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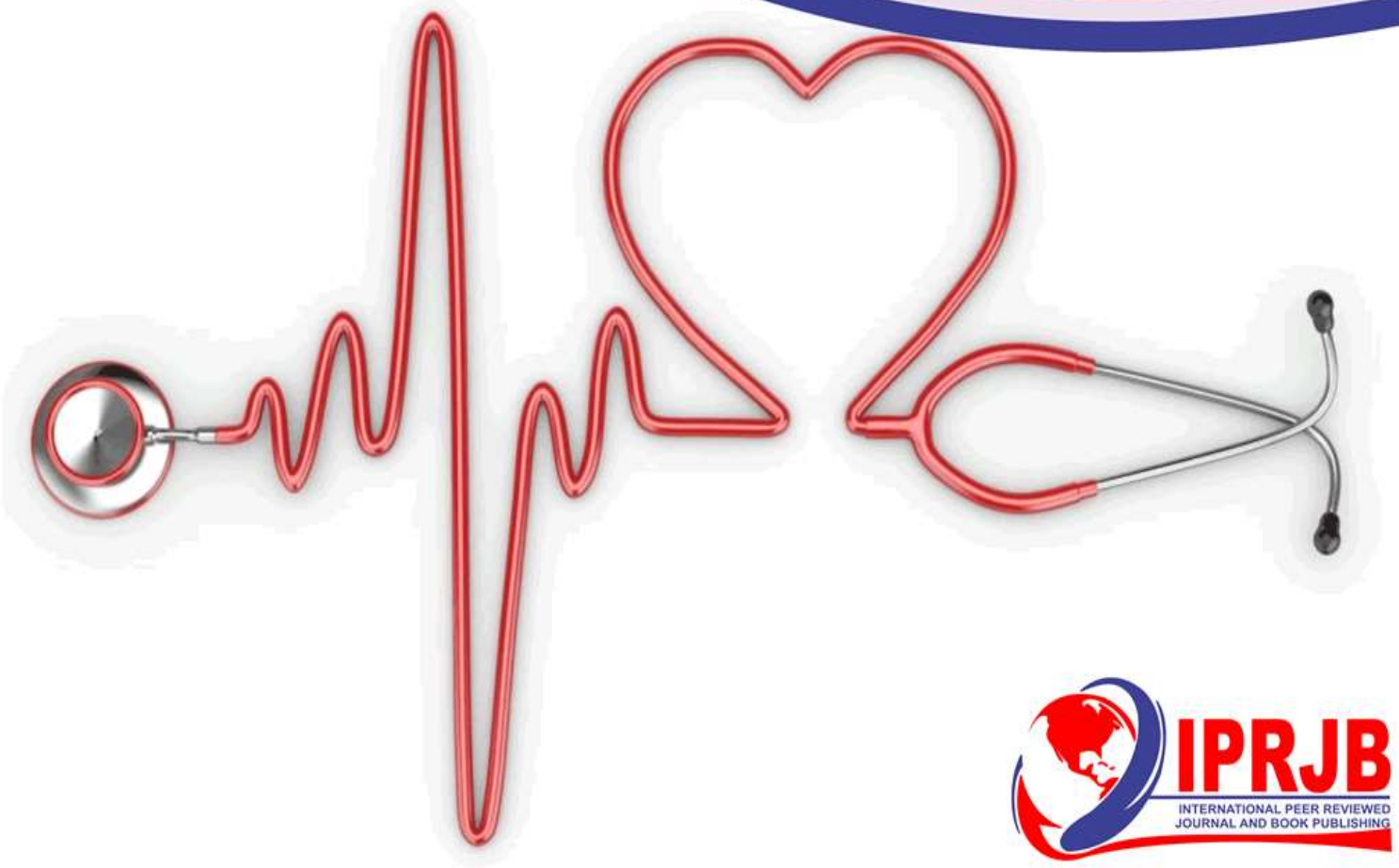

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Knowledge, Attitudes and Lifestyle Practices among Patients with Type 2 Diabetes at University Teaching Hospital, Butare- Rwanda

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Abstract

Purpose: Type 2 diabetes mellitus is a chronic metabolic disease related to insulin and is one of the most significant worldwide health problems. In the developing world, the number of people afflicted by type 2 diabetes mellitus continues rising, and carries with it considerable morbidity and mortality. Type 2 diabetes mellitus problems can be avoided or even stopped with behavior adjustment and the adoption of healthy living practices. Nevertheless, the majority of diabetes mellitus patients lack adequate knowledge of and application of healthier lifestyles. Aim of the study is to determine the knowledge, attitudes and practice regarding lifestyle modification in type 2 diabetes patients at CHUB.

