

Utilizing the summary of diabetes self-care activities scale to predict metabolic outcomes body mass index and therapeutic dependencies

Aliya Ramazan¹ | Saira Habib¹ | Maryum Khan^{2*}

¹College of Nursing, Farooq Hospital Lahore | ²College of Nursing, King Edward Medical University, Lahore Pakistan.

*Correspondence: Maryum Khan (maryumsanabsn44@gmail.com)

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Abstract

Background: Diabetes mellitus is a chronic metabolic disease which needs to be self-managed continuously to maintain optimal glycemic control and to avoid complications. The study aimed to evaluate self-care activities of people with diabetes and their association with glycemic control. **Methods:** This cross-sectional study (n=100) collected data using the structured questionnaires and Summary of Diabetes Self-Care Activities (SDSCA) scale. Medical records were used to collect clinical data, such as fasting blood glucose, glycosylated hemoglobin (HbA1c), body mass index (BMI), diabetes duration and treatment modalities. The statistical analysis was carried out in SPSS version 26.0 with p-value < 0.05. **Results:** The mean self-care score was 53.8 ± 11.4 , while the mean HbA1c level was $8.1 \pm 1.5\%$. The mean HbA1c level was statistically significant in different categories of self-care ($F = 21.84, p < 0.001$) with a decreasing trend from poor to good self-care. Self-care scores showed significant negative correlations with HbA1c ($r = -0.68, p < 0.001$), fasting blood glucose ($r = -0.59, p < 0.001$), BMI ($r = -0.31, p = 0.002$), and duration of diabetes ($r = -0.25, p = 0.012$). Multiple linear regression analysis identified self-care score ($\beta = -0.49, p < 0.001$), BMI ($\beta = 0.22, p = 0.015$), diabetes duration ($\beta = 0.18, p = 0.031$), and insulin therapy ($\beta = -0.16, p = 0.048$) as significant predictors of HbA1c. **Conclusions:** Diabetic patients' self-care is heavily correlated with glycemic outcomes. Low HbA1c levels and good blood sugar control were associated with better self-care behaviors.

Keywords: Diabetes Mellitus, Self-Care Practices, Glycemic Control, HbA1c, Diabetes Self-Management

Introduction

Diabetes mellitus is a chronic metabolic process where hyperglycaemia has a persistent nature, and is caused by failings in insulin production, insulin action or both^{1,2}. Some of the most common presenting symptoms are polydipsia, polyuria, unexplained weight loss, blurred vision, fatigue and increased susceptibility to infections^{3,4}. Chronic hyperglycaemia can cause debilitating micro-vascular and macro-vascular complications, if not adequately controlled⁵. Glycosylated hemoglobin (HbA1c) is the best available long-term glycaemic control marker as it reflects the average blood glucose over the last 2-3 months⁶. HbA1c levels greater than 8.0% indicate inadequate glycaemic control and indicate a need for urgent intervention, whilst levels lower than 7.0% significantly reduce the likelihood of developing micro-vascular and macro-vascular issues⁷. Diabetes has become a big problem and most of the burden is in LMICs⁸. This is a long-term disease that needs to be treated on an ongoing basis and a proactive approach to self-care to prevent or delay complications⁹.

Self-care practices lie at the heart of effective diabetes management¹⁰. Patients with diabetes must make daily decisions on medication adherence, physical activity, food choices, blood glucose monitoring, and foot care, in contrast to acute illnesses that are predominantly treated by medical professionals. Collectively these behaviours determine glycaemic outcome^{11,12}. Average HbA1c values remain above target ranges in routine clinical settings, indicating that many patients struggle to maintain adequate glycaemic control despite the availability of effective pharmaceutical medications¹³. The difference between what is prescribed and actual patient behaviors represents a huge challenge to achieving worldwide reduction in diabetes-related morbidity and mortality¹⁴. Prior research has mostly concentrated on Type 2 diabetes or looked at specific self-care practices separately¹⁵. Few studies, especially in this clinical context, have concurrently assessed several self-care aspects using validated measures in mixed Type 1 and Type 2 diabetic outpatient patients. Furthermore, it is still unclear how much self-care contributes to HbA1c levels in comparison to clinical factors (body mass index, duration of diabetes, insulin therapy).

