SCIENTIFIC CULTURE
www.sci-cult.com

SCIENTIFIC CULTURE, Vol. 12, No. 2.1, (2026), pp. 6330-6341
Open Access. Online & Print

DOI: 10.5281/zenodo.19483488

IMPLEMENTATION OF TRANSCULTURAL NURSING THROUGH DALIHAN NA TOLU COUNSELING IN AN EFFORT TO IMPROVE BLOOD GLUCOSE CONTROL AND QUALITY OF LIFE IN PREDIABETES PATIENTS

Febrina Angraini Simamora[1,2*], Andi Zulkifli Abdullah[3], Sukri Palutturi[4], Aminuddin Syam[5], Nursalam[6], Ariyanti Saleh[7], Rahmat Muhammad[8], Nur Nasry Noor[3], Anto J. Hadi[9], Anwar Mallongi[10*]

[1]Doctoral student, Faculty of Public Health, Hasanuddin University, Makassar, Aufa Royhan University, Padangsdimpuan, Indonesia. Email: febrina.angraini@yahoo.com
[2]Department of Nursing, Health Faculty, Aufa Royhan University, Padangsidimpuan, Indonesia.

[3]Department of Epidemiology, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia. zulkifliabdullah@yahoo.com
[4]Department of Health Policy and Administration, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia. sukritanotoa72@gmail.com
[5]Department of Nutrition, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia. aminuddinsyam@unhas.ac.id
[6]Faculty of Nursing, Airlangga University, Surabaya, Indonesia
[7]Department of Psyciatric, Nursing Faculty, Hasanuddin University, Makassar, Indonesia
[8]Faculty of Social and Political Sciences, Hasanuddin University, Indonesia
[9]Department of Magister Public Health, Faculty of Public Health Aufa Royhan University, Padangsidimpuan, Indonesia
[10]Department of Environmental Health, Faculty of Public Health, Hasanuddin University. rawnaenvi@gmail.com

Received: 21/01/2026
Accepted: 25/03/2026

Corresponding Author: Febrina Angraini Simamora & Anwar Mallongi (febrina.angraini@yahoo.com. rawnaenvi@gmail.com)

ABSTRACT

Prediabetes is a condition where blood glucose concentration is higher than normal, but lower than the diabetes threshold, and is a high-risk condition for the development of diabetes. Quality of life is an important aspect in the management of prediabetes; this is related to how sufferers are able to control their blood glucose levels. Efforts that can be made are to improve self-care behavior in prediabetes sufferers, one of which is through dalihan na tolu counseling. The purpose of this study is to analyze efforts to improve blood glucose control and quality of life in prediabetes sufferers using dalihan na tolu counseling based on transcultural nursing. This study is a quantitative study with a quasi-experimental design with a Nonequivalent Control Group with a sample size of 66 consisting of a control group and an intervention group. Data collection was carried out using random blood glucose level examination (KGDS) and Diabetic Quality of Life (DQoL)

questionnaire. The intervention carried out on the respondents in the intervention group was in the form of counseling and assistance by the family (the Dalihan Na Tolu party) for 3 months. Data analysis was carried out using a paired t-test to compare the values before and after the Dalihan Na Tolu counseling activity in the intervention control group. Then an independent t-test compared the control group with the intervention group. After conducting a paired t-test on the control and intervention groups before and after Dalihan Na Tolu counseling, a p-value of 0.000 was obtained. In the independent t-test for the control and intervention groups, a p-value of 0.000 was obtained. This shows that Dalihan Na Tolu counseling is effective in improving blood glucose control and quality of life in prediabetes sufferers. Dalihan Na Tolu counseling is effective as an effort to improve blood glucose control and quality of life in prediabetes sufferers. This is a concrete form of transcultural nursing theory that involves cultural and kinship elements in the process of caring for family members with prediabetes.

KEYWORDS: Blood Glucose Level Control, Quality of life of prediabetes, Dalihan Natolu Counseling, Transcultural Nursing.

1. INTRODUCTION

Type 2 diabetes is the most common type of diabetes, accounting for more than 90% of all diabetes cases worldwide. Type 2 diabetes is currently the 8th leading cause of disease burden globally and is projected to become the second leading cause by 2050 (1) . The cause of type 2 diabetes is not fully understood, but there is a strong association with excess weight, advanced age, ethnicity, and a family history of diabetes. Factors contributing to the risk of type 2 diabetes are thought to include a multi-gene predisposition and environmental triggers (2,3) .

Prediabetes (intermediate hyperglycemia) is a high-risk condition for diabetes defined by glycemic variables that are higher than normal, but lower than the diabetes threshold. Approximately 5–10% of people per year with prediabetes will progress to diabetes, with a similar proportion returning to normoglycemia (4) (5) . Prediabetes is a serious health condition in which blood sugar levels are higher than normal, but not yet high enough to be diagnosed as type 2 diabetes (5–7) .