Methodology: A cross section study was applied with the sample size of 364 participants, almost the half 189(51.9%) of the participants were aged between 41-60 years old. regarding the marital status the majority 246(67.6%) were married. Concerning to education level almost a half 188(51.6%) did primary school only. In this population, 39.8% of the participants were farmers while only 9.1% formal employment. Data collected with a structured questionnaire and analyzed with SPSS version 26.

Findings: The study found that 98.4% of participants had good knowledge about lifestyle modifications for managing type 2 diabetes, with all 364 participants aware of the importance of health checks and screening. However, 13.2% were unaware that limiting fatty foods contributes to managing the condition. Nearly all participants (98.1%) had a positive attitude towards a controlled diet, and all agreed on the importance of regular exercise to prevent complications. While 12.9% believed traditional healers could cure diabetes, 94.8% followed effective lifestyle practices. Factorial ANOVA revealed significant effects of BMI, marital status, and occupation on lifestyle practices ($p<0.001$).

Unique Contribution to Theory, Practice and Policy: As recommendations, measures should be taken to maintain and to improve the health promotion about life style modifications to prevent and manage the type two diabetes mellitus and other none communicable diseases.

Keywords: *Knowledge, Attitudes, Lifestyle Practices, Patients with Type 2 Diabetes, University Teaching Hospital, Rwanda*

JEL Codes: *I12, I18, O55, I19, I31*

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INTRODUCTION

Type 2 diabetes mellitus (T2DM) has emerged as a major public health challenge globally, contributing significantly to premature death, disability, and high morbidity and mortality rates. Recent estimates indicate that approximately 462 million people were living with T2DM worldwide in 2017, accounting for 6.3% of the global population. T2DM is now the 9th leading cause of mortality, claiming over one million lives annually (WHO, 2016). The World Health Organization (WHO) has projected that this number will rise to 592 million by 2035. As one of the most prevalent chronic diseases, T2DM constitutes approximately 90-95% of all diabetes cases globally, with Type 1 diabetes accounting for only 2-5% (IDF, 2019).

In the context of the Middle East, countries such as Saudi Arabia have reported alarmingly high T2DM prevalence rates, with 23.7% of the population affected in 2011, making it the second highest rate in the region and seventh highest worldwide (WHO, 2016). Similarly, in Palestine, T2DM prevalence was estimated at 15.3% in 2017, with projections indicating an increase to 23.4% by 2030. This growing burden highlights the urgent need for effective interventions.

The prevalence of T2DM is also rising rapidly in Sub-Saharan Africa (SSA), where lifestyle changes, urbanization, and dietary transitions have contributed to a sharp increase in the number of cases. In Africa, the number of people with diabetes is expected to rise from 16 million in 2019 to 42 million by 2045, a staggering 156% increase. The African region also bears the highest proportion of undiagnosed T2DM cases, with an estimated 69% of people unaware of their condition (Mekonnen et al., 2020). This lack of diagnosis and delayed intervention contributes to a growing number of diabetes-related complications and fatalities.

In Rwanda, T2DM has become an increasingly significant health concern. A recent study by Kabeza et al. (2019) estimated that 2.8% of the Rwandan population is currently living with diabetes. Although this figure is relatively low compared to other regions, the prevalence is expected to rise in the coming decades as the country experiences demographic and socio-economic transitions. Furthermore, as the population in Rwanda and Sub-Saharan Africa continues to urbanize and adopt more sedentary lifestyles, the risk of developing T2DM is likely to increase, making lifestyle modification even more critical.

The World Health Organization and the International Diabetes Federation (IDF) have noted that nearly 80% of diabetes-related deaths occur in low- and middle-income countries, and the burden of diabetes is disproportionately high in these regions. In Sub-Saharan Africa, the incidence of diabetes is expected to increase by 162.5% by 2045, placing further strain on already overstretched healthcare systems (Alaofè et al., 2021). Diabetes has a profound impact on individuals, families, and societies, with significant healthcare costs and a high incidence of complications, such as cardiovascular disease, kidney failure, and vision loss (Liu et al., 2020).

