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Improving the self-care behavior of type 2 diabetes mellitus clients by combining the basic conditioning factors and self-care agency

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ABSTRACT

Background and purpose: Type 2 diabetes mellitus (T2DM) is a chronic disease that requires active participation of the person to perform self-care. Self-care behavior requires various drivers to perform effectively. This study aims to investigate how the basic conditioning factors (BCF) and self-care agency (SCA) improve the self-care behavior (SCB) of T2DM clients.

Methods: This is a cross-sectional study that involved 195 T2DM clients who were selected through convenience sampling from three public health centers (PHCs) in Surabaya. Questionnaires were used to gather information on basic conditioning factors (i.e. developmental status, health services, sociocultural, family support, lifestyle, and environment) and self-care agency (diet, blood sugar monitoring, physical exercise, treatment, and foot care) For self-care behavior, we adopted the American Association of Diabetes Educators variables including healthy eating, being active, monitoring, taking medications, problem-solving, healthy coping, and reducing risks. We conducted the Structural Equation Modelling Smart PLS (SEM) Version 3.0 to analyze the interaction of sub-variables of BCF and SCA that improve the SCB.

Results: The development status, health status, sociocultural, family, and lifestyle indirectly (where SCA becomes the intermediate factor) influence the improvement of SCB among T2DM clients. Lifestyle and environmental factors of SCA are the sub-variables that directly improve the SCB of T2DM clients.

Conclusion: The study concludes that some sub-variables of basic conditioning factors and self-care agency are influential in improving the quality of self-care practice of T2DM sufferers. It is advised that empowering T2DM clients to perform effective self-care management requires drivers from BCF and SCA factors.

Keywords: Diabetes mellitus, basic conditioning factors, self-care agency, self-care behavior

INTRODUCTION

According to the World Health Organization, the incidence of diabetes mellitus (DM), especially type 2 diabetes mellitus (T2DM), worldwide has been significantly increasing, particularly among low- and middle-income countries.[1] The WHO reports that 422 million of the world's population have diabetes, leading to the death of 1.5 million every year. Furthermore, the International Diabetes Federation claims diabetes will become a global burden for individuals, families, and countries, projecting 783 million people living with diabetes in 2045.[2] The IDF claims that socioeconomic, demographic, environmental, and genetic factors trigger T2DM, while urbanization, the aging population, poor physical activities, being overweight, and obesity are contributing factors.

T2DM is a major casualty of morbidity and becomes an economic catastrophe for the individual and the country. Indonesia sits in fifth place in the world, with the highest population living with DM in 2021. It is predicted that 19.5 million suffer from DM, estimated to increase to 28.6 million in 2045.[3] The 2018 Basic Health Research reported that the prevalence of diabetes mellitus in the Indonesian adult population was 6.9% in 2013 and rocketed to 8.5% in 2018.[4]

T2DM is a degenerative and chronic disease that will last a lifetime and becomes a significant burden in terms of costs such as continuous care management, medicines, and time. The lifetime care of T2DM requires the cooperation and collaboration of healthcare teams (i.e. doctors, nurses, dieticians, and other health professionals) and families.[5–7] Apart from the collaboration of medical care teams and families, patients of T2DM play a vital role during medication, particularly self-medication and care. Empowering patients with knowledge, motivation, and capacity to manage self-care is essential to improve independence in controlling and monitoring their disease.[8,9] Patients are expected to perform self-care behaviors (SCB) through sufficient skills, reliability, and responsibility for their medical care.[10] The SCB includes active, healthy coping, eating, monitoring, problem solving, risk reduction, and taking medication.

SCB is widely practiced in nursing care for non-communicable diseases such as haemodialysis care [11,12], hypertension [13,14], diabetes mellitus [15,16]. The studies above highlighted education level, health beliefs, family support, perception of the illness, sex, health insurance, marital status, and income as the contributing factors of SCB. Besides the factors above, SCB is also influenced by basic conditioning factors (BCF) and self-care agency (SCA). BCF refers to the contribution of developmental status, health services, sociocultural, family support, lifestyle, and environment to health care management, while SCA includes diet, blood sugar monitoring, physical exercise, treatment, and foot care.