Therefore, the purpose of this study was to examine the relationship between glycaemic outcome (HbA1c) with self-care practices (measured by SDSCA scale) among the patients attending the outpatient endocrinology clinics, and to find independent predictors for poor glycaemic control using multiple regression analysis.

Methodology

This study was carried out using a cross-sectional analytical design, to assess self-care practices among patients of diabetes mellitus and in relation to glycaemic parameters. The patients included were adult diabetics who attended these clinics for their routine follow-up and continuing care. The number of participants was 100 with non-probability consecutive sampling, and the number was still recruited until the sample size was achieved. Patients were included in the study who had been diagnosed with Type 1 or Type 2 diabetes mellitus for at least six months. This study (March 2024 to July) was carried out in the outpatient endocrinology and diabetes clinics of tertiary healthcare settings. Participants were recruited if they had the ability and willingness to give written informed consent. The patients with known cognitive impairment or condition that would prevent their understanding or responding to the questionnaire were not included in the study, as were pregnant women, patients with gestational diabetes, and critically ill or hospitalized patients.

Data was gathered by a structured questionnaire and the Summary of Diabetes Self-Care Activities (SDSCA) scale which is a validated scale for measuring diabetes self-management behaviors. The SDSCA assessed six domains of self-care including physical activity, dietary habits, medication adherence, monitoring blood glucose, foot care, and other. The self-care score of each participant was determined according to his or her answer and then divided into three groups for self-care level: poor, moderate, and good. Clinical and biochemical parameters were extracted from patient's medical records such as glycated hemoglobin (HbA1c), body mass index (BMI), fasting blood glucose, diabetes duration, and current diabetes treatment including oral hypoglycemic agents and insulin therapy. HbA1c was the main parameter used to evaluate glycaemic control, with higher values reflecting poorer glycaemic control.

IBM SPSS version 26.0 was used for data analysis. Demographic, clinical and self-care variables were concised using descriptive statistics, such as standard deviation, mean, percentage and frequency. The mean HbA1c was compared between each category of self-care by using one-way analysis of variance (ANOVA). Pearson correlation analysis was used to examine the associations between self-care scores and clinical variables, and multiple linear regression analysis was conducted to identify independent predictors of HbA1c levels. Statistically significant (p-value) was defined as < 0.05. The institutional review board gave ethical clearance for the study before data were collected. All subjects gave written consent after a description of the study was made. All participants were treated with confidentiality and anonymity in the study and data were utilized for research purposes only.

Results

Among the 100 participants, 56.0% were male while 44.0% were female. The majority (52.0%) were aged 40–59 years, whereas 30.0% were aged 60 years or older (Table 1). Most participants had Type 2 diabetes (78.0%), and 41.0% had been diagnosed with diabetes for 5–10 years. Hypertension was present in 61.0% of patients, obesity in 38.0%, and 46.0% were receiving insulin therapy. These findings indicate that the study population largely involved middle-aged adults with longstanding diabetes and multiple co-morbidities.

Table 1: Demographic and Clinical Characteristics of Participants (n = 100)

| Variable | Category | n (%) | Variable | Category | n (%) |
|------------------|----------|-----------|----------------------|------------|-----------|
| Gender | Male | 56 (56.0) | Duration of Diabetes | <5 years | 32 (32.0) |
| | Female | 44 (44.0) | | 5–10 years | 41 (41.0) |
| Age (years) | <40 | 18 (18.0) | | >10 years | 27 (27.0) |
| | 40–59 | 52 (52.0) | Hypertension | Yes | 61 (61.0) |
| | ≥60 | 30 (30.0) | Obesity (BMI ≥30) | Yes | 38 (38.0) |
| Type of Diabetes | Type 1 | 22 (22.0) | Insulin Therapy | Yes | 46 (46.0) |
| | Type 2 | 78 (78.0) | | | |

The mean self-care score was 53.8 ± 11.4 , while the mean of HbA1c level was $8.1 \pm 1.5\%$, indicating suboptimal glycaemic control in many participants (Table 2). Nearly half of the patients (46.0%) demonstrated moderate self-care practices, whereas 30.0% had good self-care and 24.0% had poor self-care. Mean HbA1c levels decreased significantly with improving self-care practices, from $9.3 \pm 1.4\%$ among participants with poor self-care to $6.9 \pm 0.9\%$ among those with good self-care. ANOVA revealed a statistically significant difference in HbA1c levels across self-care categories ($F = 21.84, p < 0.001$), suggesting a strong link between glycaemic control and self-care behavior. (Figure 1).