Prediabetes, typically defined as a blood glucose concentration higher than normal but lower than the diabetes threshold, is a high-risk state for the development of diabetes. The diagnostic criteria for prediabetes have changed over time and vary depending on the institution of origin (7) . Prediabetes broadly refers to the intermediate stage between truly normal glucose levels and the clinical entity of type 2 diabetes, which includes IFG and impaired glucose tolerance. IGT and IFG are associated with an increased risk of developing type 2 diabetes in the future (1,8) .

Early detection of diabetes and initiation of treatment are crucial for diabetes management and prevention of complications. The longer a person has undiagnosed diabetes, the greater the risk of complications. A person is defined as having undiagnosed diabetes when their blood glucose levels meet diagnostic criteria for diabetes, but the diagnosis has not been confirmed by a healthcare professional (9–11) .

By 2024, an estimated 634.8 million adults, or 12% of adults worldwide, will have impaired glucose tolerance (IGT). By 2050, this figure is projected to increase to 846.5 million adults, or 12.9% of all adults. By 2024, an estimated 487.7 million adults, or 9.2% of the global adult population, will have impaired fasting glucose (IFG). An estimated 647.5 million adults or 9.8% of the global adult population are projected to have IFG by 2050. (1).

Quality of life (*QoL*) is an important aspect in managing prediabetes, because it is not only physiological conditions that need to be considered, but also how sufferers are able to live their daily lives well despite facing the risk of chronic disease. People with prediabetes often experience physical changes such as fatigue, excess weight, or sleep disturbances, which can affect daily activities and fitness. On the other hand, psychological burdens also arise in the form of anxiety, stress, and worry about the possibility of developing diabetes, which impact emotional well-being and motivation to carry out self-care (12) .

Efforts to improve prediabetes self-care include education. Education is conducted to enhance efforts to promote healthy living in the prevention and management of DM holistically. DM education is education and training regarding knowledge and skills for DM patients to support behavioral changes, increase patient understanding of their disease, thereby achieving optimal health, psychological adjustments, and improving quality of life (13) . The approach used in health education interventions is counseling. Education based on the theory of planned behavior, by holding face-to-face meetings and following up on samples after the educational intervention, can promote a healthy lifestyle for prediabetic women. Therefore, designing and implementing similar interventions in all prediabetic individuals seems necessary. (14) . Other studies also show that creating awareness of diabetes risk in at-risk groups and increasing counseling of at-risk groups by doctors/healthcare providers can be key to preventing diabetes . (15) .

One of the nursing theories that can be applied in efforts to improve self-care and the quality of life of prediabetes sufferers is the Transcultural Nursing theory developed by Madeleine Leininger (16) .

From a social and cultural perspective, the quality of life of people with prediabetes is often influenced by their family environment and cultural values. For example, in societies that value togetherness during meals or traditional celebrations, people with prediabetes often struggle to control their eating habits. A lack of family understanding of the importance of a healthy lifestyle can reduce social support, which should be a protective factor in managing prediabetes (17,18) .

There are several factors related to a person's behavior. Cultural and social structure factors included in this theory include technology, religion, family and kinship, politics, cultural beliefs and practices, economics, physical conditions, and biological factors that influence care and influence health/well-being patterns and well-being (19,20) .

A reduced quality of life can lead to poor adherence to self-care behaviors such as diet, physical activity, regular health check-ups, and stress management. However, a good quality of life has been shown to be positively associated with blood glucose control, improved mental health, and the prevention of metabolic complications. Therefore, addressing the quality of life of prediabetes sufferers is an integral part of efforts to prevent the disease from progressing to diabetes mellitus (4,21) .

Viewed from the aspect of kinship and cultural practices, the city of Padangsidimpuan has elements of Dalihan Natolu culture that are very closely related to the practice of daily life. *Dalihan Na Tolu* culture not only regulates relationships between individuals, but also influences people's thought patterns and behavior in daily life, including in terms of decision making, diet, health care, and attitudes towards illness. In the context of health, this culture can act as a source of social and emotional support, because the extended family and relatives have a moral responsibility to help family members who are sick (22) (23) . Dalihan Natolu becomes a framework that includes blood relatives and marriage relationships that connect one group (24,25) .

2. METHODS

This study is a quantitative study with a quasi-experimental design with a Nonequivalent Control Group consisting of a control group and an intervention group (26,27) . The population in this study were prediabetes sufferers in Padangsidimpuan City. The sample in this study consisted of 33 respondents as the control group, and 33 respondents as the intervention group selected using a *purposive sampling technique.* Data collection was carried out using several questionnaires, including a questionnaire on respondent characteristics consisting of age, gender, education, occupation, and socioeconomic status. Then for the research variables, a random blood glucose level examination (KGDS) and a *Diabetic Quality of Life* (DQoL) questionnaire were carried out using the Recall method for the previous 7 days (28,29) . The intervention carried out on respondents in the intervention group was in the form of counseling and mentoring by Dalihan Natolu for 3 months which aimed to improve blood glucose control and the quality of life of prediabetes sufferers. Counseling for prediabetes patients and the application of transcultural nursing from the aspect of kinship and culture in the southern Tapanuli region can be combined with the Dalihan Natolu Elements consisting of Mora, kahanggi and Anak Boru. In this study it is called "Dalihan Natolu Counseling". Data analysis was carried out using a paired t-test to compare the values before and after the Dalihan Na Tolu counseling activity in the intervention control group. Then the independent t-test compared the control group with the intervention group (30) .