Studies show that empowering T2DM patients to perform self-care generally relies on one stand-alone approach or treatment. It is contradicted by the nature of healthcare requiring a combination of various approaches to reach the optimum outcome of the medication. This study investigates how the basic conditioning factors (BCF) and self-care agency (SCA) improve the SCB of T2DM clients. Our knowledge about the combination of BCF and SCA needs to be improved. Therefore, this study will provide a new perspective on the use of BFC and SCA as drivers in improving the SCB of T2DM clients.

METHOD

Design and Setting

The research adopts a cross-sectional study approach, that is collecting data from different individuals at one point in time.[17] The data collection was conducted in three PHCs including Kalijudan PHC, Tambak Rejo PHC, and Pacar Keling PHC in the 3rd week of April 2023. The reason for selecting these PHCs relates to the high visits of T2DM clients, reaching approximately 400 clients in a month or 100 T2DM clients every week for each PHC.

Population and samples

The data from patient registration in the third week of April 2023 showed that approximately 100 T2DM patients attended medical care at each PHC every week or 300 T2DM clients in total (population). We used the Sample Size Calculator software developed by Raosoft,[18] to estimate the representative number of the research population. The Sample Size Calculator is friendly-user software easy to navigate by only inserting the size of the population, margin error (5%), and confidence level (95%), and the software will estimate the sample size needed to represent the population. The sample estimation calculated for 300 population for this study is a minimum of 169 T2DM clients. The study uses a convenience sampling mechanism to recruit 195 T2DM clients, exceeding the sample size required. We approached the potential respondents in the waiting room of the PHCs, introducing ourselves, explaining the research purpose, and requesting their availability to complete the questionnaire. The convenience sample procedure requires neither inclusion nor exclusion criteria for the sample instead the availability or agreement of the respondents.[19]

Data collection tool and procedures

The data were collected using questionnaires. The questionnaires cover four sections: the general characteristics of the respondents, BCF (i.e., developmental status, health service, health status, socio-culture, family support, lifestyle, and environment), and SCA, including diet, medication, exercise, blood sugar monitoring, and foot care factors. The respondents are required to complete a Likert Scale with four responses: 4 (strongly agree), 3 (agree), 2 (disagree), and 1 (strongly disagree). Furthermore, the questionnaire for SCB was adopted from the American Association of Diabetes Educators, which involves healthy eating, being active, monitoring, taking medications, problem-solving, healthy coping, and reducing risks. The instrument consists of 66 items with answers 4 (very doable), 3 (doable), 2 (less doable), and 1 (not doable).

Upon obtaining permission from the heads of PHCs, the researchers approached potential respondents in the waiting room. Researchers explained the nature of the research, benefits, and risks incurred to the respondents and requested their agreement to fill up the questionnaires. After the completion of the questionnaires, respondents were given a non-monetary token to appreciate their participation.

Data analysis

Before data collection, the questionnaires were tested in PHCs other than the research sites. The Alpha-Cronbach test was applied to test the questionnaire's validity and reliability. The test result shows that the three sections of questions are valid with a coefficient of 0.571 for BSC, 0.665 for SCA, and 0.575 for SCB. In addition, the test also concludes that the questionnaires are reliable as data collection tools with a coefficient of 0.907 for BSC, 0.859 for SCA, and 0.803 for SCB questions.

A descriptive statistical procedure was deployed to describe the demographic characteristics (i.e., sex, religion, type of family, and T2DM complication) of the respondents. The procedure is also applied to calculate the frequency distribution of BCF, SCA, and SCB factors of the T2DM respondents. The Partial Least Squares (PLS) of Structural Equation Modelling (SEM) version 3.0. analyses the association between BCF, SCA factors and the SCB. The PLS examines path analysis to what extent the significance level of tested variables including sample mean (M), Standard Deviation (STDEV), T Statistics, and p-values. If the p-value of the path analysis is <0.05, the association is considered significant.

Ethical Considerations

Data were collected after obtaining ethical approval from the Ethics and Research Committees at Poltekkes Kemenkes Surabaya No. EA/1081/KEPK-Poltekkes.Sby/V/2022. The respondents read the informed consent and signed it if they agreed to participate. Each participant agreed to provide consent after this research was explained to them. Participants were given the right not to participate in the study. The study has no substantial risk in any form to the respondents. Respondent is entitled to cancel their participation anytime, whenever they want.

