GSC Advanced Research and Reviews

eISSN: 2582-4597 CODEN (USA): GARRC2

Cross Ref DOI: 10.30574/gscarr

Journal homepage: https://gsconlinepress.com/journals/gscarr/

(RESEARCH ARTICLE)

Check for updates

Use of food demonstration during dietary education and its consequence on glycemic control of diabetic patients

Nkechi Martha Johnson [1], Robert Kelechi Ezema [2], Best Ordinioha [3], Nkechi Inumaye Ojule [4], Olabayo Kehinde Omisore [5] and Sunny Chinenye [6]

[1] *Doctor of Public Health, School of Public Health, UNIPORT.*
[2] *Psychiatric and Mental Health Nursing, Nursing SC, Chamberlain University.*
[3] *School of Public Health, UNIPORT.*
[4] *Preventive and Social Medicine, Faculty of Clinical Sciences, UNIPORT.*
[5] *Health Systems Management, School of Public Health, UNIPORT.*
[6] *Endocrinology Department, University of Port Harcourt Teaching Hospital (UPTH).*

GSC Advanced Research and Reviews, 2025, 22(02), 156-163

Publication history: Received on 07 January 2025; revised on 15 February 2025; accepted on 18 February 2025

Article DOI: https://doi.org/10.30574/gscarr.2025.22.2.0053

Abstract

The use of food demonstration combined with a personalized meal plan is an effective but neglected method of dietary education for diabetic patients. This study aimed to ascertain the consequences of using food demonstrations to evaluate their effectiveness on glycemic control. Using a quasi-experimental design, Rivers State University Teaching Hospital (RSUTH) and University of Port Harcourt Teaching Hospital (UPTH) were selected as the Control and Experimental groups respectively. Although 180 patients were enrolled, 162 were analyzed. The Control Group (CG) received a personalized meal timetable, and 2 weekly phone calls follow-up but the Experimental Group (EG) in addition to what CG received, got diet education using food demonstrations. Data was collected using a semi-structured interviewer-administered questionnaire. The statistics analysis was conducted using SPSS version 22 statistical software with a p-value of <0.05 regarded as significant. Patients' HBA1C, was assessed at baseline, three months, and six months (P1, P2 & P3). At P1, EG and CG had HBA1C values of 10.2±3.0 and 10.0±3.0 (P =0.616), HBA1C at P2 (EG: 8.5±1.4; CG: 9.3±2.3) P= 0.012. At P3 (EG: 6.6±0.8; CG: 8.1±1.8), P=0.160. Due to the dietary educational program using food demonstrations, participants in the experimental group had improved HBA1C levels by the end of the study.

Keywords: Diabetes; Mellitus; Questionnaire; Experimental; Control; Group

1. Introduction

Although dietary education using various nutrition education models is commonly used for educating diabetic patients, the prevalence of diabetes mellitus continues to increase [1] [2]. People all over the world have in years past developed unique indigenous healing traditions in line with their culture and beliefs for the satisfaction of the health needs of their community members [3]. Hence, The World Health Organization is supporting research into alternate therapies for diabetes because of issues connected with insulin and the adverse effects of currently available synthetic oral glucose-lowering medicines. Furthermore, the aspect of natural antioxidants and free radicals in regulating disease and maintaining health is also of outstanding scientific interest [4].

Diet is one of the key risk factors of Type 2 Diabetes Mellitus (T2DM) because many nations have experienced dietary changes favoring increased calorie consumption due to urbanization and economic expansion [5]. Hence, dietary management is a key cornerstone modality in the attainment of good glycemic control in T2DM. Of course, dietary

* Corresponding author: Johnson Nkechi Martha.

management of T2DM aims to improve overall health by achieving and maintaining optimal nutritional status, attaining good glycemic control, and preventing acute and long-term complications of T2DM. In addition, most diabetes guidelines recommend starting medication only after making nutritional and physical activity lifestyle adjustments; however, this approach is not usually implemented globally in practice [6].