Diabetes is also a leading cause of morbidity and mortality among young adults, adolescents, and children in the developing world, a trend that underscores the urgent need for preventive measures, early diagnosis, and better management. In Rwanda and other Sub-Saharan African countries, raising awareness about the importance of lifestyle modifications such as diet control, physical activity, and weight management is essential to mitigate the long-term impact of the disease. Interventions that focus on improving knowledge, attitudes, and practices related to diabetes care can play a key role in reducing the burden of T2DM and preventing its complications (Mekonnen et al., 2020). The aim study is to assess the knowledge, attitudes, practices, and factors influencing lifestyle modification among patients with T2DM at the

University Teaching Hospital of Butare (CHUB), Rwanda. Understanding these factors will help inform local public health strategies aimed at improving diabetes care and prevention in Rwanda and across Sub-Saharan Africa.

Problem Statement

Type 2 diabetes mellitus (T2DM) is strongly associated with high mortality rates and an increased risk of cardiovascular and renal diseases. Key risk factors for developing T2DM include poor nutrition, physical inactivity, smoking, excessive alcohol consumption, and inadequate sleep (Mekonnen et al., 2020). The prevalence and incidence of T2DM are higher in developing countries compared to developed nations, largely due to lifestyle changes occurring more rapidly in the latter. Inadequate knowledge, negative attitudes, and poor self-care practices can worsen the prognosis of T2DM, accelerating complications that could otherwise be prevented with early diagnosis and proper management (Mekonnen et al., 2020). Despite awareness of the importance of lifestyle modification in T2DM management, there is a gap in understanding the actual behaviors and practices followed by individuals diagnosed with the condition. This gap between knowledge and action contributes to poor disease control, increased healthcare costs, and higher complication risks. Therefore, it is essential to investigate the knowledge, attitudes, and practices regarding lifestyle modifications among T2DM patients, particularly in Rwanda. Limited studies on this topic exist in Rwanda, making it crucial to assess these factors at the University Teaching Hospital of Butare (CHUB) to inform targeted interventions and improve patient outcomes.

Research Objectives

It was guided by the following specific objectives:

i. To determine the knowledge regarding lifestyle modification among type 2 diabetes patients at University Teaching Hospital of Butare.

ii. To identify the attitudes regarding lifestyle modification in type 2 diabetic patients at University Teaching Hospital of Butare.

LITERATURE REVIEW

Diabetes is a metabolic disorder marked by deranged carbohydrate, lipid and protein metabolism branching from either total absence of insulin secretion by the pancreas (type one) or peripheral tissue non-response to insulin (type two). With diabetes type two diabetes mellitus, there is a whole set of malfunctions hallmarked by high blood sugar, all resulting from the combination of resistance to insulin action, dismal insulin release, and inordinate glucagon release(Watson, 2021).

Type 2 diabetes mellitus is linked with varied risk factors among which include modifiable ones like obesity and sedentary lifestyle. Proper nutrition and body exercises significantly drop the risk of catching diabetes later on in life. In patients already diagnosed of type 2 diabetes mellitus, thorough lifestyle adjustments stressing on weight decrement as well as saying physically active are efficacious in weight lowering and meliorating glycaemia and, at once, dropping the need for anti-hyperglycemic agents as well as other drugs (Watson, 2021).

Epidemiology

Worldwide, 462 million people are inflicted by Diabetes mellitus type two. Note that this number equals 6.28% of the total inhabitants of planet earth. It ranks as the ninth among the leading causes of mortality. Looking back at 2017, above one million people died of it

(Khardori, 2021). In USA only, the national diabetes statistics reported that in 2020, ,the prevalence of diabetes among the adult USA population was ranging from 1.5% to 33% in 2016.(Centers for Disease Control and Prevention, 2020).A systematic review undertaken in some developing countries revealed the prevalence of diabetes mellitus types two ranging from 1.3% to 50% (Milibari, 2020).

Lifestyle Modification

Physical Activity

Physical activity and exercises go hand in hand with magnificent outcomes in the journey of managing type 2 diabetes cases. Exercises are pivotal in managing type 1, type two diabetes mellitus, and are being incited as part of treatment regimen for type 2 diabetes mellitus. The fundamental reason for doing physical exercises, is that it betters blood circulation, glycemic control, better weight maintenance, and the reduction of the risk of acquiring cardiovascular insults and overall mortality(Colberg et al., 2016).(Hamasaki, 2016).

