Improving Glycated Hemoglobin Control in a Rural Filipino Community: The Influence of Medication, Nutrition, and Lifestyle Counseling on Type 2 Diabetes Mellitus Patients

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ABSTRACT

Background: The Philippines is experiencing a growing diabetes prevalence in line with global patterns, despite free diabetes medications available at Rural Health Units (RHUs). This rise could be linked to factors like insufficient awareness and ability to self-manage the illness resulting in medication non-adherence, negatively affecting patients' health outcomes. The study aimed to evaluate the impact of counseling on glycated hemoglobin levels among Filipino diabetic patients in rural settings.
Subjects and Method: A quasi-experimental research design was employed to determine the effect of one-on-one counseling on nutrition, lifestyle, and medication management on the HbA1C levels of the participants in a rural setting. A purposive sampling technique was used, and participants were selected based on predefined inclusion and exclusion criteria. Out of 60 diabetic patients enrolled in the study from Sinait RHU, 34 patients were qualified and randomly assigned into 'test' and 'control' groups (n=16). The 'test' group (n=18) received monthly counseling sessions lasting 20 to 25 minutes each, during monthly home visits for 3 months. Data on HbA1c reductions were compared using an unpaired t-test.
Results: After 3-month counseling interventions, HbA1c level in the test group (Mean=6.38; SD= 1.21) was lower than the control group (Mean=9.27; SD=1.38) and it was statistically significant (p= 0.010). A substantial decrease in the HbA1c levels was observed in the test group whereas a significant increase was noted in the control group.
Conclusion: The study's findings suggest that counseling can help improve diabetic patients' perceptions of disease, diet, and lifestyle changes, resulting in better glycemic control and, ultimately, a higher quality of life.

Keywords: HbA1c, Type 2 diabetes, nutrition counseling, medication counseling, lifestyle counseling, Philippines

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BACKGROUND

According to the International Diabetes Federation, the global prevalence of diabetes mellitus increased fivefold from 108 million in 1980 to approximately 537 million in 2021 (IDF, 2019). Diabetes was the direct cause of 1.5 million deaths in 2019, 48% of which occurred before the age of 70, responsible for numerous kidney and cardio-vascular disease deaths worldwide with a higher incidence in low- and middle-income countries (GBD, 2019). The Philippines, which is located in the Western Pacific region in Southeast Asia, had more than 4.3 million people diagnosed with diabetes, with a 7.1% prevalence rate in adults aged 20 to 79 years, and over 2.8 million people with diabetes remain undiagnosed in 2021 (Sun et al., 2022).

Type 2 diabetes mellitus (T2DM), also known as non-insulin-dependent diabetes or adult-onset diabetes accounts for 90% of all diabetes cases globally. T2DM is caused by the body's ineffective use of insulin which is a result of a rapid increase in obesity and physical inactivity. Other risk factors for T2DM include genetics, family history of diabetes, age, high blood pressure, and high cholesterol levels (IDF, 2019). Ethnicity can also play a role, with some populations, such as Asians and African Americans, having a higher risk of developing T2DM than others (Cho et al., 2017).

Several factors contribute to the high prevalence of T2DM among populations in the Philippines. One study identified several key factors, including a heightened diabetes risk among adults with lower educational attainment and limited access to medical information about disease prevention (Ydirin, 2021). Moreover, the country suffers from a significantly low physician-to-house-hold ratio, potentially resulting in insufficient time for patient education and counseling (Tan, 2015).

Thus, it is essential to establish the effect of community-based counseling intervention program in tackling T2DM in the Philippines. The objective of this study is to assess the impact of counseling on the glycated hemoglobin level in patients with diabetes.

SUBJECTS AND METHOD

1. Study Design

This study employed a quasi-experimental design with a pre-post interventional research design. Data were gathered at the Rural Health Unit of Sinait, Ilocos Sur from March to May 2018.

2. Population and Sample

A total of 297 diabetic patients registered in the rural health unit of Sinait, Ilocos Sur, Philippines for free access to medications provided by the government. Sixty participants were enrolled in the study of which 34 fulfilled the inclusion and exclusion criteria and completed the program while one participant from the control group withdrew. The participants were represented by 2 subsets (non-proportionate quota sampling). Stable Type 2 Diabetes Mellitus patients and both genders above 30 years of age who are under medication (oral hypoglycemic agents, insulin) and are obtaining free medications in the rural health unit were included in the study. Moreover, pregnant women, patients with >3 major diabetic complications, and cognitively impaired participants were excluded.