Dietary management of Diabetes Mellitus (DM) can help improve elevated HbA1c levels. Consequently, the patients could be protected from developing problems associated with diabetes. Recently, increased HbA1c levels have also been identified as one of the primary risk factors for developing microvascular and macrovascular problems [1]. According to Wattana, et al, [7], the understanding and practice of dietary management of diabetes is an important part of care for better glycemic control and higher quality of life. Furthermore, more knowledgeable people with diabetes have a better attitude toward the management of their conditions [8].

Globally, over centuries, people have developed unique indigenous healing traditions adapted from and defined by their culture, beliefs, and environment, which satisfy the health needs of their communities [3]. The World Health Organisation (WHO) is therefore encouraging research into alternative treatments for diabetes because of problems associated with insulin and the toxic effects of currently available synthetic oral glucose-lowering agents.

More than 5 million Nigerians suffer from diabetes, which is associated with high rates of morbidity and death in the country [9]. The prevalence rate of T2DM varies annually and regionally, despite a rise in the adult population in Nigeria [10]. According to the federation, Nigeria has 1.7 million cases of diabetes, making it the country with the greatest number of cases overall in West Africa [11].

Despite the essential role dietary educational programs play in the nutritional management of T2DM, little is known about their practices in Rivers State, Nigeria. Meanwhile, Nigerians living with T2DM are likely to have insufficient information about diabetes, poor dietary management, and higher morbidity/mortality [12] [13]. For example, up to two-thirds of patients with diabetes in Nigeria have uncontrolled blood glucose [14] [15].

According to Chinenye [9], various dietary meal planning tools such as the food pyramid, plate model, and food exchange system techniques like carbohydrate counting and glycemic index are recommended in the management of diabetes mellitus. Considering that this project's qualitative approach aims to reduce stress levels associated with strict diets, we opted for practical food demonstration using both cooked and raw food items during dietary education.

Thus, conducting a study to demonstrate the influence of using food demonstration during a dietary educational program to find out its effect on glycemic control of diabetic patients is significant in alleviating the challenges of diabetes. This study aims to investigate the effect of diabetes dietary education programs on the glycemic control levels of diabetic patients before and after the intervention.

2. Material and methods

2.1. Study Design

For this study, a quasi-experimental study design was used. This study featured pre-intervention and post-intervention assessments between two cohorts of patients diagnosed with Type 2 diabetes mellitus (DM). A total of 162 individuals living with Type 2 DM participated in the study, drawn from two leading tertiary health institutions in Port Harcourt, Nigeria. Ethical approval was obtained from the University of Port Harcourt (UNIPORT) and the University of Port Harcourt Teaching Hospital (UPTH), along with the Rivers State University Teaching Hospital (RSUTH). For this investigation, RSUTH acted as the control group, while UPTH was assigned as the experimental group, ensuring a comprehensive and thoughtful examination of the intervention's effectiveness. Participants in the experimental group were given personalized meal plans and a dietary education program featuring practical food demonstrations. They also received follow-up phone calls every two weeks to monitor their adherence to the meal plans. In contrast, the control group received personalized meal planning and the same follow-up calls, but their dietary education program did not include practical food demonstrations. The main outcome evaluated in the study was glycosylated hemoglobin levels (HbA1c).

2.2. Study Area

The study took place in tertiary hospitals in Port Harcourt, Rivers State, Nigeria.

2.2.1. Study Population

Patients with the age limits of 18 years and older with Type 2 Diabetes mellitus who were enrolled in tertiary hospitals in Rivers State, Nigeria, were included in the target population. This must be patients who met the specified inclusion and exclusion criteria.

2.2.2. Inclusion Criteria

- Participants had to be verified T2DM patients with an HbA1c that was higher than normal (7%) for a minimum of one year.
- Patients attending certain hospitals' endocrinology clinics

2.2.3. Exclusion Criteria

- Patients who did not follow through on the instructions.
- Patients who were involved in other initiatives.