3. RESULTS

3.1. Respondent Characteristics

The following are the characteristics of respondents based on gender, education, Job/Profession, socioeconomic status, and age.

Table 1: Respondent Characteristics Based on Gender, Education, Occupation, Socioeconomic Status, And Age (N = 66).

Characteristics	Control Group		Intervention Group	
	f	%	f	%
Gender				
Man	13	39.3	13	39.3
Woman	20	61.7	20	61.7
Education				
Elementary School	4	12.1	3	9.1
Senior High School	21	63.7	25	75.8
College	8	24.2	5	15.1
Job/Profession				
Housewife	9	27.3	4	12.1
Farmer	9	27.3	8	24.2
Private sector employee	7	21.2	7	21.2
Trader	5	15.1	9	27.3
Civil Servants/Police/State-Owned Enterprises	3	9.1	5	15.1
Socioeconomic Status				
Low	19	57.6	15	45.4
Intermediate	7	21.2	15	45.4
High	7	21.2	3	9.1
	Mean	**SD**	**Mean**	**SD**

Age	47.36	8.24	47.33	7.51

Source: Primary Data (2024)

Table 1 shows that the majority of respondents in both the control and intervention groups were female, with 20 respondents (61.7%) in both groups. The majority of respondents had high school education in the control group (21 respondents (63.7%) and in the intervention group (25 respondents (76.8%). For occupation, in the control group, the majority of respondents were housewives (9 respondents (27.3%) and farmers (9 respondents (27.3%), while in the intervention group, the majority of respondents were traders (9 respondents (27.3%). The majority of respondents had low socioeconomic status in the control group (19 respondents (57.6%), while in the intervention group, the majority were low (15 respondents (45.4%) and middle (15 respondents (45.4%). The average age in both the control and intervention groups was 47.3 years.

3.2. Blood Glucose Level Control and Quality of Life in Prediabetes

The following are random blood glucose levels and quality of life in prediabetes sufferers in the control group and intervention group before and after intervention in the form of dalihan na tolu counseling and assistance from dalihan na tolu.

Table 2: Random Blood Glucose Levels and Quality of Life in Prediabetes Patients in the Control Group and Intervention Group Before and After Intervention in the Form of Dalihan Na Tolu Counseling and Assistance from Dalihan Na Tolu (N = 66).

Variable	**Mean**	**Δx̄**	**SD**	**Min**	**Max**	*P value*
Blood glucose levels during prediabetes						
Control group						
Pre	180.91	3.32	10.16	156	198.00	0,000
Post	177.68		9.66	155	192.00	
Intervention group						
Pre	176.94	12.76	11.92	157	197.00	0,000
Post	164.18		10.85	146	181.00	
Quality of Life for Prediabetes						
Control group						
Pre	43.87	2.88	8.23	30.00	58.00	0,000
Post	46.75		7.95	30.00	59.00	
Intervention group						
Pre	43.21	7.54	6.93	28.00	58.00	0,000
Post	50.75		6.60	36.00	60.00	

Source: Primary Data (2024)

Table 2 shows that the results of random blood glucose level examinations carried out by respondents in the control group before the intervention had an average score of 180.90 gr/dL and after 3 months of random blood glucose level examinations, the average blood glucose level was 177.68 gr/dL. There was a decrease in blood glucose levels of around 3.32 gr/dL and when the paired t test was carried out in the control group, the *p value was* 0.000, which means there was a change in blood glucose levels in the control group.

The same thing was found in the intervention group; there was a decrease in blood glucose levels before and after the dalihan na tolu counseling intervention. At the beginning, the results of the random blood glucose level examination were 176.94 gr / dL, but there was a decrease in the value of the random blood glucose level by 12.76 gr / dL so that in the measurement after 3 months of the dalihan na tolu counseling intervention, the results of the random blood glucose level examination were again obtained with an average blood glucose level of 164.18 gr / dL. And when the *paired t test was conducted* in the intervention group, *a p value of* 0.000 was obtained, which showed that dalihan na tolu counseling was effective in efforts to improve blood glucose control in prediabetic patients.

The quality-of-life score for prediabetes patients was 43.87, and after three months of re-measurement, the score was 46.75. There was a 2.88 increase in the quality-of-life score. A paired t-test for the control group yielded a *p-value of* 0.000, indicating an improvement in the quality of life in the control group compared to prediabetes.

The same thing was found in the intervention group; there was an increase in the quality-of-life score before and after the dalihan na tolu counseling intervention. At the beginning, the quality-of-life score was 43.21, but there was an increase in the quality-of-life score of 7.54 so that in the

measurement after 3 months of the dalihan na tolu counseling intervention, the quality-of-life score of prediabetes sufferers was 50.75. And when the *paired t test was conducted* in the intervention group, *a p value of* 0.000 was obtained, indicating that dalihan na tolu counseling was effective in improving the quality of life in prediabetes sufferers.

