest shared challenges of limited resources that exacerbate adherence issues.

This study found significant baseline differences in foot self-care, with the F2F group scoring higher than the BDSME group. However, BDSME participants engaged less in vital practices such as inspecting feet, checking between toes, drying, and shoe inspection, which are essential for preventing injuries and infections. Interestingly, they avoided harmful behaviours like soaking feet in hot water, reflecting better adherence to recommended safety practices. Conversely, the F2F group frequently walked barefoot indoors, a risky behaviour that increases chances of injuries and infections, especially in those with neuropathy. These variations suggest that the quality of practices differed. Similar trends of poor adherence were reported in Lebanon (Sukkarieh-Haraty et al., 2022), Iran (Moradi et al., 2019), and Ethiopia (Hailu et al., 2019). This similarity in findings highlight global gaps requiring culturally adapted diabetes education.

At six months follow-up, participants in the BDSME group maintained significantly lower HbA1c levels than the F2F group, showing sustained glycaemic

control. This suggests that blended learning (combining online and in-person education) can support long-term diabetes self-management. Flexibility, continuous reinforcement, and remote access to resources likely enabled BDSME participants to sustain healthy behaviours. The BDSME group's HbA1c was lower than findings from Egypt (Emara et al., 2021) and Taiwan (Chen et al., 2019). However, HbA1c levels remained higher than those reported in China (Zheng et al., 2019), possibly due to differences in follow-up frequency. These variations highlight that while BDSME is effective, intervention success may depend on reinforcement tools and frequency of follow-up.

The six months follow-up assessment found better adherence to recommended foot self-care practices in the BDSME compared to the F2F group. The BDSME has better practices in inspecting feet, drying between toes, checking shoes, and avoiding risky behaviours such as soaking feet in hot water or walking barefoot. These practices reduce risks of fungal infections, burns, and unnoticed injuries. The blended model's flexibility may have reinforced these habits and encouraged consistent self-management. The BDSME group's outcomes aligned with findings from Ethiopia (Hailu et al., 2019), Iran (Hemmati-Maslakpak et al., 2017), and Morocco (Adarmouch et al., 2017), which showed that BDSME improves foot care adherence across different contexts. This finding suggests that blended approaches (offering both flexibility and reinforcement) can be effective. Given their adaptability, BDSME models may be especially valuable in low- and middle-income countries, where they can provide cost-effective and scalable solutions for sustainable foot care behaviours. This can ultimately reduce diabetes-related foot complications and surgical amputations.

Limitations

Two methodological limitations affect the interpretation of the study findings. Firstly, generalisability is limited as the study was conducted in only two tertiary institutions in Ebonyi State. Findings may not reflect responses in primary or secondary facilities or other regions with different cultural and socioeconomic contexts. Secondly, the six-month follow-up limits insight into long-term sustainability. Although BDSME improved HbA1c and foot care at six months, diabetes management is lifelong. Without longer follow-up it remains uncertain whether these improvements would persist. This limits the external validity of the study.

Conclusions

The findings suggest that while both Blended and F2F DSME support glycaemic control, BDSME offers added benefits in sustaining foot self-care. Both approaches reduced HbA1c similarly, but foot care declined over six months in the F2F group, whereas it improved consistently in the BDSME group. This demonstrates the potential of blended education in promoting long-term adherence to diabetes self-care. The BDSME may be a valuable approach for sustained blood sugar control and foot self-care in diabetes management.

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Conflict of Interest: The authors declare no conflicts of interest.

Author Contributions: ECA and CE conceptualised the study and developed the protocol. ECA conducted data collection. All authors participated in data analysis, interpretation, and manuscript preparation. The final version was reviewed and approved by all authors.