2.3. Sample Size Determination

The sample size was determined using a formula specifically designed for comparing outcomes between two independent proportions. The study aimed for a statistical power of 85%, to achieve a 25% reduction in the prevalence of suboptimal glycosylated haemoglobin (HbA1c) levels. Research conducted by Adebisi and colleagues indicated that 64% of patients with type 2 diabetes mellitus in Ilorin, Nigeria—a city situated in the southwest—had HbA1c values exceeding the normal threshold set at >7.2% for this study.

$n=\frac{2(Z\infty+Z\beta)2\ pq}{(p1-p2)2}$ was used in calculating the sample size with n=required sample size, Z∞ = standard normal deviate corresponding to a level of significance of 95% = 1.96 [9], Zβ = standard normal deviate corresponding to a power of 85% = 1.03 [9], P1= prevalence of HbA1c greater than 7.2. (= 64% in the control group; the present prevalence of suboptimal HbA1c) It was hypothesized that the Experimental would reduce the proportion by 25%, And P2= reduction in the proportion of HbA1c greater than 7.2 = 64% – 25% = 39% (i.e. prevalence/proportion expected in the experimental group)

An allowance of 15% was made for dropouts; 15% of 72 = 10.8. The final sample size = 72 + 10.8 = 83 per group. Hence, at least 83 participants for each of the control and experimental groups were recruited to participate in the study.

2.4. Sampling Technique

A two-stage sampling technique was employed in the execution of this study.

2.4.1. Stage One

Determining the Experimental (Experimental) and Comparison (Control) Groups.

The participating health institutions were designated as either experimental or control groups. Specifically, a coin-tossing technique was used in assigning the University of Port Harcourt Teaching Hospital (UPTH) as the Experimental hospital, while the Rivers State University Teaching Hospital (RSUTH) served as the control hospital.

2.4.2. Stage Two

A purposive sampling technique was utilized to recruit participants for the study. The researcher interacted with diabetic individuals at the diabetes clinics of both selected health institutions (the experimental and control groups) on multiple occasions. After thoroughly explaining the study's purpose and procedures, individuals who showed interest and met the inclusion criteria were recruited. The researcher collected the names, phone numbers, and contact details of support persons. The baseline recruitment process unfolded over approximately two consecutive months in both hospitals.

2.5. Data Collection Process

The data collection occurred in three distinct phases: the before-intervention/recruitment phase (P1), the intervention phase (P2), and the after-intervention phase (P3).

2.6. Before Experimental/Recruitment Phase (P1)

2.6.1. Research Assistants

In the before-intervention/recruitment phase (P1), six final-year nursing students, trained by the researchers, assisted with data collection across the selected health institutions. Each research assistant received comprehensive training in the specific aspects they were tasked with during the study. The questionnaire items were thoroughly explained, and the importance of maintaining objectivity was strongly emphasized.

Pre-intervention data were gathered from study participants in both the experimental and control groups who met the inclusion criteria.

2.6.2. Dietary Intervention Phase

At the diabetes clinics where the experiment took place, four registered dietitians worked together to create personalized one-week meal plans tailored to the food preferences of each patient. Patients were also informed about alternative food options in case they could not obtain the items specified in the meal plan. Nutrition health talks were conducted using food items for demonstration purposes. Additionally, bi-monthly follow-up calls were carried out to assess adherence to the meal plans, allowing for adjustments to be made if any issues or concerns regarding compliance arose.

2.7. Experimental Group Bundle

In this study, the experimental group was provided with a personalized meal schedule utilizing foods from the Diabetic exchange list (Exchange diet). This system, originally designed to assist diabetic patients in monitoring their carbohydrate intake, facilitates meal planning by estimating key macronutrients that influence post-meal blood sugar levels. The most significant revision of these lists was published in 1976, aiming to enhance caloric content accuracy, encourage fat modification, and enable individualized meal plans within the exchange framework.