RESULT

Participants' demographic characteristics, complication status, BCF, SCA, and SCB

Table 1 describes the demographic characteristics of T2DM clients, and shows that females are the dominant gender (154 (79%)), and Islam is the religion of most respondents (176 (90.1%)). The education level of the respondents is varied, where senior high school dominates other educational achievements. The T2DM patients mostly live with their primary family (78 (40%)) and suffered from complications (120 (61.5%)).

Table 1 also describes the frequency distributions of BCF, SCA, and SCB variables. The sub-variables of BCF provide positive impacts on the ability of the T2DM client to manage their self-care. Their developmental status is good (165/195 or 84.6%). The PHC is the most visited health facility when seeking medication. Regardless of long-life medication, the clients of T2DM live in healthy conditions, especially with full support from their social relations, surroundings, and family. The significant support received also drives the healthy lifestyle practiced by T2DM clients.

Table 1. Demographic characteristics, complication status, BCF, SCA, and SCB of the T2DM clients

Characteristics	Category	n (%)
Socio-Demographic		
Sex	Male	41 (21.0)
	Female	154 (79.0)
Religion	Muslim	176 (90.3)
	Catholic	3 (1.5)
	Christian	16 (8.2)
Education	Primary School	52 (26.6)
	Junior High School	38 (19.5)
	Senior High School	80 (41.0)
	University	25 (12.9)
Type of family	Extended family	34 (17.4)
	Nuclear family	78 (40.0)
	Elderly families	28 (14.4)
	Living with child	55 (28.2)
Complications of T2DM	None	75 (38.5)
	Available	120 (61.5)
Basic Conditioning Factor:		
Developmental Status	Moderate	30 (15.4)
	Good	165 (84.6)
Health service	Clinics	21 (10.7)
	PHC	131 (67.2)
	Hospitals	43 (22.1)
Health status	Healthy	195 (100)
	Unhealthy	0
Socio-culture	Supportive	161 (82.6)
	Non-Supportive	34 (17.4)
Family support	Moderate	11 (5.6)
	Good	184 (94.4)
Lifestyle	Moderate	12 (6.2)
	Good	183 (93.8)
Environment	Supportive	195 (100)
	Non-Supportive	0
Self-care Agency	Low	160 (82.1)
	High	35 (17.9)
Self-care Behavior	Remaining	15 (7.7)
	Increasing	180 (92.3)

The analysis also reveals that the contribution of SCA variables to the behavior of T2DM clients in effectively organizing their medication at home is considerably low (160/195 or 82.1%). However, the collaboration of BCF and SCA still conveys significant implications for increasing the clients' independence to perform self-care for their illness (180/195 or 92.3%).

Path Analysis of the variables relationship

Table 2 Path Analysis of the relationship between variables

Correlation of variables	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	p values	Description
Environment -> Self-Care Agency	-0.028	-0.030	0.086	0.332	0.740	not significant
Environment -> Self-Care Behavior	0.200	0.191	0.097	2.067	0.039	significant
Lifestyle -> Self-Care Agency	0.216	0.216	0.095	2.271	0.024	significant
Lifestyle -> Self-Care Behavior	0.242	0.241	0.106	2.292	0.022	significant
Self-Care Agency -> Self-Care Behavior	0.359	0.360	0.074	4.829	<0.001	significant
Family support -> Self -Care Agency	0.222	0.229	0.098	2.265	0.024	significant
Family support -> Self-Care Behavior	0.053	0.053	0.103	0.517	0.605	not significant
Health service -> Self-Care Agency	-0.097	-0.096	0.063	1.540	0.124	not significant
Health service -> Self-Care Behavior	-0.054	-0.050	0.062	0.867	0.386	not significant
Socio-culture -> Self-Care Agency	0.182	0.182	0.069	2.653	0.008	significant
Socio-culture-> Self-Care Behavior	0.064	0.063	0.073	0.883	0.378	not significant
Health status -> Self-Care Agency	-0.246	-0.242	0.067	3.675	<0.001	significant
Health status -> Self-Care Behavior	0.006	0.007	0.085	0.071	0.943	not significant
Development status -> Self-Care Agency	-0.091	-0.095	0.081	1.127	0.260	not significant
Development status -> Self-Care Behavior	-0.083	-0.084	0.073	1.139	0.255	not significant

The Path Analysis examines the relationship of BCF, SCA, and SCB sub-variables among T2DM clients. Table 2 resumes the variation of the relation between sub-variables to the main variables. The analysis reveals that the SCA variable has a significant relation to sub-variables of BCF, including lifestyle (p=0.024), family support (p=0.024), sociocultural (p=0.008), and health status (p<0.001). On the other hand, the relation between the sub-variables of BCF, such as environment, health care, and development status to SCA is weak or insignificant.