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REFERENCES

1. Adarmouch, L., Elyacoubi, A., Dahmash, L., El-Ansari, N., Sebbani, M. and Amine, M. (2017). Short-term effectiveness of a culturally tailored educational intervention on foot self-care among type 2 diabetes patients in Morocco. *Journal of Clinical & Translational Endocrinology, 7*(1), 54-59. https://doi.org/10.1016/j.jcte.2017.01.002
2. Adeloye, D., Ige, J., Aderemi, A., Adeleye, N., Amoo, E., Auta, A. and Oni, G. (2020). Estimating the prevalence, hospitalisation and mortality from type 2 diabetes mellitus in Nigeria: a systematic review and meta-analysis. *BMJ Open, 7*(1), e015424. https://doi.org/10.1136/bmjopen-2016-015424
3. Adeyemi, T. M., Olatunji, T. L., Adetunji, A. E. and Rehal, S. (2021). Knowledge, practice and attitude towards foot ulcers and foot care among adults living with diabetes in Tobago: A qualitative study. *International Journal of Environmental Research and Public Health, 18*(15), 8021.
4. Agofure, O. and Oghenerume, H. (2022). Knowledge of diabetes mellitus among students of a public secondary school in Southern Nigeria: A Cross-Sectional Study. *Student's Journal of Health Research Africa, 3*(3), 11-11.
5. Al-Busaidi, I., Abdulhadi, N. and Coppell, K. (2020). Development and pilot testing of a diabetes foot care and complications questionnaire for adults with diabetes in Oman: The Diabetic Foot Disease and Foot Care Questionnaire. *Oman Medical Journal, 35*(4), e146. https://doi.org/10.5001/omj.2020.65.
6. Alonso-Carril, N., Rodriguez-Rodriguez, S., Quirós, C., Berrocal, B., Amor, A. J., Barahona, M. J., ... & Perea, V. (2024). Could online education replace face-to-face education in diabetes? a systematic review. *Diabetes Therapy, 15*(7), 1513-1524.
7. American Association of Diabetes Educators. (2020). An effective model of diabetes care and education: revising the AADE7 Self-Care Behaviors®. *The Diabetes Educator, 46*(2), 139-160. https:/doi.org/10.1177/0145721719894903