The caloric intake for patients was carefully regulated, varying from 1200 to 2500 kcal daily depending on their specific nutritional needs. After calculating BMI, obese patients were restricted to approximately 1000-1200 kcal per day. Overweight individuals received approximately 1200-1500 kcal each day, those with a normal weight consumed around 1600-2000 kcal daily, while underweight patients were allocated roughly 2000-2500 kcal per day.

2.8. Bi-Monthly Phone Call Follow-up

Participants received phone calls every two weeks to monitor their adherence to the meal plans. In cases where the participants were unreachable by phone, we contacted them through the phone numbers of their caregivers or spouses, or WhatsApp. The primary objective of these calls was to assess how well the participants were following the meal plans and to address any issues or complaints they might have had. Adjustments were made to the meal plans for some patients, while others who were struggling to comply were encouraged to adhere more closely to the guidelines.

2.9. Food Demonstration

During the dietary education phase, dietitians and research assistants utilized both cooked and raw food items to demonstrate appropriate serving sizes to the diabetic patients. The purpose of displaying the foods was to help them visualize the portion sizes that would be suitable for their dietary needs. Photographs of the raw food items used during the health talk can be found in the appendices.

2.10. Control Group Bundle

The control group received the same treatment as the experimental group, excluding the food demonstration.

3. Result

Table 1 shows a significant difference in the smoking habits of the respondents p=0.013, 6(7.4%) of the respondents in the experimental group smoked compared to 0(0.0%) of the respondents in the control group.

The result showed no significant difference in the pattern of exercise p=0.079, pattern of fruit consumption p=0.637 and family history of diabetes p=0.059

Table 1 Social and Lifestyle History of the patients in Experimental and Control groups

Variable	Experimental n=81	Control n=81	X^2(P-value)
Exercise daily			
Yes	39(48.1)	28(34.6)	3.080(0.079)
No	42(51.9)	53(65.4)	
The pattern of fruit consumption			
Everyday	41(50.6)	44(54.3)	0.223(0.637)
Not everyday	40(49.4)	37(45.7)	
Smoke			
Yes	6(7.4)	0(0.0)	6.231(0.013)
No	75(92.6)	81(100.0)	
Family history of diabetes			
Yes	44(54.3)	32(39.5)	3.569(0.059)
No	37(45.7)	49(60.5)	

Table 2 Weight of the Respondents at Initial Time, 3 Months and 6 Months

Variable	Experimental n(%)	Control n(%)	t(P-value)
Initial weight	69.6±6.3	74.0±13.0	3.193(0.002)
Weight at 3 months	69.4±7.6	72.2±6.4	2.579(0.011)
Weight at 6 months	68.0±10.8	74.4±6.6	4.652(<0.001)
Height	1.7±0.1	1.6±0.1	1.647(0.102)

Table 2 showed a significantly different weight p<0.002 in the initial weight among the experimental 69.6±6.3 and the control group 74.0±13.0. The difference in their weight was also significant at 3 months and 6 months

Table 3 BMI of the respondents at the Initial Time, 3 Months and 6 Months

Variable	Experimental n (%)	Control n (%)	t (P-value)
Initial BMI	25.2±2.7	27.8±6.7	3.198(0.002)
BMI at 3 months	25.2±3.8	27.0±4.2	2.943(0.004)
BMI at 6 months	24.8±5.3	26.9±6.6	2.232(0.027)

Results from Table 3 showed a significantly different BMI of p<0.02, p<0.004, and p<0.027 in the initial, third month, and sixth months.

Table 4 HBAIC of the respondents at the Initial Time, 3 Months and 6 Months

Variable	Experimental n(%)	Control n(%)	t(P-value)
Initial HBAIC	10.2±3.0	10.0±3.0	0.503(0.616)
HBAIC at 3 months	8.5±1.4	9.3±2.3	2.535(0.012)
HBIC at 6 months	6.6±0.8	8.1±1.8	6(.923(0.160)

Table 4 showed a significantly different HBAIC p<0.012 in the third month among the Experimental 8.5±1.4 and the control group 9.3±2.3 The difference in their HBAIC after 6 months was not statistically significant.