3.3. Effectiveness Of Dalihan Na Tolu Counseling on Blood Glucose Level Control and Quality of Life in Prediabetes Patients

The following are the results of the independent t-test on the control of blood glucose levels and the quality of life of prediabetes sufferers in the control group and the intervention group after the intervention in the form of Dalihan Na Tolu counseling and mentoring from Dalihan Na Tolu.

Table 3: Results Of the Independent T-Test on Blood Glucose Level Control and Quality of Life of Prediabetes Sufferers in the Control Group and Intervention Group After Intervention in the Form of Dalihan Na Tolu Counseling and Mentoring from Dalihan Na Tolu (N = 66).

Variable	**Mean**	**Δx̄**	**SD**	**Min**	**Max**	*P value*
Post-Intervention Blood Glucose Level Control						
Control group	177.68	13.50	9.66	155	192.00	0,000
Intervention group	164.18		10.85	146	181.00	
Post-Intervention Quality of Life						
Control group	46.75	4.00	16.24	34.00	80.00	0,000
Intervention group	50.75		17.64	44.00	110.00	

Source: Primary Data (2024)

Table 3 shows that there was a difference in the average blood glucose levels in the control and intervention groups after the intervention in the form of dalihan na tolu counseling. In the control group, the blood glucose level after 3 months was 177.68 gr/dL, and in the intervention group, the blood glucose level was 164.18 gr/dL, there was a difference in the average blood glucose level of 13.50 gr/dL between the control and intervention groups. And when the independent t-test was conducted in the control and intervention groups, *a p value of* 0.000 was obtained, which indicates that Dalihan Natolu counseling is effective in increasing blood glucose control in prediabetes sufferers.

The same thing was also found in the quality of life of prediabetes patients; there was a difference in the average quality of life scores in the control and intervention groups after the intervention in the form of dalihan na tolu counseling. In the control group, the quality-of-life score after 3 months was 46.75, and in the intervention group, the quality-of-life score was 50.75, there was a difference in the average quality of life score of 4.00 between the control and intervention groups. And when the independent t-test was conducted In the control and intervention groups, *a p value of* 0.000 was obtained, which indicates that Dalihan Natolu counseling is effective in improving the quality of life in prediabetes sufferers.

4. DISCUSSION

4.1. Respondent Characteristics

The research results showed that the characteristics of respondents varied from gender, education, occupation, socioeconomic status, and age. Several studies also stated that the characteristics of diabetes sufferers are mostly women, and with education around junior high school to high school, and age under 60 years and low to middle socioeconomic status (31) . However, in practice, female diabetes sufferers are also better able to maintain their quality of life compared to male sufferers (32) . Other studies show that women are significantly associated with the occurrence of prediabetes. Women are at 0.4 times higher risk of developing prediabetes (33) . Women of childbearing age are less susceptible to cardiovascular disease due to the protective effect of estrogen. Estrogen generally lowers circulating triglyceride and LDL-C levels, while increasing HDL-C levels. However, several studies mention the development of cardiovascular disease in women with lower blood glucose levels than men (3) (34) .

Gender significantly contributes to diabetes *self-care.* It has been shown that female clients demonstrate better diabetes *self-care behaviors* than male clients. Both male and female diabetes clients should engage in diabetes *self-care activities* , but women appear to be more concerned about their health, making optimal efforts to self-treat their illness (35) .

The research results showed that the majority of respondents were of low and middle socioeconomic status. Socioeconomic status influences diabetes *self-care.* A positive relationship can be observed, where

clients with a high socioeconomic status will improve their diabetes *self-care behavior.* Diabetes mellitus is a chronic disease that requires quite expensive treatment. If a client's economic status is inadequate, it will make it difficult for them to visit health care centers regularly, making it difficult to monitor the client's health status and making them more likely to experience diabetes complications (36) .

Education and occupation also influence blood glucose control and quality of life. Some people with prediabetes are not well aware of their health status, so they delay activities that could improve their quality of life (34) .

4.2. Blood Glucose Control and Quality of Life in Prediabetes

Prediabetes represents a window of opportunity during which modifiable risk factors, such as overweight/obesity, a high-energy diet, and physical inactivity, can be targeted to prevent or delay the development of type 2 diabetes (2) . Lifestyle interventions in individuals with prediabetes may also have beneficial effects on the development of cardiovascular disease, microvascular complications, and cardiovascular and all-cause mortality in the long term. Lifestyle interventions in individuals with impaired glucose tolerance delay the onset of type 2 diabetes and reduce the incidence of cardiovascular events, microvascular complications, cardiovascular and all-cause mortality, and increase life expectancy. These findings provide strong justification for continuing to implement and expand the use of such interventions to curb the global epidemic of type 2 diabetes and its consequences (2,37) .

Blood glucose control is a crucial component of improving self-care and the quality of life for people with prediabetes. This will demonstrate whether the education provided by healthcare workers and others is being implemented by those with prediabetes (38) .

self-care is a program or action that must be carried out throughout the client's life and is the full responsibility of each diabetes client. Activities included in diabetes *self-care* include regulating diet, physical exercise , blood sugar monitoring, medication, and foot care (39) .