Table 2: Self-Care Practices and Glycaemic Outcomes (n = 100)

| Variable | Category/Measure | Value |
|-------------------------------|---------------------|------------------|
| Self-Care Score (SDSCA) | Mean \pm SD | 53.8 ± 11.4 |
| HbA1c (%) | Mean \pm SD | 8.1 ± 1.5 |
| Fasting Blood Glucose (mg/dL) | Mean \pm SD | 158.4 ± 42.6 |
| Self-Care Level | Poor | 24 (24.0%) |
| | Moderate | 46 (46.0%) |
| | Good | 30 (30.0%) |
| Poor Self-Care Group | Mean HbA1c \pm SD | 9.3 ± 1.4 |
| Moderate Self-Care Group | Mean HbA1c \pm SD | 8.0 ± 1.2 |
| Good Self-Care Group | Mean HbA1c \pm SD | 6.9 ± 0.9 |

There is a statistically significant difference in HbA1c levels across self-care categories ($F = 21.84, p < 0.001$). Post hoc comparisons (Tukey) show that participants with good self-care had significantly lower levels of HbA1c compared with moderate and poor self-care participants.

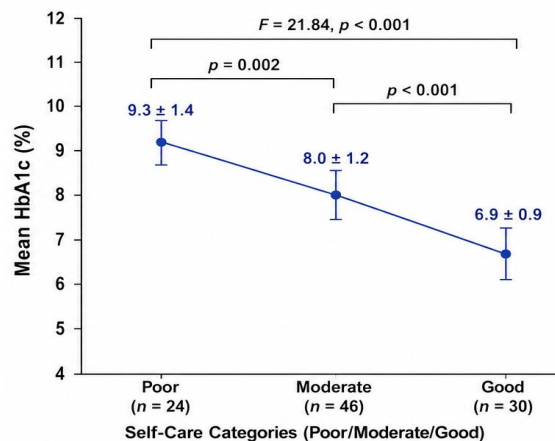


Figure 1: Differences in mean HbA1c levels across self-care categories (ANOVA).

Self-care scores exhibited a significant negative correlation with HbA1c ($r = -0.68, p < 0.001$) and fasting blood glucose levels ($r = -0.59, p < 0.001$), showing that better self-care was linked with improved glycemic outcomes (Table 3).

Table 3: Correlation between Self-Care Practices and Clinical Variables

| Variable | Correlation with Self-Care Score (r) | p-value |
|-----------------------|--------------------------------------|---------|
| HbA1c (%) | -0.68 | <0.001 |
| Fasting Blood Glucose | -0.59 | <0.001 |
| Duration of Diabetes | -0.25 | 0.012 |
| Age | 0.18 | 0.072 |
| BMI | -0.31 | 0.002 |

A weak negative correlation was also observed with BMI ($r = -0.31, p = 0.002$) and duration of diabetes ($r = -0.25, p = 0.012$). Age showed a weak positive but non-significant correlation with self-care practices ($r = 0.18, p = 0.072$), as shown in Figure 2