Patients are motivated to perform a 30-60-minute moderate-intensity aerobic activity on most weekdays. For simplified compliance, patients are allowed to choose the type of exercise they usually enjoy and they should be given boosting encouragement and tips for skipping any roadblock to exercising. Perfectly, warming up and simple stretching for ten minutes and later twenty minutes of tender aerobic activity; walking, riding a bicycle or rowing with a boat; to mention a few, is recommended. The advice is to do it on three or more occasions a week, and no two straight days off.

Individuals with a higher level of physical fitness can be allowed Shorter-duration, intensive exercise. If no contraindications are present, individuals with type 2 diabetes should also be boosted to perform resistance training at least two times week(Colberg et al., 2016).(Watson, 2021).

Nutrition

Diet is among of the most important aspect and integral part in management of diabetes mellitus. Unfortunately, both clinicians and patients do not understand the elementary principles of nutrition. By Medical nutrition therapy (MNT) we mean the diet that is fitted for diabetes mellitus patients, founding on medical factors, lifestyle factors, as well as personal factors. Great stress should be put on heavily reducing the number of calories consumed per diet (Khaodhiar & Blackburn, 2019). If the patient is overweight or obese, the nutritional plan should stress on weight control but as long as the patient's weight is not a problem, the target should be maintaining healthy weight, consistency in carbohydrate intake at meals or snacks as well as balancing other nutrients(Fridman et al., 2020).

The diet opted for should be adapted according to blood glucose readings, in order to prevent the risks of low blood sugar or high blood sugar. Other nutrient types especially micronutrients must be included in the diet(Khaodhiar & Blackburn, 2019).A variety of eating patterns (Mediterranean, low fat, low carbohydrate, vegetarian) is accepted.

The quality of Fat than quantity is more important. Again, Trans fatty acids are known to pose the risk of coronary heart disease, whereas monounsaturated and polyunsaturated fatty acids have relative protection against coronary heart diseases. Therefore, consuming Trans fatty acid should be avoided as much as possible(Khaodhiar & Blackburn, 2019).Concerning the proteins to be taken, the plan should be individualized but the daily allowance must not be below zero-

point eight gram per kilogram of body weight per day. Patients are advised to substitute red meat with fish, eggs, beans, peas, soy products, and nuts and seeds(Ellis, 2019).

Weight Control

Given the fact that obesity is among the top risk factors of contracting type 2 diabetes, healthy weight control is pivotal in preventing and controlling type 2 diabetes mellitus. It is believed that excess adipose tissue as occurs in obesity, is thought to cause liberation of fatty acids and adipocytes which trigger inflammation. It is believed that this inflammation is linked to insulin resistance (Fridman et al., 2020).

The direct trial, which enrolled patients with type two diabetes (duration less than six years) who were not treated with insulin at the start of their treatment course, intense clinician-supervised calories restriction yielded weight reduction of at least 15 kilograms in 24 percent of the subjects and at one year, diabetes abatement was 46 percent, which is high compared to only 4 percent in the control group. A close association in remission rates and the magnitude of weight loss was observed which increased from 7-86 percent as weight loss increased from less than 5 percent to more than 15percent.

In a two-year analysis of the direct trial, only eleven percent of intervention participants had lost 15 kilograms or more compared with 24 percent in the one-year analysis. Nevertheless, 36 percent of all participants-maintained diabetes remission, compared with the three percent of control group.(Lean et al., 2019).Though weight loss is of paramount benefit, a minority of patients with type 2 diabetes are able to reach and maintain tangible healthy weight(Leslie et al., 2016).

Stress

It was shown that having nervous strain had a direct and indirect effect on the probability of acquiring diabetes mellitus. This being said, the reaction to stress may include non-healthy living, including not doing exercises, and other unhealthy living style, which are associated with heightened risk of contracting diabete**s.**(Meebunmak et al., 2021).In addition, there are physiologic changes related to stress that are believed to impact negatively the endocrine system and immune system, summiting in type 2 diabetes mellitus. Not to forget, stress strongly affects the adherence to treatment options opted for, and this can distort the control of glycaemia in patients in whom the diagnosis type 2 diabetes mellitus is established. In a particular study called “impact of stress in type 2 diabetes mellitus management” it was demonstrated that stress is on a positive correlation with fasting blood sugar levels while postprandial blood sugar levels were unaffected (Zamani-Alavijeh et al., 2018).