Blood glucose control in individuals with prediabetes should focus on returning to normoglycemia rather than simply maintaining prediabetes. A previous study in the Middle East found that diabetes progression was significantly lower in individuals who returned to normoglycemia than in those who consistently maintained prediabetes. This was due to improvements in insulin sensitivity and pancreatic β-cell function during the intervention. The study also showed that the proportion of individuals who became normoglycemic was significantly higher in the intervention group than in the control group. Assuming this reversal is temporary, the risk of prediabetes individuals progressing to type 2 diabetes mellitus is certainly reduced (40) .

Prediabetes care cannot be done by the sufferer alone, but also requires help and support from others. As found by previous research, people with prediabetes often need encouragement to discuss the responsibilities, choices, and behaviors they follow to support self-care to improve their health and well-being (41) .

The study results showed that the overall quality of life of individuals with prediabetes did not differ significantly from that of subjects with normal glucose tolerance, whereas for participants with diabetes, the quality was lower (mainly due to the presence of vascular complications). However, some components of quality of life were already affected in prediabetic IGT, particularly mobility and psychological distress. Understanding the stage of diabetes at which health status declines will allow for prioritization of intervention efforts and more effective targeting of policies and strategic interventions to improve health outcomes. Therefore, quality of life issues (particularly physical and psycho-emotional issues) should be investigated when individuals with prediabetes are diagnosed in routine clinical practice, as their identification could potentially lead to more effective overall management of their condition (42) .

4.3. Effectiveness Of Dalihan Natolu Counseling on Blood Glucose Level Control and Quality of Life in Prediabetes Patients

People with prediabetes are at high risk of developing other complications, such as the development of diabetes mellitus, cardiovascular problems, and so on. Prediabetes is positively correlated with the risk of all-cause mortality and the incidence of cardiovascular outcomes, coronary heart disease, stroke, chronic kidney disease, cancer, and dementia (43) . Psychologically, high levels of distress are also found in people with diabetes. Therefore, special attention is needed by patients, their families, and the medical team to incorporate distress evaluation as part of routine procedures in diabetes care, and recommend that doctors implement a comprehensive approach in diabetes management, which is very important (31) .

The quality of life of people with prediabetes is

also influenced by their daily activities. Studies have shown that people with prediabetes who achieve prediabetes physical activity guidelines have higher levels of physical and mental quality of life than those who are inactive. Furthermore, these results support the rationale for developing strategically designed physical activity programs for individuals with prediabetes (44) .

A reduced quality of life can lead to poor adherence to self-care behaviors such as diet, physical activity, regular health check-ups, and stress management. However, a good quality of life has been shown to be positively associated with blood glucose control, improved mental health, and the prevention of metabolic complications. Therefore, addressing the quality of life of prediabetes sufferers is an integral part of efforts to prevent the disease from progressing to diabetes mellitus (4,21) .

On research conducted in India also shows that there has been a decline

A statistically significant ($p<0.0001$, with 95% CI) difference was found in blood sugar levels from baseline to post-counseling, as evidenced by a decrease in complaints of diabetes symptoms (45) . Other studies also show that counseling provides respondents with an understanding of their illness, which then encourages them to manage their illness and subsequently plan what actions to take to manage their illness. Ultimately, this home care counseling enables respondents to accept their illness and be wiser in living with their illness, thereby improving their quality of life and preventing complications (46) .

One approach that can be taken is the Transcultural Nursing approach, which involves several factors in an effort to improve self-care behavior in prediabetes sufferers. Cultural and social structural factors included in this theory include technology, religion, family and kinship, politics, cultural beliefs and practices, economics, physical conditions, and biological factors that influence care and influence health/well-being patterns and well-being (29,39) .

Various sociocultural factors influence public health, including kinship and cultural practices. These two factors can be modified through the development of counseling methods appropriate to the local cultural context. Counseling itself is a personal relationship between two individuals: a counselor with specialized skills and a client as the recipient of assistance. In this face-to-face interaction, the counselor plays a role in creating a learning environment that enables the client to understand themselves, their current situation, and the possibilities they can shape for the future by utilizing their potential. The ultimate goal is to improve the well-being of individuals and society, while equipping clients with problem-solving skills and identifying future needs. (47) .

In the context of the South Tapanuli community, the counseling approach for prediabetes sufferers can be linked to Transcultural Nursing through the integration of Dalihan Na Tolu values. The Dalihan Na Tolu system consists of three essential elements—Mora, Kahanggi, and Anak Boru—which are interconnected and inseparable. This term originates from the metaphor of a three-legged stove, which symbolizes social balance in the Batak Angkola community. Each element has its own social responsibility and role in maintaining harmonious kinship relationships. (48,49) . Therefore, in this research, this approach is called Dalihan Na Tolu Counseling.