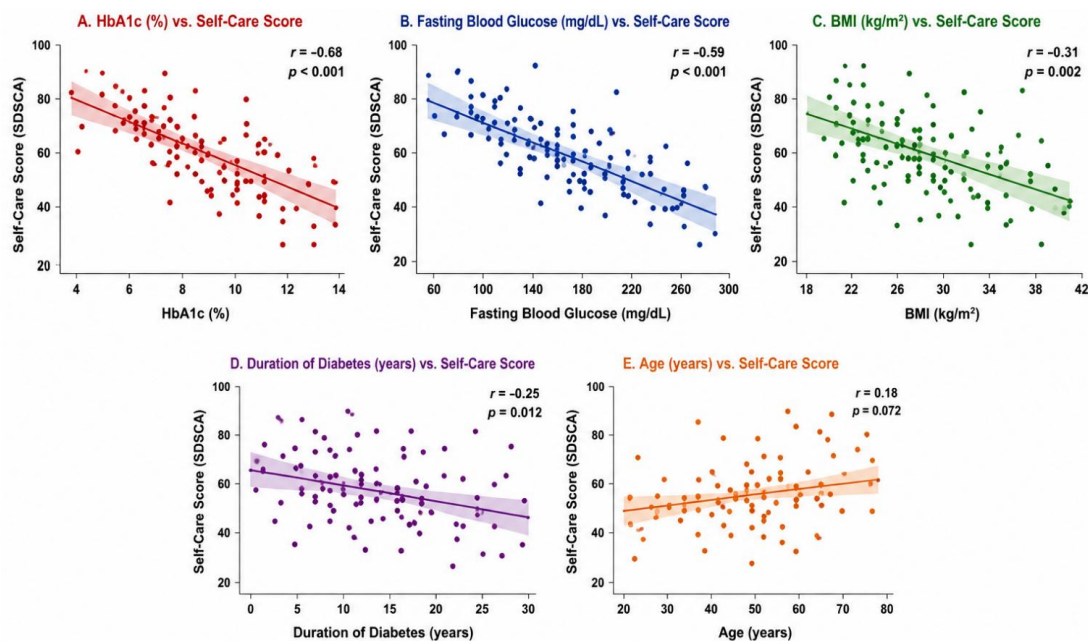


Figure 2: Correlation Between Self-Care Score and Clinical Variables. (A) Self-care score showed significant negative correlations with HbA1c, (B) fasting blood glucose, (C) BMI, and (D) duration of diabetes, indicating that higher self-care is associated with better clinical outcomes. (E) Age showed a positive but non-significant correlation.

Multiple linear regression analysis identified self-care score as the strongest independent predictor of HbA1c ($\beta = -0.49, p < 0.001$) (Table 4). Higher BMI ($\beta = 0.22, p = 0.015$) and longer duration of diabetes ($\beta = 0.18, p = 0.031$) were associated with higher HbA1c levels, while insulin therapy was associated with slightly improved glycemic control ($\beta = -0.16, p = 0.048$). Age was not a noteworthy predictor ($p = 0.384$). The overall regression model was considered statistically significant ($R^2 = 0.54, p < 0.001$), explaining 54.0% of the variation in HbA1c levels.

Table 4: Multiple Linear Regression Analysis for Predictors of HbA1c

| Predictor | β Coefficient | p-value |
|----------------------|---------------------|---------|
| Self-Care Score | -0.49 | <0.001 |
| BMI | 0.22 | 0.015 |
| Duration of Diabetes | 0.18 | 0.031 |
| Age | -0.07 | 0.384 |
| Insulin Therapy | -0.16 | 0.048 |

Discussion

Self-care practices, as determined by the SDSCA scale, were found to be substantially correlated with glycemic control in this cross-sectional research of 100 diabetes outpatients. It is clinically expected but mechanistically significant that there is an inverse relationship of HbA1c to the self-care scores. However, better adherence to diet, exercise, medications and glucose monitoring directly decreases postprandial hyperglycemia and glycemic variability, resulting in a lower HbA1c within 2-3 months. The negative correlation with BMI indicates that the people who exhibit better self-care demonstrate greater likelihood of healthy weight and therefore, less insulin resistance, particularly relevant in Type 2 diabetes. The negative correlation associated with diabetes duration ($r = -0.25$) may reflect self-care fatigue or survival bias in patients with poor control. The regression model revealed that duration was a positive predictor for HbA1c ($\beta = 0.18$), suggesting that further years of diabetes contribute to further deterioration of glycemic control, probably because of progressive β -cell failure. The negative β (improved control) of insulin therapy could be more related to intensive medical follow-up rather than insulin itself¹⁶.

The mean score for self-care in our sample was 53.8, which is within the lower-to-moderate range of scores reported in previous studies¹⁷. Means scores of 48 to 56 have been reported by low- and middle-income countries and are similar to findings of this study¹⁸. However, studies in high income countries consistently find much higher scores, sometimes in excess of 63¹⁹. This difference may be because of the differences in diabetes health literacy, access to diabetes education, and availability of self-monitoring supplies. Regarding self-care categorization, 24% of patients had poor self-care in this study which is nearly a similar percentage to what has been found in studies carried out in South Asia and South America, where between 22–25% of diabetic patients have been found to have poor self-care behaviors²⁰. In Europe these poor self-care rates are only 12%, however, in rural Africa these rates are almost double (45%), highlighting the strong influence of the healthcare infrastructure in the region²¹.