Alcohol and Smoking

Although there is not a total limitation of alcohol consumption for patients with diabetes, it should be taken with great precaution in order to control well the condition and avoid associated complications. In a long-term alcohol consumer patient with adequate nutrition, there is a heightened risk of having high blood sugar. On the Contrary, when the patient has long-term alcohol consumption associated with under-nutrition status, the risk of falling into hypoglycemia is even higher (Emanuele et al., 2016). When chronic hyperglycemia and smoking are combined in diabetes type 2 patients, the risk of vascular complication among the patients is heightened (Campagna et al., 2019).

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METHODOLOGY

Study Design

An analytical cross-sectional design was used in this study, applying the quantitative approach to assess the knowledge possessed, attitudes and practices with respect lifestyle modification as management of type 2 diabetes cases at University Teaching Hospital of Butare (CHUB). This hospital chosen because their higher number of patients with diabetes type 2 in HMIS report. In this analytical cross-section study design that we employed, the data was collected from participants and quantitative approach of enquiry was used and data management to obtain results.

Research Setting

The study was undertaken at the University Teaching Hospital of Butare (CHUB). The hospital has major departments like surgery, pediatrics, gynecology-obstetrics, emergency, OPD, and internal medicine. In the internal medicine department, diabetes tops the list of ten conditions followed up at the department. This hospital serves almost the entire population of southern province as well as some of the western province population. It is located 130km from Kigali, the capital city of Rwanda.

Target Population

This study targeted all patients with confirmed type 2diabetes mellitus. The patients were those who consulted or who were followed up at the University Teaching Hospital of Butare. The whole number of patients with diabetes type two who consulted the hospital in the year 2021 to 2022 was 3948.(CHUB, 2021).

Sample Size

The sample size for this study was determined by using **Taro Yamane Formula (Yamane, 1973)** which is used if the target population is known $\mathbf{n= N/1+Ne^2}$

Description:

n= Sample size

N= Population

***e*=**acceptable error of sample size which is equal to 0.05

Calculations

n= 3948/ 1+ 3948(0.05^2) =364

Sampling Technique

Convenience sampling was used for the patients who were willing and able to give in the necessary info required during the period of data collection. The researcher or research assistant collected data for each and every patient with diabetes mellitus types two who consults CHUB when they are available.

Data Collection Methods

In this study, primary data was obtained from participants fulfilling the inclusion criteria. The data was gathered using face to face interview with closed ended questionnaire.

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Data Collection Instruments

A data collection tool was composed of five sections namely demographic characteristics, health information, knowledge, attitudes and practices regarding lifestyle modification applied to type two diabetes mellitus(Mekonnen et al., 2020). The tool contains a series of questions and provided in the tool, is spaces or boxes where participant's responses were recorded. Lastly, the tool is made up of closed-ended questions only.

Procedures of Data Collection

Training was provided to 3 researcher's assistants who gave support during data collection or who may even collect data in case of total unavailability of the main investigator. These research assistants received training chiefly on how to obtain and record accurately the information required which include patients' demographic characteristics, health parameters, knowledge, attitudes and practices regarding lifestyle modification which can assist in taming diabetes mellitus type two as it is predetermined on questionnaire with closed ended questions developed in English but translated into Kinyarwanda.

RESULTS AND DISCUSSIONS

Demographic Characteristics of the Participants

Table 1: Demographic Characteristic of the Participants

Variables		Frequency	Percentage
Age	18-40 years	47	12.90%
	41-60 years	189	51.90%
	>60 years	128	35.20%
Marital status	Married	246	67.60%
	Single	100	27.50%
	Divorced	18	4.90%
Education	No formal education	30	8.20%
	Primary	188	51.60%
	Secondary	104	28.60%
	Tertiary	42	11.50%
	Farmer	145	39.80%
	Self-employment	141	38.70%
	Formal employment	33	9.10%
Occupation	Households	45	12.40%
	High -normal	47	12.90%
	Grade 1 hypertension	106	29.10%
	Grade 2 hypertension	57	15.70%
Diastolic blood pressure	Normal	215	59.10%
	High -normal	48	13.20%
	Grade 1 hypertension	70	19.20%
	Grade 2 hypertension	31	8.50%
Body mass index	< 18.5: underweight	173	47.50%
	18.5-24.5: Normal weight	7	1.90%
	25-29.9: Overweight	118	32.80%
	30-34.9: Obesity class 1	50	13.60%
	35-39.9: Obesity class 2	13	3.60%
	> 40Obesity class 3	3	0.80%

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This study recruited 364 participants, almost the half 189(51.9%) of the participants were aged between 41-60 years old. regarding the marital status the majority 246(67.6%) were married. Concerning to education level almost a half 188(51.6%) did primary school only. In this population 39.8% of the participants were farmers while only 9.1% formal employment. More than a half 59.1% was having normal blood pressure. Regarding to weight status, nearly to the half 173 (47.5%) were underweight.