4. Discussion of Findings

4.1. Social and Lifestyle History

Results from the study show that the majority (48.1%) of the participants in the Experimental group exercised daily compared to the participants in the control group. This difference was, however, not statistically significant. For the family history, findings from this study showed that the majority of the participants 54.3% had a family history of diabetes. This agrees with a study by Ndetei et al, [16], which showed that between 60% and 68.8% of diabetic patients have at least one family member with a history of diabetes. However, although most of the patients in the experimental groups had a family history of diabetes, the better HBA1C result obtained from this study shows that diabetic patients with a family history of diabetes can still have better HBA1C outcomes if they adhere to the dietary educational programs.

4.2. Glycemic control of DM patients.

The HbA1c was obtained from the patients who knew their values, the patient's files, and from the lab where the test was conducted for patients who could not afford the test using reagents to measure the glucose control. At baseline, the mean HbA1c values of patients in the experimental and control groups were 10.2% and 10.0%, respectively. However, these values are comparable to those obtained from a study by Adebisi et al, [17] in hospitals in North Central, Nigeria. The author reported a mean HbA1c value of 8.0%, indicating inadequate control. Conversely, compared to the current study, a larger percentage of diabetes patients had inadequate glycaemic control in the Adebisi et al, [17] study. A mean value of 8.3% was reported by the authors of a later study that included seven tertiary hospitals across Nigeria's six geopolitical zones. Given that the normal/recommended HbA1c value is 7%, these values indicate that additional interventions are needed to improve the glycemic control of DM patients [18]. Significantly, glycaemic control improved for participants in the experimental group of this study, declining by 1.7 % and 3.6 % by three and six months after the intervention, respectively.

Moreover, a multicenter study by Chinenye et al, [18], [19] found that 32.4% of DM patients had a normal HbA1c level, using 7% as the cut-off point, whereas Adebisi et al, [17] reported that only 36.6% of DM patients had a normal HbA1c level, based on a cut-off point of 7.2%. This percentage is extremely similar to what was observed in the study's experimental group of patients (32.7%).

The experimental group's improved glycaemic control is consistent with the results of a one-group before-test and after-test experimental study conducted by Hu et al, [5]. The results are likewise comparable to those of Gherasim et al, [20].

Furthermore, six months after the intervention, the patients in the experimental group still had a decrease in their glycaemic control. This result is consistent with the findings of Gherasim et al, [20] and Pamungkas et al, [21]. There was no discernible difference between the HbA1c levels of patients in the experimental and control groups in the sixth month after the intervention. The baseline incompatibility made it difficult to have a significant difference between the experimental and control groups, even though the HbA1c level of patients in the experimental group decreased significantly after the intervention. However, studies by Williams et al, [22]. and Wichit et al, [23]. revealed that a diabetes educational intervention did not significantly alter the HbA1c of a group of diabetes patients, which is similar to the results of this study.

According to the authors, there is a correlation between a decrease in HbA1c value of as little as 1% and a decreased likelihood of developing complications related to diabetes mellitus (DM) [24]. [25]. Additionally, it has been reported that achieving an HbA1c level of 7% or lower is associated with a decrease in microvascular complications [22].

5. Conclusion

In the experimental group, patients' HbA1c levels significantly decreased after six months, while those in the control group did not experience much decrease. This may also serve as motivation for them to change their lifestyle to delay the onset of type 2 diabetes. Most significantly, the patients' levels of glycosylated hemoglobin were significantly reduced as a result of the intervention.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest is to be disclosed.

Statement of ethical approval

This study was reviewed and approved by the Ethics Committee of the University of Port Harcourt. The committee ensured that all ethical considerations were addressed, including the protection of participant privacy, informed consent, and the minimization of any potential risks associated with the study. The research adheres to the ethical guidelines outlined in the Declaration of Helsinki and complies with local regulatory requirements.