At enrollment, the patient's demographic details, and anthropometrics were obtained. Additionally, laboratory test like glycosylated hemoglobin (HbA1c) were obtained and recorded by a registered medical technologist. One-on-one counseling of 20 to 25 minutes to the test group was conducted. The house visit was done monthly for over three months. The researcher utilized a standard counseling program

which includes but is not limited to pathophysiology and cause of diabetes, short- and long-term complications of diabetes, blood glucose control, recommendations for appropriate lifestyle changes, and nutrition recommendations. After the first counseling session, the test group patients were given printed handouts in the local dialect containing information on diabetes and desirable dietary and lifestyle changes. The patients in the control group received counseling and patient information leaflets at the end of the study only for ethical concerns. The changes in the glycosylated hemoglobin were noted and assessed before and after the counseling intervention program.

3. Study Variables

The dependent variable is the HbA1c values while the medication, nutritional and lifestyle counseling is the independent variable.

4. Definition Operational of Variables

Glycated hemoglobin (HbA1c): is a laboratory test value that indicates the average level of blood sugar of an individual over the past 2 to 3 months. The HbA1c values used in this study were collected from the medical records at the rural health unit of Sinait, Ilocos Sur.

Counseling: refers to an implemented intervention program aimed at providing support and guidance to individuals with type 2 diabetes mellitus. It involves one-on-one counseling sessions lasting 20 to 25 minutes. Additionally, monthly house visits were conducted for 3 months, along with the provision of printed handouts.

Medication Counseling: was defined as a part of the counseling intervention program which includes the provision of information related to the use of medication for type 2 diabetes mellitus medication. It includes proper directions for medication use, advice on potential side effects and drug interactions, and guidance on appropriate storage of the medication.

Nutritional Counseling: was defined as a part of the counseling intervention program which includes the provision of information on dietary changes necessary for the management of type 2 diabetes mellitus. It focuses on educating individuals about suitable dietary choices, portion control, and other nutritional considerations that can help them effectively manage their condition.

Lifestyle Counseling: was defined as a part of the counseling intervention program which includes the provision of information on various aspects of lifestyle modifications to support the management of type 2 diabetes mellitus. It includes guidance on physical activities, such as exercise routines and their benefits, weight management strategies, and advice on minimizing alcohol and tobacco use.

5. Study Instruments

Blood pressure was measured by sphygmomanometer while HbA1c was obtained through laboratory testing. The other variables were collected by questionnaire.

6. Data Analysis

Data on reduction in HbA1C levels were compared using an unpaired t-test at a level of significance using GraphPad Prism.

7. Research Ethics

Research ethical issues including informed consent, anonymity, and confidentiality, were addressed carefully during the study process. The research ethical clearance approval letter was obtained from the Research Ethics Committee at the Centro Escolar University, Philippines, issued on March 02, 2018.

RESULTS

1. Sample Characteristics

From a total of 60 patients who participated in the study, 34 of them met the inclusion and exclusion criteria and were randomly assigned to either the "test" or "control" groups. Among these patients, 10 (29.4%)

were male and 24 (70.6%) were female. Table 1 displays the breakdown of diabetic patients based on their demographic, biochemical, clinical features, and treatment information.

The study showed respondents' level of education, more than half (66.6%) of the test group had completed secondary school, while one-third (33.3%) only had completed college. A significant proportion (88.9%) of the test group had a family history of DM, indicating the rapid emergence of the condition in the general population. Furthermore, the study found that (55.6%) of the test group were overweight, and (11.1%) were obese, suggesting a lack of awareness about the benefits of physical activity in reducing BMI. While the majority (58.82%) of the patients had elevated systolic blood pressure of ≤120 mm Hg, almost half (47.1%) had a diastolic blood pressure of ≥90 mm Hg. This is consistent with their medication records, which showed that more than half of them (58.82%) were taking antihypertensive medication. Among the patients, 26 (76.57%) were treated with oral hypoglycemic agents (especially metformin without insulin) but not necessarily regularly, while 8 (23.5%) were using a combination of oral hypoglycemic agents and insulin. In the test group, 47.1% of the patients had been diabetic for five years or more. Some patients both from the test and control groups were experiencing diabetic complications, such as weight loss, numbness in hands and feet, blurred vision, burning sensation in soles, leg swelling, infection, and fatigue.