Knowledge Regarding Lifestyle Modification among Diabetes Mellitus Type Two Patients

Table 2: Knowledge Regarding Life Style Modification among the Participant

QUESTIONS		Frequencies N & (%)
Healthy diet	Correct	359(98.6)
	Incorrect	5(1.4)
Regular exercise	Correct	350(96.2)
	Incorrect	14(3.8)
Weight control	Correct	348(95.6)
	Incorrect	16(4.4)
Smoking cessation	Correct	351(96.4)
	Incorrect	13(3.6)
Alcohol Cessation	Correct	333(91.5)
	Incorrect	31(8.5)
Health checks and screening	Correct	364(100%)
	Incorrect	0(0%)
Limit fatty foods	Correct	316(86.8)
	Incorrect	48(13.20

Results in **Table 2** showing that all participants 364 (100%) were aware that health checks and screening play an important role in life style modification. However, 13.2% of the participants were not aware that limiting fatty foods can play role into the management of their condition.

Attitude Regarding Lifestyle Modification among Diabetes Mellitus Type Two Patients

Table 3: Attitude Regarding Life Style Modification among the Participant

Attitude	Strong agree	Agree	Neutral	Disagree	Strong Disagree
Lifestyle modification is important in the management of type 2 Diabetic	164(45.1)	189(51.9)	11(3)	0(0)	0(0)
Traditional Healer can cure Diabetics mellitus with herbs	26(7.1)	21(5.8)	85(23.4)	107(29.4)	125(34.3)
Regular exercise can prevent complications of Diabetics	228(62.6)	121(33.2)	15(4.1)	0(0)	0(0)
Eating controlled and planned diet is essential in the management of type2 DM	237(65.1)	120(33)	7(1.9)	0(0)	0(0)
Smoking and Alcohol cessation can prevent complications of Diabetics	282(77.5)	38(10.4)	16(4.4)	15(4.1)	13(3.6)

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Table 3: showing that almost the participant 98.1% had positive attitudes on eating controlled and planned diet in the management of diabetes mellitus type two. There are no participants who disagree on regular exercise in order to prevent diabetes complications. The results showed 12.9% of the participants agree that traditional healer can cure diabetes mellitus with traditional herbs medication

Table 4: Correlation between Practice, Attitude and Knowledge

		Overall practice	Overall attitude	Overall knowledge
Overall practice	Pearson Correlation	1	.041	.098
	Sig. (2-tailed)		.438	.063
	N	364	364	364
Overall Attitude	Pearson Correlation	.041	1	.233**
	Sig. (2-tailed)	.438		<0.001
	N	364	364	364
Overall Knowledge	Pearson Correlation	.098	.233**	1
	Sig. (2-tailed)	.063	.000	
	N	364	364	364
**. Correlation is significant at the 0.01 level (2-tailed).				

Results Pearson correlation test showed there is significant correlation knowledge and attitude with the P< 0.001 but there is no significant correlation between attitude and practice nor between knowledge and practice with the following P-values : 0.063 and 0.438 respectively.

Table 5: Statistically Significant Difference between Group Means by Using ANOVA

Source	Sum of Squares	df	Mean Square	F	Sig.
Age category	2.724	2	1.362	.512	.600
BMI class	30.440	5	6.088	2.290	.046
Marital status	61.157	2	30.578	11.505	<0.001
Education	6.014	3	2.005	.754	.521
Ocupation	109.902	3	36.634	13.783	.000
Age category * BMI class	27.492	4	6.873	2.586	.037
Age category * Marital status	97.005	2	48.503	18.248	<0.001
Age category * Education	51.092	4	12.773	4.806	.001
Age category * Ocupation	52.574	4	13.143	4.945	.001
BMI class * Marital status	3.470	2	1.735	.653	.521
BMI class * Education	106.766	5	21.353	8.034	<0.001
BMI class * Ocupation	85.336	4	21.334	8.027	<0.001
Marital status * Education	35.163	2	17.582	6.615	.002
Marital status* Ocupation	11.705	3	3.902	1.468	.223
Education * Ocupation	31.709	4	7.927	2.983	.019

Factorial ANOVA was conducted to examine the effect demographic characteristic practicing life style modification regarding to diabetes type. It has showed that there is a statistically significant effect of BMI class, Marital status, Occupation, on practice with the following Pvalues : p= .046; p<0.001 and P<0.001 respectively. It showed that also there is statistically significant interaction effect between Age category * BMI class, Age category * Marital status, Age category * Education, Age category * Occupation, BMI class * Education, BMI class * Occupation, Marital status * Education and Education * Occupation on practice with the following values: p= .037, p< .001,p= .001, p=.001 ,p< .00 1, p<.001,p< .019 respectively.