The results of the study indicate that the implementation of Dalihan Na Tolu Counseling is effective in helping control blood glucose levels and improving the quality of life of prediabetic patients. In line with these findings, other studies confirm that the success of preventing Type 2 Diabetes Mellitus is highly dependent on family involvement, because the family is an important part of the Dalihan Na Tolu social and cultural system. The role of kinship includes the habit of helping each other, sharing roles, providing advice, and maintaining social relationships through various forms of support, both moral and material. Values such as visiting relatives, giving gifts, and mutual cooperation in social responsibility remain part of the culture of the South Tapanuli community even though there have been several shifts (50,51) . The Dalihan Na Tolu kinship system is still held by the South Tapanuli community, even though there have been shifts (40) .

Counseling for prediabetes sufferers generally focuses on lifestyle changes, so the involvement of family members and relatives is essential. In this study, the counseling process was conducted in conjunction with support from Dalihan Na Tolu, who are the respondents' closest relatives. Other studies also indicate that behavioral change takes time, so ongoing support from Mora, Kahanggi, Anak Boru, and local traditional and community leaders is needed to strengthen the effectiveness of lifestyle counseling (52) .

In addition, previous studies have shown that individuals who attend counseling sessions tend to have a higher awareness of the risks and complications of diabetes compared to those who do not (53) . For example, in Finland, a lifestyle

counseling model has become part of general nursing practice. In this system, nurses play an active role in helping patients make changes to their health behaviors by utilizing various supporting theories and models. One key to its success is collaboration between nurses and patients in setting shared goals, an approach that is now a priority in the country's type 2 diabetes prevention program. (54) .

Meanwhile, the main obstacles in prediabetes care are often caused by low patient compliance with self-management and a lack of awareness of the importance of maintaining health. According to Leininger, research and the implementation of evidence-based nursing practices that are sensitive to culture are needed. She emphasized the importance of nursing education that prepares nurses with cross-cultural competence to be able to bridge the paradigm shift from traditional practices to modern approaches in health care, especially in cases of prediabetes (39) .

5. CONCLUSIONS

5.1. Conclusion

Understanding the culture of the Padangsidimpuan community is crucial for integrating a transcultural approach into public health programs. This approach allows for more acceptable, effective, and sustainable health interventions, as they are tailored to local values and perspectives. Dalihan Natolu counseling is effective in improving blood glucose control and the quality of life for people with prediabetes. This is a concrete example of *transcultural nursing theory* , which incorporates cultural and kinship elements into the care process for family members with prediabetes.

5.2. Suggestion

The Padangsidimpuan City Government, particularly the Health Department, is expected to increase efforts to encourage healthy lifestyle changes in the community, particularly in preventing non-communicable diseases and their complications. Furthermore, it is recommended that promotional and preventive programs integrate more deeply with local cultural values, particularly elements of Dalihan Na Tolu, to make the approach more relevant and acceptable to the community.

Ethical Clearance: This research has undergone ethical review by the research ethics committee of the Faculty of Public Health, Hasanuddin University, Makassar, with registration number 1796/UN4.14.1/TP.01.02/2024.

REFERENCES

International Diabetes Federation. IDF Diabetes Atlas 11th edition 2025. IDF Diabetes Atlas 2025. 2025;

Palladino R, Tabak AG, Khunti K, Valabhji J, Majeed A, Millett C, et al. Association between pre-diabetes and microvascular and macrovascular disease in newly diagnosed type 2 diabetes. World J Pediatr Surg. 2020;3(1):1–11.

Smeltzer, SC, Bare, BG, Hinkle, JL, & Cheever KH. Brunner & Suddart's Textbook of Medical Surgical Nursing (12th). 12th ed. Suzanne C. Smeltzer SCOS, editor. Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2010.

Tabák, AG, Herder, C., Rathmann, W., Brunner, E.J., & Kivimäki M. Prediabetes: a high-risk state for diabetes development. Lancet. 2012;379(9833):2279–90.

CDC. Prediabetes – Your Chance to Prevent Type 2 Diabetes. 2021.

Fitriani F, Sanghati S. Literature Review of Lifestyle Interventions for the Prevention of Type 2 Diabetes Mellitus in Pre-Diabetic Patients. J Ilm Kesehat Sandi Husada. 2021;10:704–14.

Tabák AG, Herder C, Rathmann W, Brunner EJ, Kivimäki M. Prediabetes : a high- risk state for diabetes development. Lancet. 2012;379(9833):2279–90.

Lancet T. Prediabetes and the potential to prevent diabetes. Lancet [Internet]. 2012;379(9833):2213. Available from: http://dx.doi.org/10.1016/S0140-6736(12)60960-X

Astuti A. Age, Obesity, and Physical Activity Risk Factors for Prediabetes. J Endur Kaji Ilm Probl Kesehat. 2019;4(2):319–24.

Simatupang R. Dietary Guidelines for Diabetes Mellitus Sufferers. Banten: Education and Social Foundation; 2020.

Biuso TJ, Butterworth S, Linden A. A Conceptual Framework for Targeting Prediabetes with Lifestyle, Clinical, and Behavioral Management Interventions. Dis Manag. 2007;10(1):6–15.