Table 1. Characteristics of Diabetic Patients Registered in the Rural Health Unit of Sinait, Ilocos Sur, Philippines (N=34)

Patient Characteristics	Category	Test Group (N=18)		Control Group (N=16)	
		Frequency	Percentage	Frequency	Percentage
Sex	Male	4	22.2 %	6	37.5%
	Female	14	77.8 %	10	62.5%
Age (years)	30-39	4	22.2 %	2	12.5%
	40-49	4	22.2 %	4	25.0%
	50-59	4	22.2 %	8	50.0%
	60-69	6	33.3 %	2	12.5%
	70 and above	0	0.0%	0	0.0%
Educational attainment	Elementary level	4	22.2 %	4	25.0%
	Highschool level	8	44.4%	4	25.0%
	College level	6	33.3%	8	50.0%
DM history in the family	Present	16	88.9%	10	62.5%
	Absent	2	11.1%	6	37.5%
BMI (kg/m²)	Normal	6	33.3%	4	25.0%
	Overweight	10	55.6%	6	37.5%
	Obese	2	11.1%	6	37.5%
Duration of diabetes (years)	Less than 1	0	0.0%	6	37.5%
	1 to 4	6	33.3%	6	37.5%
	5 to 9	6	33.3%	2	12.5%
	10 or more	6	33.3%	2	12.5%
BP Systolic (mm Hg)	<120	6	33.3%	8	50.0%
	120-129	12	66.7	6	37.5%
	130-139	0	0.0%	2	12.5%
	≥140	0	0.0%	0	0.0%
BP Diastolic (mm Hg)	<80	2	11.1%	0	0.0%
	80-89	10	55.6%	6	37.5%
	≥90	6	33.3%	10	62.5%

Patient Characteristics	Category	Test Group (N=18)		Control Group (N=16)	
		Frequency	Percentage	Frequency	Percentage
Medications	OHA alone	6	33.3%	8	50%
	OHA + antihypertensive	8	44.4%	4	25.0%
	OHA + insulin + antihypertensive	4	22.2%	4	25.0%

2. Impact of counseling to the HbA1C levels of diabetic patients

Table 2 displays the average HbA1C levels of patients in both the test and control groups during their first and final visits. The initial average HbA1C levels of patients in the control group (Mean=8.16; SD=1.76) and the test group (Mean=8.15; SD=1.57) were not statistically significant with (p= 0.970) which is higher than the 0.05 and 0.01 levels. After a 3-month intervention, a substantial decrease in the HbA1c levels was observed in the test group (Mean= 6.38; SD=1.21) at (p<0.010 level of significance, whereas a significant increase was noted in the control group (Mean= 9.27; SD=1.38).

Table 2. Impact of counselling to the HbA1c levels of diabetic patients Registered in the Rural Health Unit of Sinait, Ilocos Sur, Philippines

Impact of counselling	Baseline		After Counselling (After 3 mos.)		Reduction	
	Mean	SD	Mean	SD	Mean	SD
Test Group (N=18)	8.15	1.57	6.38	1.21	1.77	1.03
Control Group (N=16)	8.16	1.76	6.38	1.38	-1.04	1.27

(-) indicates increased in HbA1C
Reductions in HbA1c between the test and control groups are significantly different at (p<0.010)

DISCUSSION

Diabetes is a chronic condition that can significantly reduce a patient's quality of life because of its various complications. Many of these complications result from inadequate knowledge of disease and poor management of blood sugar levels. In this study, patients attributed their blurred vision to aging and their numbness to work exhausttion. Among the 34 patients, there were more females than males, and the largest number of patients aged 50-59 years. More than three-quarters of diabetic patients had a positive family history of DM, indicating that most of the study population had a genetic predisposition to diabetes, while only a quarter had no family history of diabetes. In this study, patients described their physical activity patterns and dietary habits. Doing housework was considered regular exercise, following a healthy diet plan was rarely observed at home, and medication alone was believed to be the only means of controlling diabetes. This suggests a lack of awareness among diabetic patients about how to manage the disease. On the other hand, there is ample evidence that educating patients is the most effective way to reduce diabetes-related complications.