Discussions

The present study, conducted at the University Teaching Hospital of Butare (CHUB), aimed to assess knowledge, attitudes, practices, and factors influencing lifestyle modifications among patients with Type 2 Diabetes Mellitus (T2DM). It found that the majority (98.4%) of participants had good knowledge about lifestyle modifications for managing and preventing complications of T2DM, which is in line with findings from South Africa (Okonta et al., 2014) and Ethiopia (Garedow et al., 2023). These results suggest a global trend toward increased awareness about the importance of lifestyle changes in managing diabetes, likely driven by improvements in health education, access to technology, and global health system advancements. However, the discrepancy observed in Saudi Arabia (Awadh et al., 2023), where only 56.4% of participants exhibited moderate knowledge, highlights the impact of different health promotion strategies and the need for more targeted educational efforts in specific regions. Cultural factors, including different health beliefs and practices, as well as the varying levels of healthcare accessibility, may contribute to these differences. For example, in some cultures, traditional medicine and healers play a more prominent role in managing health conditions, which could affect how patients view conventional medical advice, including lifestyle changes.

The positive attitudes observed in our study (98.1%) regarding controlled and planned diets align with findings from South Africa (84.5%, Okonta et al., 2014) and Ethiopia (80%, Garedow et al., 2023), indicating a generally favorable attitude toward lifestyle modification among T2DM patients across various regions. However, in contrast, a study in Nigeria found that only 54.3% of participants had a positive attitude towards lifestyle changes (Amere et al., 2020). This difference might be attributed to variations in the healthcare infrastructure, socioeconomic status, and the general health promotion environment in these countries. In Rwanda, economic constraints and limited access to resources such as healthy food options may impact individuals' ability to fully embrace the recommended dietary changes. Additionally, the high reliance on traditional medicine, particularly in rural settings, could explain why some participants in our study (12.9%) still believed that traditional healers could cure diabetes using herbs. This cultural belief presents a barrier to the effective implementation of evidence-based lifestyle modifications and highlights the need for culturally sensitive health interventions that respect local practices while promoting modern diabetes management strategies.

Regarding the practice of lifestyle modification, our study found that only 32.1% of participants followed a controlled diet, and 26.6% engaged in regular physical activity, which is consistent with studies in Bangladesh (Wu et al., 2022) and India (Pardhan et al., 2024), where diet control and physical activity were commonly practiced. The lower adherence to regular physical exercise in our study could be due to economic factors, such as limited access to gyms or exercise equipment, and a lack of awareness or resources for physical activity that is both

feasible and enjoyable. In some African contexts, cultural and environmental factors may also hinder physical activity, such as societal perceptions of exercise or the preference for traditional, less physically demanding tasks. Furthermore, limited access to nutritious food in rural areas of Rwanda could contribute to the challenges in dietary control, especially when fresh produce and healthier food options are scarce or expensive. This situation emphasizes the need for interventions that not only provide education but also address the structural barriers to healthy living, including the availability of affordable, nutritious food and opportunities for physical activity.

A significant factor influencing the practice of lifestyle modification in this study was education level, with those having tertiary education showing better adherence to lifestyle modifications. This is consistent with findings from a systematic review (Mohamed Nor et al., 2019), which demonstrated that higher education levels correlate with better knowledge and understanding of health practices. This relationship likely reflects the increased health literacy associated with higher education, which may empower individuals to make more informed decisions about their diabetes management. Additionally, higher education often correlates with better economic status, which can provide individuals with the financial resources needed to implement lifestyle changes, such as purchasing healthier foods or accessing fitness services. However, economic constraints remain a significant barrier in Rwanda, where many individuals live below the poverty line, and access to healthcare services and healthy food remains a challenge, particularly in rural areas.