Williams JS, Walker RJ, Smalls BL, Hill R, Egede LE. Patient-Centered Care, Glycemic Control, Diabetes Self-Care, and Quality of Life in Adults with Type 2 Diabetes. Diabetes Technol Ther. 2016;18(10):644–9.

Amiruddin R. Epidemiology of Non-Communicable Diseases: Quality of Nursing and Quality of Life of Diabetes Mellitus Patients (Quality of Care & Life Diabetes Mellitus). 1st ed. Jakarta: TIM; 2023.

Mohammadnia motlagh K, Shamsi M, Roozbahani N, Karimi M. Effect of theory - based education on promoting a healthy lifestyle in pre - diabetic women : RCT . BMC Women's Health. 2022;1–9.

Okosun IS, Lyn R. Prediabetes awareness, healthcare provider's advice, and lifestyle changes in American adults. Int J Diabetes Mellit. 2015;3(1):11–8.

Leininger MM. Current issues in using anthropology in nursing education and services. West J Nurs Res. 2001;23(8):795–806.

Wah Oo HS, Nau K, Kyi KM. The cultural practices of Bamar diabetic patients: An ethnographic study. Heliyon [Internet]. 2020;6(2):e03267. Available from: https://doi.org/10.1016/j.heliyon.2020.e03267

Khusna RP, Pangastuti HS, Wicaksana AL. Dietary adherence and the associated factors among Indonesian patients with type 2 diabetes: What should we be concerned about? Nurs Front. 2023;10(4):427–36.

McFarland MR, Wehbe-Alamah HB. Leininger's Theory of Culture Care Diversity and Universality: An Overview With a Historical Retrospective and a View Toward the Future. J Transcult Nurs. 2019;30(6):540–57.

Grosso A Del. Application of Leininger's Culture Care Theory in Family Medical History. Honors Thesis [Internet]. 2019; Available from: https://red.library.usd.edu/honors-thesis/43

Sachdeva S, Khalique N, Ansari M, Khan Z, Mishra S, Sharma G. Cultural determinants: Addressing barriers to holistic diabetes care. J Soc Heal Diabetes. 2015;03(01):033–8.

Pulungan A. The Role of Dalihan Na Tolu in the Process of Interaction Between Traditional Values and Islam in the Mandailing and Angkola Communities of South Tapanuli. Dissertation. 2003;1–302.

Sihombing AA. Getting to Know Toba Batak Culture Through the Philosophy of "Dalihan Na Tolu" (Perspective of Cohesion and Harmony). J Religious Lect. 2018;16(2):347–71.

Please BR. Traditional Poda-Poda: Horja Godang/Bolon, Siluluton/Siriaon. Padangsidimpuan: Grace Library; 1982.

Fata N, Siregar LYS, Lazuardi, Siregar FC, Hasibuan ZE. Exploring Ethical Impacts: Internalizing Dalihan Natolu's Values in Angkola Batak Society for the Development of Moral Character. Dirasat Hum Soc Sci. 2025;52(6):1–11.

Polit DF, Beck CT. Nursing research: Generating and assessing evidence for nursing practice. (9th ed.). Philadelphia: Lippincott William & Wilkins; 2012.

Dahlan MS. Statistics for Medicine and Health. Jakarta: Indonesian Epidemiology; 2014.

Kamradt M, Bozorgmehr K, Krisam J, Freund T, Kiel M, Qreini M, et al. Assessing self-management in patients with diabetes mellitus type 2 in Germany: Validation of a German version of the Summary of Diabetes Self-Care Activities measure (SDSCA-G). Health Qual Life Outcomes. 2014;12(1):1–10.

Toobert DJ, Hampson SE, Glasgow RE. The Summary of Diabetes Self-Care. Diabetes Care J. 2000;23(7):943–50.

Stang. Practical Methods for Determining Statistical Tests in Health and Medical Research, 2nd Edition. Jakarta: Mitra Wacana Media; 2018.

Huynh G, Tran TT, Do THT, Truong TTD, Ong PT, Nguyen TNH, et al. Diabetes-related distress among people with type 2 diabetes in Ho Chi Minh City, Vietnam: Prevalence and associated factors. Diabetes, Metab Syndr Obes. 2021;14:683–90.

Corrêa K, Gouvêa GR, da Silva MAV, Possobon R de F, Barbosa LF de LN, Pereira AC, et al. Qualidade de vida e características dos pacientes diabéticos. Cienc e Saude Coletiva. 2017;22(3):921–30.

Amelia R, Harahap J, Wijaya H, Pase MA, Suryani Widjaja S, Saktioto S. Prevalence, Characteristics and Risk Factors Analysis of Prediabetes: A Cross-Sectional Study. F1000Research. 2024;13:843.

Ibrahim N, Moy FM, Awalludin IAN, Ali Z, Ismail IS. The health-related quality of life among pre-diabetics and its association with body mass index and physical activity in a semi-urban community in Malaysia - A cross sectional study. BMC Public Health. 2014;14(1):1–10.

Sousa VD, Zauszniewsk JA, Musil CM, Lea PJP, Davis SA. Relationships Among Self-Care Agency, Self-Efficacy, Self-Care, and Glycemic Control. Res Theory Nurs Pract An Int Journ. 2005;19(3):217–30.