This study raises the question of whether diabetic patients possess sufficient knowledge about their illness and its related complications. Most of the respondents in the study visited rural health units solely to obtain free medications, without necessarily consulting with a physician. Low educational attainment is a well-known significant risk factor for incidents of diabetes and its progression, such as complications and death and patient education has been widely re-

garded as a crucial aspect of diabetes management (Hill-Briggs et al., 2021).

Patient counseling can enhance patients' ability to manage their disease and make informed decisions regarding medication and management, motivating them to change harmful lifestyles and dietary habits (Chowdary and Aanandhi, 2018; İstek and Karakurt, 2018). Moreover, previous research demonstrated that individuals that had received diabetes education were 2.5 times more likely to perform self-management making them 1.5 times more likely to have HbA1c < 7.0% (<53 mmol/mol) target (Gagliardino et al., 2019). And this study supports the positive effects of pharmacist-led patient counseling on glycemic control and quality of life outcomes in diabetic patients (Goruntla et al., 2019; Fajriansyah et al., 2020).

The test group showed a higher frequency of correct answers after 3 months compared to the group that did not receive counseling, indicating an improvement in knowledge, attitude, and practice toward disease management through medication, nutrition, and lifestyle counseling. Patients in the test group became more aware of the benefits and side effects of their medication, how to manage hypoglycemia, the benefits of exercise, the importance of taking their medication on time, and consulting their physician regularly. Patients also showed an improvement in their nutrition knowledge, particularly in the importance of eating fiber-rich foods and controlling salt, sugar, and fats in their diet. Furthermore, lifestyle changes were observed, as all patients in the test group began at least 30 minutes of morning walking for a more active and healthier lifestyle.

The present study suggests that counseling can not only enhance patients' knowledge, attitude, and practice but also contribute to better control of blood sugar levels.

Notably, better glycemic control was achieved by implementing nutritional and lifestyle changes alone, without altering the patients' current medication. HbA1C, or glycated hemoglobin, is the internationally accepted test for diabetes assessment. In this study, the measurement of respondents' HbA1C levels was used to monitor their glycemic control. The reductions in HbA1C levels were significantly greater in the test group, while the control group experienced a noticeable increase. This indicates that educating patients through counseling improved their glycemic control. Therefore, this study emphasizes the importance of educating patients about appropriate dietary choices, exercise routines, glucose monitoring, and regular consultations with their physicians. Furthermore, it reinforces the recommendation by the American Diabetic Association that educating patients about diabetes management is crucial in empowering them with the knowledge/ skills needed for self-care, crisis management, and lifestyle changes.

It is well established in this study that effective diabetes management requires patient engagement. Patients had uncontrolled HbA1C levels, but counseling had a positive effect on their glycemic levels after three months of intervention. As numerous studies have shown, proper education for diabetic patients can lead to improved glycemic control in type 2 diabetes mellitus, which is linked to reduced risk of complications and improved quality of life, including fewer physical symptoms, better mood, and enhanced well-being, ultimately resulting in better economic outcomes

Based on the findings of this study, it can be concluded that a culturally sensitive nutrition, lifestyle, and counseling intervention program can be extremely beneficial in managing diabetes, as it has been shown to improve glycemic control and reduce complications associated with the disease.

This conclusion is supported by evidence from other parts of the world and highlights the importance of incorporating counseling interventions into diabetes management programs, to ensure consistent and high-quality services in rural Filipino communities, a standardized approach by healthcare providers to diabetes management counseling is recommended.

In countries like the Philippines where there is poor physician-patient ratio, healthcare providers like pharmacists can play a critical role in providing counseling services. By establishing trusting and professional relationships with patients, pharmacists can motivate and encourage patients to participate in counseling programs that can significantly improve their quality of life. This would also give pharmacists a greater role in the medical management of patients with diabetes.

AUTHOR CONTRIBUTION

All authors have contributed significantly to the analysis of data as well as the preparation of the final manuscript.

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CONFLICT OF INTEREST

There is no conflict of interest in this study.

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