The relation between BCF and SCB of T2DM patients is significant in the sub-variables environment (p=0.039) and lifestyle (p=0.022). Family support, health services, socio-culture, and development status have weak associations with the independence of T2DM clients to perform their self-care. Regardless of the variation of the sub-variables relationship, the analysis resumes the strong association between SCA and SCB of the T2DM clients.

Table 3 shows that the sub-variables of BCF, namely health status, socio-culture, family support, and lifestyle, have strong associations as the drivers of SCA of T2DM clients. Lifestyle and environment are the only sub-variables of BCF that significantly influence the SCB of the clients. Finally, the model analysis concluded the significant association between BCF, SCA, and SCB (p<0.001).

Table 3. Correlation between basic conditioning factors, self-care agency, and self-care behavior among T2DM clients.

	Original Sample (O)	T Statistics (|O/STDEV|)	p
Health status ➔ Self Care Agency	-0.26	3.61	<0.001
Sociocultural ➔ Self Care Agency	0.16	2.50	0.01
Family support➔ Self Care Agency	0.22	2.37	0.02
Lifestyle ➔ Self Care Agency	0.18	2.13	0.03
Lifestyle ➔ Self Care Behavior	0.24	2.56	0.01
Environment ➔ Self Care Behavior	0.19	2.00	0.05
Self-Care Agency ➔ Self-Care Behavior	0.38	5.43	<0.001

The final model of the relationship of SCF, SCA and SCB of T2DM clients

The GoF test validates the inner model produced in Figure 1 by calculating the predictive relevance (Q2). The Q2 value is 0.2422 (Q2>0), which concludes that the model has a good prediction. The Standardized Root Mean Square Residual (SRMR) value is 0.047, below 0.05, which declares that the model is excellent and fit to describe the association of variables.

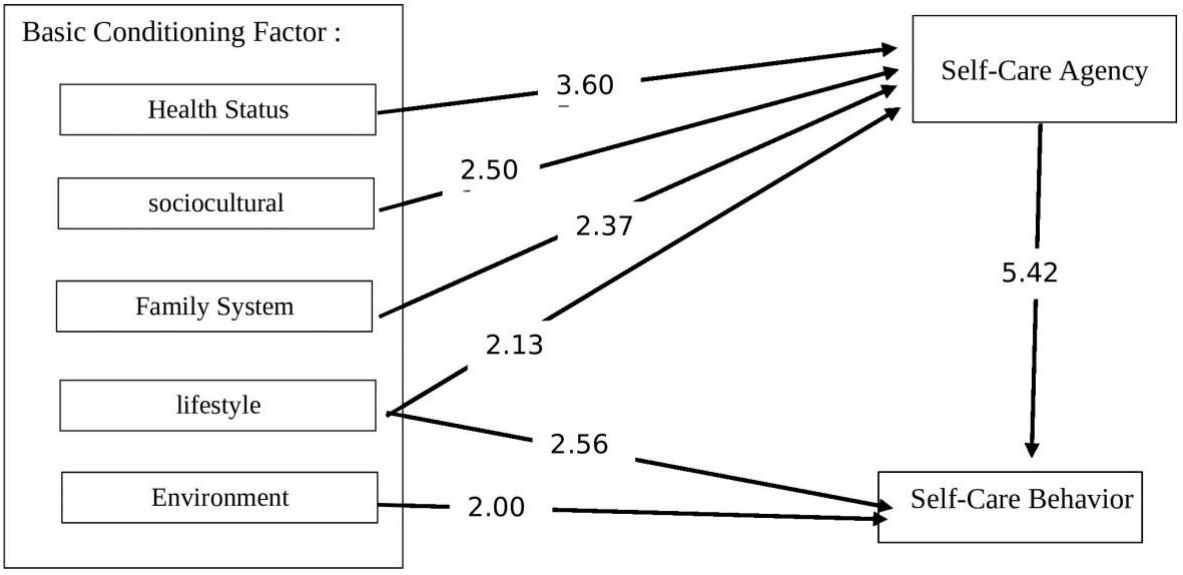

Figure 1. The final model correlation between basic conditioning factors, self-care agency, and self-care behavior among T2DM clients.