Bai Y, Chiou C, Chang Y. Self-care behavior and related factors in older people with Type 2 diabetes. J Clin Nurs…. 2009;18(23):3308–15.

Gong, QiuhongQian X et al. Morbidity and mortality after lifestyle intervention for people with impaired glucose tolerance: 30-year results of the Da Qing Diabetes Prevention Outcome Study. Lancet Diabetes Endocrinol. 2019;7(6):452–61.

Franciosi M, Pellegrini F, De Berardis G, Belfiglio M, Cavaliere D, Di Nardo B, et al. The Impact of Blood Glucose Self-Monitoring on Metabolic Control and Quality of Life in Type 2 Diabetic Patients. Diabetes Care. 2001;24(11):1870–7.

Alhaiti AH, Senitan M, Dator WLT, Sankarapandian C, Baghdadi NA, Jones LK, et al. Adherence of Type 2 Diabetic Patients to Self-Care Activity : Tertiary Care Setting in Saudi Arabia. J Diabetes Res. 2020;1–7.

Perreault L, Pan Q, Mather KJ, Watson KE, Hamman RF, Kahn SE. Effect of regression from prediabetes to normal glucose regulation on long-term reduction in diabetes risk: Results from the Diabetes Prevention Program Outcomes Study. Lancet [Internet]. 2012;379(9833):2243–51. Available from: http://dx.doi.org/10.1016/S0140-6736(12)60525-X

van Wissen K, Blanchard D. The 'work' of self-care for people with cardiovascular disease and prediabetes: An interpretive description. Int J Nurs Stud [Internet]. 2021;116(xxxx):103548. Available from: https://doi.org/10.1016/j.ijnurstu.2020.103548

Makrilakis K, Liatis S, Tsiakou A, Stathi C, Papachristoforou E, Perrea D, et al. Comparison of health-related quality of Life (HRQOL) among patients with pre-diabetes, diabetes and normal glucose tolerance, using the 15D-HRQOL questionnaire in Greece: The DEPLAN study. BMC Endocr Disord. 2018;18(1):1–10.

Schlesinger S, Neuenschwander M, Barbaresko J, Lang A, Maalmi H, Rathmann W, et al. Prediabetes and risk of mortality, diabetes-related complications and comorbidities: umbrella review of meta-analyses of prospective studies. Diabetology. 2022;65(2):275–85.

Taylor LM, Spence JC, Raine K, Plotnikoff RC, Vallance JK, Sharma AM. Physical activity and health-related quality of life in individuals with prediabetes. Diabetes Res Clin Pract [Internet]. 2010;90(1):15–21. Available from: http://dx.doi.org/10.1016/j.diabres.2010.04.011

Sridevi Kandavalli, Subaiah Venkata et al. Impact of Patient Counseling on Blood Glucose Levels of Diabetes. Indo Am J Pharm Res. 2017;7(05):8689–94.

Hikmah Buchair N, Amiruddin R, Indar. The Effect of Home Care Counseling on the Quality of Life of Type 2 Diabetes Patients at the Talise Community Health Center in Palu City. Prev J Kesehat Masy [Internet]. 2021;12:332–43. Available from: http://jurnal.fkm.untad.ac.id/index.php/preventif

Richardson MS. Counseling for Work and Relationships. Couns Psychol. 2012;40(2):190–242.

Harahap RB. Critical Analysis of the Role of Dalihan Natolu in Marriage of the Batak Angkola Community of South Tapanuli. J Al-Maqasid. 2019;5(1):69–81.

Nuddin M. Analysis of the Concept of Dalihan Na Tolu in the Batak Angkola-Mandailing Community [Internet]. Padangsidimpuan State Islamic Institute; 2021. Available from: http://etd.uinsyahada.ac.id/7147/

Soep, Siagian A, Siregar FA, Mutiara E. The Effect Of Health Promotion - Dalihan Na Tolu In The Prevention Of Type 2 Diabetes Mellitus At Risk Groups Of The Mandailing Tribe In Padangsidimpuan City. Proceedings 1st Int Conf Heal Polytech Jambi. 2023;1:74–83.

Pulungan HR. Preventing the Occurrence of Consanguineous Marriages by Understanding Partuturon in the Batak Angkola-Mandailing Society. FITRAH J Study of Islamic Sciences. 2016;1(2):307–24.

Morrison F, Shubina M, Turchin A. Lifestyle counseling in routine care and long-term glucose, blood pressure, and cholesterol control in patients with diabetes. Diabetes Care. 2012;35(2):334–41.

Shah MK, Moore MA, Narayan KMV, Ali MK. Trends in Lifestyle Counseling for Adults With and Without Diabetes in the US, 2005–2015. Am J Prev Med. 2019;57(5):e153–61.

Kettunen T, Poskiparta M, Kiuru P, Kasila K. Lifestyle counseling in type 2 diabetes prevention: A case study of a nurse's communication activity to produce change talk. Commun Med. 2006;3(1):3–14.