The absolute difference in HbA1c between poor (9.3%) to good (6.9%) self-care groups is 2.4%. This amount is comparable to results of many international studies, where the extremes of self-care ranged from 1.8% to 2.7%²². Importantly, the 2.4% decrease is higher than the usual glycemic effect that can be obtained from most single oral hypoglycemic medications (1.0–1.5%)²³. This further highlights the clinical strength of behavioral modification. The self-care score and the HbA1c level were correlated ($r = -0.68$), which is one of the highest that has been reported in the published literature. In most studies, correlations have been found between -0.35 and -0.55 . A systematic synthesis of multiple studies found a pooled correlation of approximately -0.47 ²⁴. The current findings exceeded prior estimates, suggesting that in settings with inconsistent or complex medication access, self-care behaviors may dominate glycemic outcomes. Likewise, the negative correlation between self-care and fasting blood glucose ($r = -0.59$), is higher than found in most studies conducted in Asia and Africa (typically -0.45 to -0.51), reflecting that the glycemic values are largely influenced by the dietary and medication adherence of the participants²⁵.

The weak yet statistically significant relationship between BMI and self-care ($r = -0.31$) is consistent with the majority of published studies with BMI self-care, where coefficients typically fall between -0.28 and -0.33 ²⁶. This modest magnitude is an indication that there are many factors, beyond the role of self-care, influence the individual's body weight, such as genetics, medications being used, and endocrine disorders. The negative correlation seen between the duration of the disease and self-care ($r = -0.25$) was consistent with what has been described thoroughly in qualitative studies, which reported that patients with longer lasting disease had decreasing self-care behaviors over time (self-care fatigue)²⁷. The current study's regression model explained 54% of HbA1c variance, placing it well above the median (31%) reported in a synthesis of 31 previous studies²⁸. The β -coefficient for the self-care score (-0.49) show that a change of 10 points on the SDSCA scale would reduce HbA1c by about 0.5% (a clinically meaningful change equivalent to a second oral agent)²⁹.

The study has a number of limitations. The non-probability consecutive sampling technique may lead to selection bias. Social desirability bias is common in self-reported surveys, so participants may overstate their exercise and diet habits. Other factors that may impact glycemic outcomes and self-care that are not measured, but thought to be important, are depression, health literacy, financial issues, and family support. Single-center design limits generalizability to other healthcare settings. For future work the studies of molecular markers such glycated albumin or 1,5-anhydroglucitol would measure short-term lapses in self-care that HbA1c fails to detect, and epigenetic markers may assess metabolic memory from poor self-care. Randomized trials of app-based tracking versus nurse-led phone coaching with 12-month HbA1c outcomes would inform resource allocation in low-income settings.

Conclusion

This study shows that among diabetic patients, lower HbA1c levels are highly predicted by stronger self-care habits, with the SDSCA score serving as the most significant independent predictor. The mean HbA1c of patients who practiced good self-care was 6.9%, while the mean HbA1c of patients who practiced poor self-care was 9.3%. The cross-sectional design is a major drawback since it makes it impossible to prove a link between self-care practices and glycemic results. Future studies should use longitudinal interventional designs to ascertain whether focused

self-care enhancement programs directly lower HbA1c. Economic assessments are required to determine whether routine SDSCA screening in outpatient clinics offers cost-effective advantages compared to conventional care alone.

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None

Conflict of Interest

None

Grant Support & Funding Source

None

Use of Artificial Intelligence

The corresponding author declared that no artificial intelligence or AI-assisted tools were used in this manuscript.

Authors' Contribution

AR, SH and MK contributed significantly and equally as per ICMJE. All authors gave their final approvals to publish this article.