DISCUSSION

T2DM disease is a long-life health problem and becomes an increasing burden for the sufferers and their families. It takes a certain amount of resources in terms of funding and various non-monetary aspects (i.e., social capital, time, psychology, and well-being). It is costly for T2DM to attend continual health care in health facilities. Among chronic illness patients, improving the independence of care is crucial to improving the quality of life and well-being, minimizing morbidity, mortality, the price of medical care, and also readmission to health facilities.[20,21] Self-care management reduces the complication risks among T2DM clients.[22]

SCB required driving factors to perform effectively. The drivers include sufficient skills, reliability, and responsibility for their medical care.[10] This study explores various factors, especially BCF and SCA, that contribute to improving the SCB among T2DM clients. The components of BCF include developmental status, health services, sociocultural, family support, lifestyle, and environment to health. These factors are predicted to directly influence and increase SCB or indirectly influence SCB through the mediating factors of SCA, such as diet, blood sugar monitoring, physical exercise, treatment, and foot care.

The new model driven by the data analysis reveals health status, socio-culture, and family system; the lifestyle of BCF indirectly influenced the improvement of SCB where SCA factors (i.e., diet, blood sugar monitoring, physical exercise, treatment, foot care) become the mediating factors. Lifestyle also directly and indirectly influences the improvement of SCB, while the environment is the only factor directly influencing the increase of SCB performance.

The study shows that health status significantly improves the SCB of T2DM clients. Health status refers to the perception of the T2DM clients of their existing health condition. The T2DM (195) clients perceived themselves as being healthy. The association of health status to SCA is strongly shown by their willingness to take care of their illness through good diet, medication, exercise, blood sugar monitoring, and foot care. Positive perception of health status predicts overall self-care[23] and adherence to treatment among patients with T2DM.[24] Negative perception of the illness, on the other hand, worsens the health status and well-being of patients.[25,26]

Sociocultural background significantly influences the lifespan of an individual, including the ways people perceive and treat health and diseases, including their health-seeking.[27] The social dimension refers to the standard of living, behavior, and economic conditions, while the cultural aspect of health care refers to the perception and the ways health.[28]

The model produced in this study proves the role of the sociocultural aspect as the driver of SCB among T2DM in Surabaya. The 161 (82.3%) T2DM clients at the research sites claim they obtained significant support from their surroundings during the medication process.

The sociocultural factors influence T2DM patients' self-care, such as diet, medication, exercise, blood glucose monitoring, and foot care. Cultural context shapes health beliefs and practices, while social networks and systems are essential in encouraging or maintaining positive health behaviors and outcomes.[29] Failure to position sociocultural aspects in health care improves the adverse outcomes of medication.[30] Adequate sociocultural support improves the confidence of T2DM clients to perform self-care for their illness. A study in Nigeria found the importance of integrating sociocultural aspects to reduce the fear of medication, stigma, a perception that diabetes is an incurable illness, and the inability to perform self-care at home.[31]

Since self-care management of T2DM occurs within families, it is crucial to involve the family in the

medication process of T2DM. This study infers the majority of the T2DM sufferers reported that their families have substantial support in diet, blood sugar monitoring, physical exercise, treatment, and foot care. Family provide social support for their members suffering from diseases or illnesses through emotional, instrumental, informational, and appraisal.[32] The T2DM clients experience barriers to performing everyday life, including working, social engagement, and various physical activities. Therefore, families should be available to assist T2DM clients in improving their self-confidence to manage their health care. T2DM clients need to feel the presence of family to encourage them to take good care of themselves to produce optimum health outcomes.