Statement of informed consent

All participants in this study provided written informed consent before their involvement. They were fully informed about the purpose, procedures, potential risks, and benefits of the study. Participants were assured that their participation was voluntary and that they could withdraw from the study at any time without any consequences. Confidentiality and anonymity of the participants' data were maintained throughout the study.

References

[1] Sami W, Ansari T, Butt NS & Hamid MA Effect of diet on type 2 diabetes mellitus: A review. International Journal of Health Science (Qassim). Apr-Jun 2017;11(2):65-71. PMID: 28539866; PMCID: PMC5426415.

[2] Wake A (2020) Antidiabetic Effects of Physical Activity: How It Helps to Control Type 2 Diabetes. Diabetes, Metabolic Syndrome and Obesity, 13. 2909-2923. 10.2147/DMSO.S262289.

[3] World Health Organization Vital statistics on Nigeria.http://www.who.int/countries/nga/en/. Accessed 9th April, 2018.

[4] Akoko S, Siminialayi IM & Chinenye S. Feasibility of remission of type 2 diabetes mellitus using a wholly Nigerian dietary Experimental at University of Port Harcourt Teaching Hospital, Nigeria. International Journal of Health Sciences, 2022, 6(S9), 3973–3991. https://doi.org/10.53730/ijhs.v6nS9.13541

[5] Hu J, Wallace DC, McCoy TP and Amirehsani KA.A Family-Based Diabetes Experimental for Hispanic Adults and Their Family Members. The Diabetes Educator 40: 48, 2014

[6] Kahan S and Manson JE Nutrition Counseling in Clinical Practice: How Clinicians Can Do Better. JAMA, 318, 2017 1101-1102. https://doi.org/10.1001/jama.2017.10434

[7] Wattana C, Srisuphan W, Pothiban L, Upchurch SL. Effects of a diabetes self-management program on glycemic control, coronary heart disease risk, and quality of life among Thai patients with type 2 diabetes. Nurs Health Sci. 2007 Jun;9(2):135-41. doi: 10.1111/j.1442-2018.2007.00315.x. PMID: 17470188.

[8] D'Souza MS, Ruppert SD, Parahoo K, Karkada S N, Amirtharaj A, Jacob D, Balachandran S & Salmi I . Foot care behaviors among adults with type 2 diabetes.2016 Primary Care Diabetes, 10(6), 442–451. https://doi.org/10.1016/j.pcd.2016.04.002

[9] Chinenye S, Oputa RN & Oko-Jaja RI Diabetes and related diseases in Nigeria: Need for improved primary care in rural communitiesRes. J. of Health Sci. Vol 2(2), April/June 2014

[10] Uloko AE, Musa BM, Ramalan MA, Gezawa ID, Puepet FH, Uloko AT, Borodo MM, Sada KB. Prevalence and Risk Factors for Diabetes Mellitus in Nigeria: A Systematic Review and Meta-Analysis. Diabetes Ther. 2018 Jun;9(3):1307-1316. doi: 10.1007/s13300-018-0441-1. Epub 2018 May 14. PMID: 29761289; PMCID: PMC5984944.

[11] International Diabetes Federation (IDF). Diabetes at a glance, AFRICA (Afr). www.idf.org. Retrieved 21st March, 2015.

[12] Osuji Nnenna. Relationship between glycemic control and perceived family support among people with type 2 diabetes mellitus seen in a rich kinship network in Southwest Nigeria. Family Medicine and Community Health. 6. 10.15212/FMCH.2018.0115.

[13] Stephani V, Opoku D, Beran D. Self-management of diabetes in Sub-Saharan Africa: a systematic review. BMC Public Health. 2018 Sep 29;18(1):1148. doi: 10.1186/s12889-018-6050-0. PMID: 30268115; PMCID: PMC6162903.