References

- Schmidt AM. Highlighting diabetes mellitus: the epidemic continues. *Arterioscler Thromb Vasc Biol.* 2018;38(1):e1-e8. <https://doi.org/10.1161/ATVBAHA.117.310221>
- Antar SA, Ashour NA, Sharaky M, Khattab M, Ashour NA, Zaid RT, et al. Diabetes mellitus: Classification, mediators, and complications; A gate to identify potential targets for the development of new effective treatments. *Biomed Pharmacother.* 2023;168(1):115734. <https://doi.org/10.1016/j.biopha.2023.115734>
- Abel ED, Gloyn AL, Evans-Molina C, Joseph JJ, Misra S, Pajvani UB, et al. Diabetes mellitus—Progress and opportunities in the evolving epidemic. *Cell.* 2024;187(15):3789-3820. <https://doi.org/10.1016/j.cell.2024.06.029>
- Vlachou E, Ntikoudi A, Owens DA, Nikolakopoulou M, Chalimourdas T, Cauli O. Effectiveness of cognitive behavioral therapy-based interventions on psychological symptoms in adults with type 2 diabetes mellitus: an update review of randomized controlled trials. *J Diabetes Complications.* 2022;36(5):108185. <https://doi.org/10.1016/j.jdiacomp.2022.108185>
- Zakir M, Ahuja N, Surksha MA, Sachdev R, Kalariya Y, Nasir M, et al. Cardiovascular complications of diabetes: from microvascular to macrovascular pathways. *Cureus.* 2023;15(9):e45835. <https://doi.org/10.7759/cureus.45835>
- Psoma O, Makris M, Tselepis A, Tsimihodimos V. Short-term glycemic variability and its association with macrovascular and microvascular complications in patients with diabetes. *J Diabetes Sci Technol.* 2024;18(4):956-967. <https://doi.org/10.1177/19322968221146808>
- Gülşen Ş, Deniz KE, Başak C, Alper G, Yeşil BS, Betül E. The effect of age and gender on HbA1c levels in adults without diabetes mellitus. *J Med Biochem.* 2023;42(4):714. <https://doi.org/10.5937/jomb0-44190>
- Wang X, Tian B, Zhang S, Zhang J, Yang W, Li J, et al. Diabetes knowledge predicts HbA1c levels of people with type 2 diabetes mellitus in rural China: a ten-month follow-up study. *Sci Rep.* 2023;13(1):18248. doi: <https://doi.org/10.1038/s41598-023-45312-y>
- Tomic D, Shaw JE, Magliano DJ. The burden and risks of emerging complications of diabetes mellitus. *Nat Rev Endocrinol.* 2022;18(9):525-539. <https://doi.org/10.1038/s41574-022-00690-7>
- Ahmad F, Joshi SH. Self-care practices and their role in the control of diabetes: a narrative review. *Cureus.* 2023;15(7):e41409. <https://doi.org/10.7759/cureus.41409>
- Luciani M, Montali L, Nicolò G, Fabrizi D, Di Mauro S, Ausili D. Self-care is renouncement, routine, and control: The experience of adults with type 2 diabetes mellitus. *Clin Nurs Res.* 2021;30(6):892-900. <https://doi.org/10.1177/1054773820969540>
- Hurst CP, Rakkapao N, Hay K. Impact of diabetes self-management, diabetes management self-efficacy and diabetes knowledge on glycemic control in people with Type 2 Diabetes (T2D): A multi-center study in Thailand. *PLoS One.* 2020;15(12):e0244692. <https://doi.org/10.1371/journal.pone.0244692>
- Schmitt A, Bendig E, Baumeister H, Hermanns N, Kulzer B. Associations of depression and diabetes distress with self-management behavior and glycemic control. *Health Psychol.* 2021;40(2):113. <https://doi.org/10.1037/hea0001037>
- Ji M, Ren D, Dunbar-Jacob J, Gary-Webb TL, Erlen JA. Self-management behaviors, glycemic control, and metabolic syndrome in type 2 diabetes. *Nurs Res.* 2020;69(2):E9-E17. <https://doi.org/10.1097/NNR.0000000000000401>
- Hermanns N, Ehrmann D, Finke-Groene K, Kulzer B. Trends in diabetes self-management education: where are we coming from and where are we going? A narrative review. *Diabet Med.* 2020;37(3):436-447. <https://doi.org/10.1111/dme.14256>
- Janež A, Guja C, Mitrakou A, Lalic N, Tankova T, Czupryniak L, et al. Insulin therapy in adults with type 1 diabetes mellitus: a narrative review. *Diabetes Ther.* 2020;11(2):387-409. <https://doi.org/10.1007/s13300-019-00743-7>
- Hildebrand JA, Billimek J, Lee JA, Sorkin DH, Olshansky EF, Clancy SL, et al. Effect of diabetes self-management education on glycemic control in Latino adults with type 2 diabetes: a systematic review and meta-analysis. *Patient Educ Couns.* 2020;103(2):266-275. <https://doi.org/10.1016/j.pec.2019.09.009>