Family support helps improve the quality of life and reduce physical and psychological complications in people with T2DM.[33] Joelianti describes that family support significantly influences the T2DM client in self-management of care by taking herbal medicines.[34] Adherence to control over blood sugar is inseparable from the full support of the families of T2DM clients.[35] Furthermore, the habit of "eating together" within a family is an example of family support that is more powerful than medication adherence and physical activity among T2DM in Kathmandu, Nepal.[36]

The lifestyle of the T2DM clients also influences the SCB. The statistical analysis reveals that 183 (93.8) of the T2DM have an excellent lifestyle. The lifestyle significantly influences the SCA (p=0.033) and (p=0.011) for SCB. A healthy lifestyle includes a healthy, balanced diet, regular exercise, and avoiding toxic habits such as smoking, alcohol, and unsafe sex activity.[37,38] For T2DM clients, maintaining a good health status requires a healthy lifestyle. As an insulin-dependent, consuming a balanced diet is necessary for T2DM clients. Adherence to a healthy diet is still a challenge for T2DM due to poor understanding, implementation, and maintenance of the best practices of a healthy diet.[39] Knowledge of a good diet is frequently associated with SCB and adherence to a good diet.[40] Insulin resistance and the development of T2DM have a strong association with a poor lifestyle.[41] Self-care agencies require patients to modify diet, exercise, blood sugar checks, medication, and foot care.[42]

The environment has a significant burden on T2DM incidence. Modifying the environment, including the self-care practice, is effective for T2DM management. Self-care practice also depends on the environment where the T2DM sufferer lives, both social and physical or natural environment. This study verifies that the environment significantly influences the SCB of T2DM, with p=0.046. The availability of a supportive neighborhood environment (i.e., access to healthy food, social support, and neighborhood aesthetics) for T2DM care motivates the client to perform self-care for their illness.[43] A stressful environment is a predictor of the quality of life and well-being of T2DM clients. Living in crowds, stressful, and unsafe surroundings become barriers for T2DM client to perform effective self-care for their illness.

The study bears some limitations. The model produced in the study is unable to explore in detail why some components of BCF such as developmental status, health services, sociocultural, family support, and lifestyle indirectly influence the SCB of T2DM clients. Furthermore, the study also needs to explain the contributing factors of lifestyle and environment that directly influence the SCB of the T2DM clients.

CONCLUSION

The study concludes that BCF and SCA factors directly and indirectly influence SCB. The SCB is indirectly

influenced (SCA as bridging factors) by health status, socio-culture, family system, and lifestyle, except the developmental status of the T2DM client. Furthermore, the environment has directly influenced the SCB performance of the T2DM clients. It infers that environment (both physical and social) is a significant determiner influencing the willingness of the T2DM client to be independent in caring for their illness.

It is advised to involve BCF and SCA factors to improve the willingness of T2DM clients to perform their self-care. Planned and focused health education is necessary to promote SCB among T2DM clients.

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AUTHOR CONTRIBUTION

Proposal and Conceptualization: MN, SP, AAA, YKW, HY, MI; Data curation: SP, AAA, MI; Data validation and analysis: MN, SP, AAA, YKW; Manuscript drafting: MN, SP, AAA, HY, MI; English translation and proofreading: YKW

CONFLICT OF INTEREST

There is no conflict of interest for any parties

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REFERENCES

1. WHO. Diabetes [Internet]. 2023. Available from: https://www.who.int/health-topics/diabetes?gclid=CjwKCAiA-#tab=tab_1
2. International Diabetes Federation. Diabetes around the world in 2021 [Internet]. 2023. Available from: https://idf.org/about-diabetes/diabetes-facts-figures/
3. International Diabetes Federation. IDF diabetes atlas 10th edition [Internet]. 2021. Available from: https://diabetesatlas.org/atlas/tenth-edition/
4. Ministry of Health of Republic of Indonesia. Riset Kesehatan Dasar Tahun 2018 [The 2018 Indonesian Basic Health Research]. Jakarta: National Institute of Health Research and Development Republic of Indonesia; 2018.
5. Kwan BM, Jortberg B, Warman MK, Kane I, Wearner R, Koren R, et al. Stakeholder engagement in diabetes self-management: Patient preference for peer support and other insights. *Family Practice*. 2017; 34(3): 358–363.
6. Nurchis MC, Sessa G, Pascucci D, Sassano M, Lombi L, Damiani G. Interprofessional collaboration and diabetes management in primary care: A systematic review and meta-analysis of patient-reported outcomes. *Journal of Personalized Medicine*. 2022; 12(4): 1–12.
7. Ryan JC, Wiggins B, Edney S, Brinkworth GD, Luscombe-March ND, Carson-Chahhoud KV, et al. Identifying