In conclusion, while the knowledge and attitudes towards lifestyle modifications in T2DM patients in Rwanda are comparable to those observed in other African and global settings, the practice of these modifications is influenced by various contextual factors. Cultural beliefs, limited healthcare resources, and economic constraints pose unique challenges in the Rwandan context that may affect adherence to recommended lifestyle changes. Understanding these factors and tailoring interventions to address the specific barriers faced by Rwandan patients will be crucial for improving diabetes management outcomes. Additionally, comparing the findings of this study with similar research in other countries underscores the importance of considering local contexts when designing health promotion and diabetes care strategies. These findings call for a more integrated approach that combines education, healthcare accessibility, and socio-economic support to effectively manage and prevent T2DM in diverse settings.

Limitations

The study is subject to several limitations that should be considered when interpreting the findings. Firstly, the cross-sectional design limits the ability to establish causal relationships between the observed variables, meaning that while the study provides valuable insights into knowledge, attitudes, and practices regarding lifestyle modifications among patients with Type 2 Diabetes Mellitus (T2DM), it cannot determine the cause-and-effect dynamics underlying these behaviors. Additionally, the sample population was drawn from the University Teaching Hospital of Butare, which may not be fully representative of all T2DM patients across Rwanda. The findings may, therefore, be influenced by the specific demographic and clinical characteristics of the patients attending this tertiary care facility, and may not be generalized to individuals with T2DM in rural or less-accessible regions, where healthcare access and socio-economic factors differ. The study's focus on a single hospital further limits the generalizability of the results to other healthcare settings in Rwanda, where regional differences in healthcare infrastructure, cultural practices, and local health promotion efforts may influence patient knowledge, attitudes, and behaviors.

Despite these limitations, the study provided important insights into the knowledge and practices surrounding lifestyle modifications in T2DM patients, offering valuable information for improving diabetes care management within the specific context of University Teaching Hospital of Butare. Future research, ideally involving a larger and more diverse sample across multiple regions, is needed to better understand the broader applicability of these findings and to explore potential causal relationships between the factors influencing lifestyle modifications in T2DM patients.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The study at CHUB assessed knowledge, attitudes, and practices related to lifestyle modification in type 2 diabetes patients. It found that 98.4% had adequate knowledge, and 1.6% had poor knowledge. 98.1% had a positive attitude towards diet control. 96.4% practiced lifestyle modification, health checks, and screening. However, there is a need for improved health promotion to raise awareness about lifestyle modifications for type 2 diabetes and other non-communicable diseases.

However, this study indicated that 98.1% of participants had positive attitude towards diet control to normalize blood sugar; about practice of lifestyle modification, health checks and screening is performed by 96.4%, followed by controlled and planned diet and regular physical exercise (practiced by 32.1% and 26.6% respectively), while monitoring of body weight was practiced in 21.7% of participants.

This poor knowledge and limited practice of some activities, highlight the urgent and sustained need for health promotion about prevention and management of type two diabetes mellitus to improve the population's awareness about life style modifications necessary for prevention and management of type two diabetes mellitus and other none communicable diseases.

Briefly, this study has achieved the following proposed research 'objectives; the determination of knowledge, attitude, practice and factors influencing lifestyle modification among patients with type two diabetes mellitus at CHUB.

Recommendations

According to our study of knowledge, attitudes and practices regarding life style modification in type 2 diabetes at CHUB, the recommendations were based on results of this study are drafted as follow. The administration of hospitals should take measures to improve and maintain the health promotion about life style modifications to prevent and manage the type two diabetes mellitus and other none communicable diseases.

The health professionals should provide health education about life style modification among patients with type two diabetes mellitus and other none communicable diseases. The nursing researchers, should conduct further researches to highlight the factor/ barriers to knowledge, attitudes and other factors associated with practice of lifestyle modification to control/ manage type two diabetes mellitus and other none communicable diseases.

Author Contributions

Mr. Rwabuneza Richard played a pivotal role in the conceptualization and development of the study's methodology. Both Mr. Onesmus Marete and Mr. Rwabuneza Richard were responsible for software validation, data analysis, and leading the overall investigation. Mr. Rwabuneza Richard also made significant contributions to drafting the original manuscript. Dr. Andala

Opiyo Hesbon provided critical review and substantial editorial contributions, while Dr. Rosemary Okova offered valuable supervision throughout the entire research process.

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Ethics Statement: The authors affirm their commitment to presenting findings that are dependable, trustworthy, and reliable, ensuring that no information is disclosed for personal gain.

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