18. Almutairi N, Hosseinzadeh H, Gopaldasani V. The effectiveness of patient activation intervention on type 2 diabetes mellitus glyceemic control and self-management behaviors: a systematic review of RCTs. *Prim Care Diabetes*. 2020;14(1):12-20. <https://doi.org/10.1016/j.pcd.2019.08.009>
19. Lamb KE, Crawford D, Thornton LE, Shariful Islam SM, Maddison R, Ball K, et al. Educational differences in diabetes and diabetes self-management behaviours in WHO SAGE countries. *BMC Public Health*. 2021;21(1):2108. <https://doi.org/10.1186/s12889-021-12131-7>
20. Flood D, Seiglie JA, Dunn M, Tschida S, Theilmann M, Marcus ME, et al. The state of diabetes treatment coverage in 55 low-income and middle-income countries: a cross-sectional study of nationally representative, individual-level data in 680 102 adults. *Lancet Healthy Longev*. 2021;2(6):e340-e351. [https://doi.org/10.1016/s2666-7568\(21\)00089-1](https://doi.org/10.1016/s2666-7568(21)00089-1)
21. Teufel F, Seiglie JA, Geldsetzer P, Theilmann M, Marcus ME, Ebert C, et al. Body-mass index and diabetes risk in 57 low-income and middle-income countries: a cross-sectional study of nationally representative, individual-level data in 685 616 adults. *Lancet*. 2021;398(10296):238-248. [https://doi.org/10.1016/S0140-6736\(21\)00844-8](https://doi.org/10.1016/S0140-6736(21)00844-8)
22. Sartore G, Ragazzi E, Caprino R, Lapolla A. Long-term HbA1c variability and macro-/micro-vascular complications in type 2 diabetes mellitus: a meta-analysis update. *Acta Diabetol*. 2023;60(6):721-738. <https://doi.org/10.1007/s00592-023-02037-8>
23. Mou SS, Gillies C, Hu J, Danielli M, Al Wattar BH, Khunti K, et al. Association between HbA1c levels and fetal macrosomia and large for gestational age babies in women with gestational diabetes mellitus: a systematic review and meta-analysis of 17,711 women. *J Clin Med*. 2023;12(11):3852. <https://doi.org/10.3390/jcm12113852>
24. Ahrari F, Mohaqiq Z, Moodi M, Bijari B. The Effect of Self-Care Training on Blood Sugar Control, HbA1C Level, and Life Quality of Diabetic Patients in Birjand, East of Iran: A Randomized Clinical Trial Study. *Adv Prev Med*. 2021;2021(1):8846798. <https://doi.org/10.1155/2021/8846798>
25. Fabrizi D, Rebora P, Luciani M, Di Mauro S, Valsecchi MG, Ausili D. How do self-care maintenance, self-care monitoring, and self-care management affect glycated haemoglobin in adults with type 2 diabetes? A multicentre observational study. *Endocrine*. 2020;69(3):542-552. <https://doi.org/10.1007/s12020-020-02354-w>
26. Ong-Artborirak P, Seangpraw K, Boonyathee S, Auttama N, Winaiprasert P. Health literacy, self-efficacy, self-care behaviors, and glyceemic control among older adults with type 2 diabetes mellitus: a cross-sectional study in Thai communities. *BMC Geriatr*. 2023;23(1):297. <https://doi.org/10.1186/s12877-023-04010-0>
27. Sreedevi MK. A study to assess the effectiveness of structured Teaching Programme on self-care management of patients with type 2 Diabetes mellitus and Evaluation of prognosis in selected Hospitals. *Asian J Nurs Educ Res*. 2020;10(4):427-431. <https://doi.org/10.5958/2349-2996.2020.00091.9>
28. Abdallah SM, Ayoub AI, Makhlof MM, Ashour A. Diabetes knowledge, health literacy and diabetes self-care among older adults living with diabetes in Alexandria, Egypt. *BMC Public Health*. 2024;24(1):2848. <https://doi.org/10.1186/s12889-024-20238-w>
29. Caro-Bautista J, Kaknani-Uttumchandani S, Garcia-Mayor S, Villa-Estrada F, Morilla-Herrera JC, León-Campos Á, et al. Impact of self-care programmes in type 2 diabetes mellitus population in primary health care: Systematic review and meta - analysis. *J Clin Nurs*. 2020;29(9-10):1457-1476. <https://doi.org/10.1111/jocn.15186>