critical features of type two diabetes prevention interventions: A delphi study with key stakeholders. *PLoS One*. 2021; 16(8): 1–16.
8. du Pon E, Wildeboer AT, Van Dooren AA, Bilo HJG, Kleefstra N, van Dulmen S. Active participation of patients with type 2 diabetes in consultations with their primary care practice nurses-what helps and what hinders: A qualitative study. *BMC Health Services Research*. 2019; 19(1): 1–11.
9. Gómez-Velasco DV, Almeda-Valdes P, Martagón AJ, Galán-Ramírez GA, Aguilar-Salinas CA. Empowerment of patients with type 2 diabetes: Current perspectives. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*. 2019; 12: 1311–1321.
10. Udo I. Promoting diabetes self-management education and training in outpatient clinics [Doctoral Dissertation]. Minneapolis (MN): Walden University; 2016.
11. Kim H, Cho MK. Factors influencing self-care behavior and treatment adherence in hemodialysis patients. *International Journal of Environmental Research and Public Health*. 2021; 18(24): 1–13.
12. Sharif Nia H, Kohestani D, Froelicher ES, Ibrahim FM, Ibrahim MM, Bayat Shahparast F, et al. The relationship between self-care behavior and concerns about body image in patients undergoing hemodialysis in Iran. *Frontiers in Public Health*. 2022; 10: 1–6.
13. Ma C. An investigation of factors influencing self-care behaviors in young and middle-aged adults with hypertension based on a health belief model. *Heart & Lung*. 2018; 47(2): 136–141.
14. Pahria T, Nugroho C, Yani DI. Factors influencing self-care behaviors in hypertension patients with complications. *Vascular Health and Risk Management*. 2022; 18: 463–471.
15. Hu Y, Liu H, Wu J, Fang G. Factors influencing self-care behaviors of patients with type 2 diabetes in China based on the health belief model: A cross-sectional study. *BMJ Open*. 2022; 12(8): 1–6.
16. Van Loi P, Hoang NH, Xuyen DT. Factors related to self-care behaviors in patients with type 2 diabetes mellitus in Thai Nguyen Province, Vietnam. *International Journal of Medical Science and Clinical Research Studies*. 2023; 3(3): 557–564.
17. Thomas L. Cross-sectional study | definition, uses & examples [Internet]. 2020. Available from: https://www.scribbr.com/methodology/cross-sectional-study/
18. Raosoft. Sample size calculator [Internet]. 2004. Available from: http://www.raosoft.com/samplesize.html
19. Nikolopoulou K. What is convenience sampling? | definition & examples [Internet]. 2022. Available from: https://www.scribbr.com/frequently-asked-questions/what-is-the-scribbr-knowledge-base/
20. Jaarsma T, Hill L, Bayes-Genis A, La Rocca HPB, Castiello T, Čelutkienė J, et al. Self-care of heart failure patients: Practical management recommendations from the Heart Failure Association of the European Society of Cardiology. *European Journal of Heart Failure*. 2021; 23(1): 157–174.
21. Riegel B, Dunbar SB, Fitzsimons D, Freedland KE, Lee CS, Middleton S, et al. Self-care research: Where are we now? Where are we going?. *International Journal of Nursing Studies*. 2021; 116: 1–7.
22. Maina PM, Pienaar M, Reid M. Self-management practices for preventing complications of type II diabetes mellitus in low and middle-income countries: A scoping review. *International Journal of Nursing Studies Advances*. 2023; 5: 1–7.
23. Kugbey N, Oppong Asante K, Adulai K. Illness perception, diabetes knowledge and self-care practices among type-2 diabetes patients: A cross-sectional study. *BMC Research Notes*. 2017; 10(1): 1–7.
24. Alharbi S, Alhofaian A, Alaamri MM. Illness perception and medication adherence among adult patients with type 2 diabetes mellitus: A scoping review. *Clinics and Practice*. 2023; 13(1): 71–83.
25. Jabbarian LJ, Rietjens JA, Mols F, Oude Groeniger J, van der Heide A, Korfage IJ. Untangling the relationship between negative illness perceptions and worse quality of life in patients with advanced cancer—a study from the population-based PROFILES registry. *Support Care in Cancer*. 2021; 29(11): 6411–6419.
26. Schoormans D, Wijnberg L, Haak H, Husson O, Mols F. Negative illness perceptions are related to poorer health-related quality of life among thyroid cancer survivors: Results from the PROFILES registry. *Head & Neck*. 2020; 42(9): 2533–2541.
27. Alves SAA, de Oliveira MLB. Sociocultural aspects of health and disease and their pragmatic impact. *Journal of Human Growth and Development*. 2018; 28(2): 183–188.
28. Mankar D, Shaikh DA. Socio-cultural dimensions of public health. *Indian Practitioner*. 2023; 74(11).