8. American Diabetes Association. (2018). Standards of medical care in diabetes—2018 abridged for primary care providers. *Clinical Diabetes*, *36*(1), 14.
9. Bashir, M., Yahaya, A., Muhammad, M., Yusuf, A. and Mukhtar, I. (2021). Prediabetes burden in Nigeria: A systematic review and meta-analysis. *Frontiers in Public Health, 9*(1), e762429. https://doi.org/10.3389/fpubh.2021.762429.
10. Bosun-Arije, F. S., Ling, J., Graham, Y. and Hayes C. (2019). A Systemmatic review of factors influencing Type 2 Diabetes Mellitus management in Nigeria public hospitals. *International Journal of Africa Nursing Sciences 19*(11) 100-151.
11. Chen, R., Huang, L., Su, C., Chang, Y., Chu, C., Chang, C. and Lin, C. (2019). Effectiveness of short-term health coaching on diabetes control and self-management efficacy: a quasi-experimental trial. *Frontiers in Public Health, 7*(1), e314. https://doi.org/10.3389/fpubh.2019.00314.
12. Costello, J., Barras, M., Snoswell, C. L., & Foot, H. (2025). A post-discharge pharmacist clinic to reduce hospital readmissions: a retrospective cohort study. *International Journal of Clinical Pharmacy, 25(*1), 1-9.
13. Emara, R., Hamed, M., Awad, M. and Zeid, W. (2021). Effect of diabetes self-management educational programme on glycaemic control in diabetic patients attending the family medicine outpatient clinic, Suez Canal University Hospital, Ismailia, Egypt. *The Egyptian Journal of Internal Medicine, 33*(1), 1-6.
14. Farag, N. A., Hathout, H. and Hegazy, N. N. (2021). Outcomes of diabetes self-management education on glycaemic control among diabetic patients (Menoufia family medicine clinic). *Menoufia Medical Journal, 34*(2), 556.
15. Ghiyasvandian, S., Zakerimoghadam, M., Koupaei, A. M., Dehkordi, L. M., & Rasti, A. (2023). Effects of Blended Self-Management Training on Knowledge and Self-Care Behaviors of Patients with Type 2 Diabetes: A Randomized Clinical Trial. *Clinical Diabetology, 12*(2), 105-111.
16. Goswami, N. (2024). A dual burden dilemma: Navigating the global impact of communicable and non-communicable diseases and the way forward. *International Journal of Medical Research, 12*(3), 65-77.
17. Hailu, F., Moen, A. and Hjortdahl, P. (2019). Diabetes self-management education (DSME)–Effect on knowledge, self-care behavior, and self-efficacy among type 2 diabetes patients in Ethiopia: A controlled clinical trial. *Diabetes Metabolic Syndrome and Obesity, 12*(1), 2489-2499.
18. Hemmati-Maslakpak, M., Razmara, S. and Niazkhani, Z. (2017). Effects of face-to-face and telephone-based family-oriented education on self-care behavior and patient outcomes in type 2 diabetes: a randomized controlled trial. *Journal of Diabetes Research, 17*(1), e8404328. https://doi.org/10.1155/2017/8404328.
19. Huang, J. H., Lin, Y. K., Lee, T. W., Liu, H. W., Chien, Y. M., Hsueh, Y. C., ... & Chen, Y. J. (2021). Correlation between short-and mid-term hemoglobin A1c and glycemic control determined by continuous glucose monitoring. *Diabetology & Metabolic Syndrome, 13*(1), 94.
20. Moradi, A., Alavi, S., Salimi, M., Nouhjah, S. and Shahvali, E. (2019). The effect of short message service (SMS) on knowledge and preventive behaviors of diabetic foot ulcer in patients with diabetes type 2 Diabetes & Metabolic Syndrome: *Clinical Research & Reviews, 19*(1), 1255-1260.
21. Nozawa, K., Ikeda, M., & Kikuchi, S. (2022). Association Between HbA1c Levels and Diabetic Peripheral Neuropathy: A Case–Control Study of Patients with Type 2 Diabetes Using Claims Data. *Drugs-real World Outcomes, 9*(3), 403-414.
22. Polit, D. and Beck, C. (2021). *Nursing research: generating and assessing evidence for nursing practice. Eleventh edition (11 ed.)*. Philadelphia: Wolters Kluwer.
23. Rajput, S. A., Ashraff, S. and Siddiqui, M. (2022). Diet and management of type II diabetes mellitus in the United Kingdom: a narrative review. *Diabetology, 3*(1), 72-78.
24. Sari, Y., Upoyo, A., Isworo, A., Taufik, A., Sumeru, A., Anandari, D. and Sutrisna, E. (2020). Foot self-care behavior and its predictors in diabetic patients in Indonesia. *BMC Research Notes, 13*(1), 38. https://doi.org/10.1186/s13104-020-4903-y.
25. Scannell, C., O'Neill, T., & Griffin, A. (2025). The Effectiveness of a Primary Care Diabetes Education and Self-Management Program in Ireland: A 6-Month Follow-Up Study. *Endocrinology, Diabetes & Metabolism, 8*(2), e70036.
26. Singh, F., Islam, F., Shaikh, A., Pathak, R., Kohli, S. and Kashyap, V. (2022). Randomized controlled trial to assess the effectiveness of group-based Diabetes Self-Management Education (DSME) program on glycemic control and self-care activities among type-2 diabetics in South-East Delhi. *Indian Journal of Community Health, 34*(3), 402-407.
27. Sukkarieh-Haraty, O. E., Khazen, G., Abi-Kharma, J., Farran, N. and Bassil, M. (2022). Results from the first culturally tailored, multidisciplinary diabetes education in Lebanese adults with type 2 diabetes: Effects on self-care and metabolic outcomes. *BMC Research Notes, 15*(1), e39.
28. Tella E. E., Yunusa I., Hassan J. H., Chindo I. A. and Oti V. B. (2021) Prevalence, Contributing Factors and Management Strategies (Self-Management Education) of Type 2 Diabetes Patients in Nigeria: A Review. *International Journal of Diabetes Research, 8*(1), 148. https://doi.org/10.23937/2377-3634/1410148
29. Wazqar, A., Baatya, M., Lodhi, F. and Khan, A. (2021). Assessment of knowledge and foot self-care practices among diabetes mellitus patients in a tertiary care centre in Makkah, Saudi Arabia: a cross-sectional analytical study. *Pan African Medical Journal, 40*(1), 123.

30. Yimer, Y. S., Addissie, A., Kidane, E. G., Reja, A., Abdela, A. A., & Ahmed, A. A. (2025). Effectiveness of diabetes self-management education and support interventions on glycemic levels among people living with type 2 diabetes in the WHO African Region: a Systematic Review and meta-analysis. *Frontiers in Clinical Diabetes and Healthcare, 6*(1), e1554524.
31. Yu, X., Duan, F., Lin, D., Li, H., Zhang, J., Wang, Q., ... & Zhou, G. (2020). Prevalence of diabetes, prediabetes, and associated factors in an adult Chinese population: baseline of a prediabetes cohort study. *International Journal of Endocrinology, 20*(1), 8892176.
32. Zheng, F., Liu, S., Liu, Y. and Deng, L. (2019). Effects of an outpatient diabetes self-management education on patients with Type 2 Diabetes in China: A randomized controlled trial. *Journal of Diabetes Research, 19*(1), e1073131. https://doi.org/10.1155/2019/1073131.