[14] Attoye T & Adebobola P & Inem V. An Assessment of Glycaemic Control and Modes of Health Financing among Type 2 Diabetic Patients Attending a Teaching Hospital in South-western Nigeria. West African journal of medicine 2020 37. 237-247.

[15] Oluma A, Abadiga M, Mosisa G, Etafa W. Magnitude and predictors of poor glycemic control among patients with diabetes attending public hospitals of Western Ethiopia. PLoS One. 2021 Feb 25; 16(2):e0247634. doi: 10.1371/journal.pone.0247634. PMID: 33630936; PMCID: PMC7906479.

[16] Ndetei DM, Mutiso V, Musyimi Cet al. Association of type 2 diabetes with a family history of diabetes, diabetes biomarkers, mental and physical disorders in a Kenyan setting. Sci Rep 14, 11037 2024. https://doi.org/10.1038/s41598-024-61984-6

[17] Adebis SA, Oghagbon EK, Akande, TM & Olarinoye, JK. Glycated hemoglobin and glycaemic control of Diabetics in Ilorin. Nigerian Journal of Clinical Practice March 2009. 12.1:87-91.

[18] Chinenye S, Uloko AE, Ogbera AO, Ofoegbu EN, Fasanmade OA, Fasanmade AA & Ogbu OO. Profile of Nigerians with diabetes mellitus – Diabcare Nigeria study group: Results of a multicenter study. Indian Journal of Endocrinology and Metabolism 16. 4: 558–564. doi: 10.4103/2230-8210.98011.

[19] American Diabetes Association. Standards of Medical Care in Diabetes. Diabetes Care 40.Suppl. 1: S11–S66 2018. 6. Glycemic Targets: Standards of Medical Care in Diabetes—2018. Diabetes care, 41. Supplement 1: S55-S64.

[20] Gherasim A, Arhire LI, Niţă O, Popa AD, Graur M, Mihalache L. The relationship between lifestyle components and dietary patterns. Proc Nutr Soc. 2020 Aug;79(3):311-323. doi: 10.1017/S0029665120006898. Epub 2020 Apr 1. PMID: 32234085; PMCID: PMC7663317.

[21] Pamungkas RA, Chamroonsawasdi K, Vatanasomboon P. A Systematic Review: Family Support Integrated with Diabetes Self-Management among Uncontrolled Type II Diabetes Mellitus Patients. Behav Sci (Basel). 2017 Sep 15;7(3):62. doi: 10.3390/bs7030062. PMID: 28914815; PMCID: PMC5618070.

[22] Williams AL, Jacobs SB, Moreno-Macías H, Huerta-Chagoya A, Churchhouse C, Márquez-Luna C, García-Ortíz H, Jose Gomez-Vazquez M, Burtt NP, Aguilar-Salinas CA, González-Villalpando C. Sequence variants in SLC16A11 are a common risk factor for type 2 diabetes in Mexico. Nature. 2014 Feb 1;506(7486):97-101.

[23] Wichit N, Mnatzaganian G, Courtney M, Schulz P, Johnson M. Randomized controlled trial of a family-oriented self-management program to improve self-efficacy, glycemic control and quality of life among Thai individuals with Type 2 diabetes. Diabetes Res Clin Pract. 2017 Jan; 123:37-48. doi: 10.1016/j.diabres.2016.11.013. Epub 2016 Nov 19. PMID: 27918976.

[24] Tang TS, Brown MB, Funnell MM, Anderson RM. 2008.Social Support, Quality of Life and SelfCare Behaviours among African Americans with Type 2.Diabetes. Diabetes Educator 34: 266–276.

[25] Sinclair KA, Makahi EK, Shea – Solatorio C, Yoshimura SR, Townsend CK, Kaholokula JK. Outcomes from a diabetes self-management Experimental for Native Hawaiians and Pacific. Annals of Behavioural Medicine and Public Social Behaviour. Medicine 2013 45: 24-32.