29. Omodara DA, Gibson L, Bowpitt G. Exploring the impact of cultural beliefs in the self-management of type 2 diabetes among Black sub-Saharan Africans in the UK–a qualitative study informed by the PEN-3 cultural model. *Ethnicity & Health*. 2022; 27(6): 1358–1376.
30. Latif AS. The importance of understanding social and cultural norms in delivering quality health care—a personal experience commentary. *Tropical Medicine and Infectious Disease*. 2020; 5(1): 1–8.
31. Chinenye S, Ogbera A. Socio-cultural aspects of diabetes mellitus in Nigeria. *Journal of Social Health and Diabetes*. 2013; 1(1): 15–21.
32. Heaney CA, Israel BA. Social networks and social support. *Health Behavior and Health Education: Theory, Research, and Practice*. 2008; 4(1): 189–210.
33. Sinawang GW, Kusnanto K, Pratiwi IN. Systematic review of family members in improving the quality of life of people with T2DM. *Journal Ners*. 2020; 15(2):107–112.
34. Joeliantina A, Agil M, Qomaruddin MB, Kusnanto, Soedirham O. Family support for diabetes self-care behavior in T2DM patients who use herbs as a complementary treatment. *Medico-Legal Update*. 2019; 19(1): 238–243.
35. Primadani M, Mulasari SA, Sunarti S. The role of family support on self-care behavior in patients diabetes mellitus (DM) type 2. *Jurnal Berkala Kesehatan*. 2022; 8(2): 100–107.
36. Kandel S, Wichaidit W. Self-care and family support among people with type 2 diabetes. *Journal of Health Science and Medical Research*. 2021; 39(1): 23–33.
37. Shaikh J. What are 10 tips for a healthy lifestyle? [Internet]. 2023. Available from: https://www.medicinenet.com/what_are_10_tips_for_a_healthy_lifestyle/article.htm
38. Watson RR, Zibadi S. Lifestyle in heart health and disease [Internet]. Academic Press; 2018. Available from: https://www.sciencedirect.com/book/9780128112793/lifestyle-in-heart-health-and-disease#book-info
39. Al-Salmi N, Cook P, D'souza MS. Diet adherence among adults with type 2 diabetes mellitus: A concept analysis. *Oman Medical Journal*. 2022; 37(2): e361.
40. Hu X, Zhang Y, Lin S, Guo X, Yang D, Cai M, Gao L. Dietary knowledge, attitude and practice (KAP) among the family members of patients with type 2 diabetes mellitus (T2DM) and its influence on the KAP of T2DM patients. *Diabetes, Metabolic Syndrome and Obesisty*. 2021; 14: 205–213.
41. Dong G, Qu L, Gong X, Pang B, Yan W, Wei J. Effect of social factors and the natural environment on the etiology and pathogenesis of diabetes mellitus. *International Journal of Endocrinology*. 2019; 2019: 1–7.
42. Shrivastava SR, Shrivastava PS, Ramasamy J. Role of self-care in management of diabetes mellitus. *Journal of Diabetes & Metabolic Disorders*. 2013; 12(1): 1–5.
43. Walker RJ, Smalls BL, Campbell JA, Williams JLS, Egede LE. Impact of social determinants of health on outcomes for type 2 diabetes: A systematic review. *Endocrine*. 2014; 47: 29–48.